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Building a High-Reliability Organization

A Toolkit for Success

Second Edition

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Gary L. Sculli, MSN, ATP, brings a unique and diverse perspective to patient safety. He is a registered nurse and has worked in multiple clinical specialties. In addition to serving as an officer in the United States Air Force Nurse Corps, Sculli is also a former airline pilot for a major U.S. airline. He has developed and taught Crew Resource Management (CRM) programs in both aviation and healthcare and continues to work as a patient safety consultant. Currently at the National Center for Patient Safety in Ann Arbor, Michigan, Sculli leads programs that implement CRM, team training, and human factors concepts in clinical practice to create and sustain high-reliability care. He is also the author of the HCPro book *Soaring to Success: Taking Crew Resource Management From the Cockpit to the Nursing Unit*.

Douglas E. Paull, MD, MS, FACS, FCCP, CSHE, graduated from Duke University with degrees in zoology and medicine. He completed his general surgical training at the New York Hospital-Cornell Medical Center and his cardiothoracic surgical fellowship at the University of North Carolina at Chapel Hill. He obtained a master's degree in patient safety from the University of Illinois at Chicago. He has more than 20 years of clinical experience. Prior to joining the Veterans Health Administration's National Center for Patient Safety (NCPS), Paull was associate professor of surgery at the Boonshoft School of Medicine at Wright State University in Dayton, Ohio. He is currently director of patient safety curriculum and medical simulation at NCPS and has authored multiple publications on surgery, team training, and patient safety.

David Sine, CSP, ARM, CPHRM, DrBE, is a former federal executive with experience in multiple disciplines, including enterprise risk management, organizational ethics, high reliability, and patient safety. A healthcare risk management consultant since 1980, he acts as a risk management and clinical ethics advisor to the National Association for Behavioral Healthcare. Certified by the Board of Certified Safety Professionals and a Certified Professional Healthcare Risk Manager, Sine has a doctorate in biomedical ethics from Loyola University in Chicago.

Acknowledgments

Gary L. Sculli, MSN, ATP

I want to sincerely thank you, the reader. If you are reading this, you are most certainly dedicated to the unique discipline that is patient safety and have devoted a part of your professional life trying to improve the system for the benefit of patients. The road to high reliability is daunting; what it takes to achieve it in many cases does not mesh well with traditional and well-established methods used to deliver healthcare. But you embrace the idea and forge ahead anyway because you know that to "get there," your steadfast leadership is required. It is my hope that what you read here can serve you well on your journey.

Douglas E. Paull, MD, MS, FACS, FCCP, CHSE

I would like to acknowledge the guidance and wisdom of my mentors in patient safety, both past and present: Dr. Jim Bagian, Dr. Robin Hemphill, Caryl Lee, Linda Williams, and my co-author, Gary Sculli. They have taught me, and countless others, about the foundations of patient safety for a modern healthcare system and have served as excellent role models in patient safety leadership. I would also like to thank my many colleagues who have dedicated their professional lives to improving patient safety and helped me throughout my career.

Words cannot express my gratitude for my wife, Lisa, and her understanding and patience in support of the writing of this book. Further inspiration came from my daughter, Sara, and grandchildren, Elena Jane and John.

Foreword

To the reader:

I am very pleased to have been asked to write a foreword for this new book, *Building a High-Reliability Organization: A Toolkit for Success,* by Gary Sculli, Douglas Paull, and David Sine. As a consultant physician working for the National Health Service in the United Kingdom, I did my pre-clinical studies at Worcester College, Oxford University, and my clinical training at King's College Hospital Medical School, London University. The emphasis throughout that training and in my postgraduate years was very much on getting it right for the patients and reducing iatrogenic harm. In simple terms, this meant establishing the right diagnoses in the context of the patient's comorbidities, making and implementing wise plans for treatments, monitoring the patient's clinical status, reviewing progress regularly, and being careful to reduce avoidable harm. Quality and safety in the care of the individual patient was drummed into us! But ensuring quality and safety requires much more than simply emphasizing the importance of "wise" plans or being "careful." In my opinion, most senior doctors and administrators have not realized how much healthcare delivery has changed over the past 70 years. In the past, a senior doctor (consultant or attending) was very much like an individual craftsman running his own business, like a carpenter, plumber, or goldsmith. As Sir William Osler stated, "Physicians as a rule have less appreciation of the value of an organization than members of other professions." Today, healthcare is highly complex and fast-moving, and it requires high-risk decision-making by teams whose membership can change rapidly. Reliable outcomes depend on well-organized standard operating procedures, clear and efficient communication, high-functioning interdisciplinary teams, resilient processes, the use and sustainment of safety tools such as checklists and briefings, the firm presence of a culture of safety, and ongoing training in crew resource management. These elements are at least as important as the intellectual or technical brilliance of any individual clinician and require an unwavering commitment from the highest levels in an organization.

In April 2013, I happened serendipitously to sit next to David Sine, a colleague of both Gary Sculli and Douglas Paull, at the International Forum on Quality and Safety in Healthcare in London. We soon got to talking about the use of checklists in healthcare, a topic with which I am quite familiar. David was very enthusiastic about Sculli's work and encouraged me to obtain a copy of *Soaring to Success: Taking Crew Resource Management From the Cockpit to the Nursing Unit.*

I devoured that book because it echoed my belief that we could dramatically improve patient safety not only by changing what we say and how we say it, but also by adopting the tools used in high-reliability industries.

This book takes that idea to a new level. How can top leaders and managers in healthcare organizations really know if they have what it takes to create and sustain high-reliability care? How can top leaders ensure that frontline staff possess the knowledge, skill, and resources needed to make their work processes consistent, safe, and reproducible? In 10 chapters, Sculli, Paull, and Sine provide a road map that answers these questions directly. Clearly laid out for the reader in narrative and checklist form are what the authors term *high-reliability markers,* which, if present, indicate that an organization has the necessary elements in place to trap human error, anticipate and safely manage failure, and avoid catastrophic events. Sculli, Paull, and Sine intuitively write that top leaders must be present *in* the workplace, have a deep rich understanding of the frontline experience, and exert their efforts to transform the clinical setting into a venue where it's easy to "get it right" and hard to "get it wrong." The authors explicate topics key to high reliability, such as human factors, strategies to support individual and team situational awareness, a preoccupation with the possibilities for failure, reducing variability through adherence to standard operating procedures, creating readily accessible usable workplace checklists, creating and nurturing a Just Culture and a safety culture, and much more. Sculli and Paull's use of the word *mandate* throughout the book along with an almost religious adherence to investing in and sustaining a perpetual training program for all clinicians will certainly challenge leaders to depart from business-as-usual approaches. The authors make it clear that high reliability is not a passing fad or quick fix, but rather a way of life that requires bold decisions and transformational leadership.

The good news is that moving toward high reliability will reduce the long-term financial and emotional cost burden for any healthcare organization. It will substantially increase the chances that your organization will consistently "get things right" with less avoidable harm for patients. The road map for that high-reliability journey is before you.

Read on!

Gordon

Dr. Gordon Caldwell, FRCP
Consultant Physician and Clinical Tutor
National Health Service, United Kingdom

How to Read This Book

This book was written, as are most books, with a distinct beginning, middle, and end in mind by the authors. However, the reader need not follow that linear progress from beginning to end. An informed reader, anxious to get started, might be better served by first using the checklists found at the end of each chapter as an assessment to establish an organizational baseline or find some navigational aids to get them course-corrected in a high-reliability organization journey that has already begun. The checklists lay out what we call *high-reliability markers*. The markers are presented on the left side of the checklist, and methods to implement are presented on the right. The checklists provide a concise summary of what has been developed in the chapter text. Note also that the checklists are administrative summaries, not the type of checklists one would see in a safety-sensitive operational setting. Therefore, they do not follow the design principles discussed in Chapter 4. Because the chapters are for the most part self-contained and stand on their own, other readers may simply want to jump into a particular aspect of high reliability and select a chapter that resonates with them.

Throughout the book, case studies are used liberally to intentionally illustrate the concepts within the context of the clinical environment. We believe that case studies from various medical disciplines and settings are a good way to ground theory in practice.

Lastly, it is important for you to know that Chapter 1, *Situational Awareness Is Fundamental to High Reliability,* is a **mostly theoretical chapter and does not follow the format seen in the rest of the book (i.e., no leadership checklist)**. Situational awareness is a topic from which many concepts derive. Situational awareness influences and informs all high-reliability markers and in this sense is truly fundamental to the rest of the book. A critical step in the movement toward high reliability occurs when leaders commit to measures that facilitate the development of both individual and team situational awareness at the front line of care. For this reason, we devote two chapters to the topic.

CHAPTER 1

Situational Awareness Is Fundamental to High Reliability

In this chapter:

- Situational awareness case study
- Background
- Leadership, situational awareness, and high reliability
- Developing situational awareness
- Situational awareness derailed
- Cognitive resources of situational awareness
- Environmental threats to situational awareness
- What's next?

Case study

A 75-year-old male patient is on a cardiac medical surgical unit with tachycardia and worsening angina. After being admitted and placed on telemetry, the patient is scheduled for a cardiac catheterization. The unit has a central nurse's station monitor, but it is not manned and is there only as a backup to remote monitoring. In a remote location, all of the unit's telemetry-capable beds are monitored by a certified cardiac monitor technician. At 11 a.m., the monitor technician notices that the patient is not registering a readable rhythm and immediately calls the unit. A medical assistant answers the phone and, after receiving the information from the technician, summons the nurse taking care of the patient. Going to the bedside, the nurse notices that the patient seems restless and has accidentally ripped off one of the electrodes. She settles the patient down and reattaches the electrode. After attaching the electrode and verifying a readable rhythm at the central station, the nurse—who was already behind with the 10 a.m. medication pass—returns to her work. Approximately 10 minutes pass, and the patient, now unattended, again pulls off his electrodes. Shortly after, he develops ventricular fibrillation and then cardiac arrest. The telemetry technician notices the absence of a rhythm and thinks that what he sees is related to the initial situation he called about earlier. He thinks the nurse knows what is going on and does not feel the need to call. No one at the central station notices this either, because all alarms are silenced and nurses rarely look at the monitor during hours of high task load. When the medical team comes by for rounds, the patient is found pulseless, cyanotic, and without respirations. A "code blue" is initiated, but the patient does not respond to interventions and is pronounced dead. Staffing on the unit calls for six nurses and two medical assistants for 30 patients. On this day, two nurses were pulled to another unit, leaving the unit understaffed.

Background

In this modified but true case, the clinicians involved, and the team as a whole, were not aware of critical pieces of information that if known would have helped form a more accurate understanding about what was actually happening with this patient. Nor, it seems, was there an attitude of vigilance, which might have prompted the staff to anticipate impending failures. In other words, what was formulated in the mind did not align with the truth or actual reality of the situation. While there are many possible reasons for this dissonance between what a team thinks is happening and what is really happening, the result is the same: low situational awareness (SA).

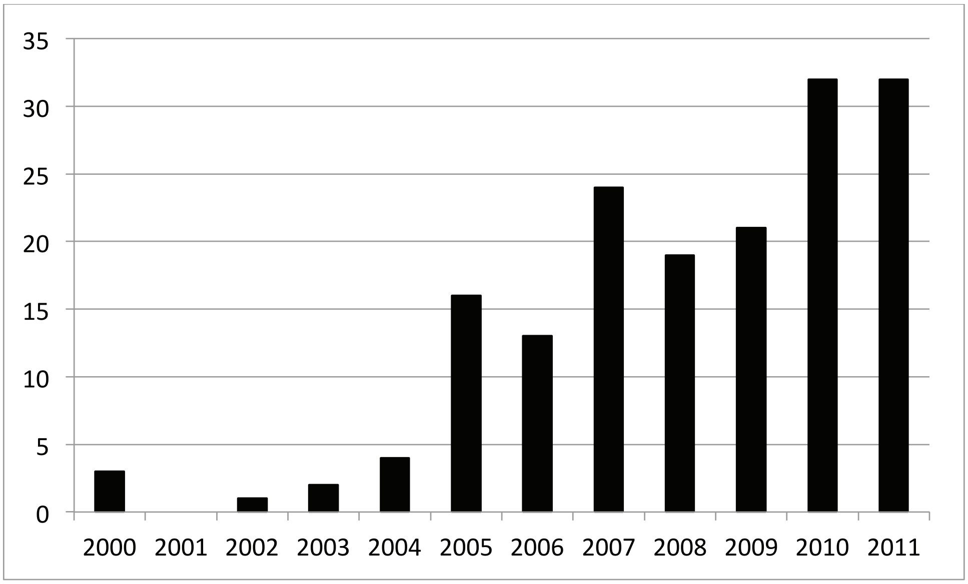
This case raises multiple questions:

- Why was the unit so profoundly understaffed?
- Was this a regular occurrence?
- What is the standard operating procedure for communication between the monitor technician and nursing staff for resolving rhythm irregularities?
- Did the staff trust the functionality of the telemetry equipment? Why was the alarm turned down at the central station?
- What was the task load of the monitor technician, and what made him believe that a second rhythm irregularity was related to the first and known by the nursing staff?
- Did the nurse anticipate a possible problem with the patient since he had become anxious?

The answer to each of these questions plays a central role in the development of SA, a state of being that profoundly affects patient safety.

High-reliability industries and organizations are very familiar with the term SA. In such industries, the term is not a passing fad embraced for a few short years only to be replaced by the next buzzword or catchy movement. SA is a foundational concept, and its importance in operational decision-making at the front line is recognized and categorically supported by leadership. In healthcare, save for pockets of very safe and reliable care delivery, this is generally not the case. SA is not a term that is fluently defined or discussed by frontline clinicians, clinical managers, and healthcare executives. For example, Fore and Sculli (2013) published a concept analysis on the term situational awareness in nursing practice. What they discovered was interesting: An overwhelming majority of these articles were unrelated to healthcare and came from other disciplines, such as aviation, nuclear power, and military operations. Limiting the search to use of the term in nursing returned almost nothing, so they expanded to healthcare in general. While this increased the number of studies that discussed the definition, use of, or measurement of SA, and while the number has increased over the past decade or so (**see Figure 1.1**), healthcare continues to be under-represented when it comes to understanding and supporting SA.

Figure 1.1: Abstracts on PubMed and CINAHL 2000–2011



Leadership, Situational Awareness, and High Reliability

What is meant by the phrase "supporting situational awareness"? It's simple: Healthcare leaders must understand the critical link between situational awareness and clinical decision-making. They need to understand how teams develop situational awareness and must be prepared to clear any and all obstacles that impede that process. Executive leaders and service line leaders close to the bedside must scrutinize models of care delivery currently in use and must be sure that these models enhance a clinician's ability to capture patient information, process the information, easily communicate that information to other team members, and use an engaged and functional team to manage clinical situations likely to occur. The importance of the previous sentence cannot be underestimated.

If you approached the everyday line pilot for a major airline and asked the question, "What is meant by the term situational awareness, and what are specific behaviors you and your team practice on a regular basis to maintain it?" you would receive a cogent answer with specifics. Yet if you approached a nurse or physician or any other healthcare worker and asked the same question, chances are the answer would not come as easily. It is exponentially harder for clinicians to maintain adequate levels of SA than it is for an airline pilot. When you consider staffing shortfalls, hostile work environments, distractions, unmanageable task loads, inadequate training, and poor human-centered designs that persist in many patient care environments, the ability to develop and maintain adequate levels of SA can be profoundly compromised (Sculli et al., 2011). I also assert that if healthcare organizations from the top down and bottom up were committed to making it

CHAPTER 2

Institute Countermeasures to Manage Threats to Situational Awareness

In this chapter:

- Ensuring that clinical teams are practicing and using key “situational awareness threat countermeasures”
  - Implement team monitoring and cross-checking
  - Divide task load
  - Improve staffing
  - Use checklists
  - Reduce distractions, interruptions, and noise
  - Invest in technology and automation
  - Reduce fatigue for all staff
  - Commit to a perpetual team training program
- Are you there yet?
  - High-reliability markers to assess organizational commitment to situational awareness

Situational Awareness Countermeasures

Countermeasure 1: Implement team monitoring and cross-checking

Case study

A 55-year-old female patient ran out of her antianxiety medications and came to the emergency room (ER) after having a seizure. Prior to being discharged, she had another seizure. The ER physician ordered an IV infusion of the antiseizure medication Dilantin 800 mg. This would require the nurse to procure four vials of Dilantin and mix it into a small intravenous (IV) bag for administration. The nurse misread the order as 8000 mg and obtained 32 vials from three different dispensing cabinets. The dose was two to three times the lethal dose. The infusion required the nurse to obtain an extra IV bag to deliver the solution. During the ensuing code blue, the vials and dosage were discovered; the patient died. During the time when the nurse was moving around the unit acquiring the drug vials from three different dispensing units, other nurses and physicians were less than 100 feet away (Agency for Healthcare Research and Quality, 2015).

Figure 2.1: The effects of fatigue on performance

- Lower standards of performance unconsciously become acceptable
- Activities become more difficult to perform
- Performance becomes inconsistent
- Attention diminishes
- Logic and reasoning become impaired
- Social interactions decline
- Mood deteriorates
- Attitude declines
- Ability to maintain a clear picture of the overall situation declines
- Lapses into involuntary sleep (microsleep) occurs

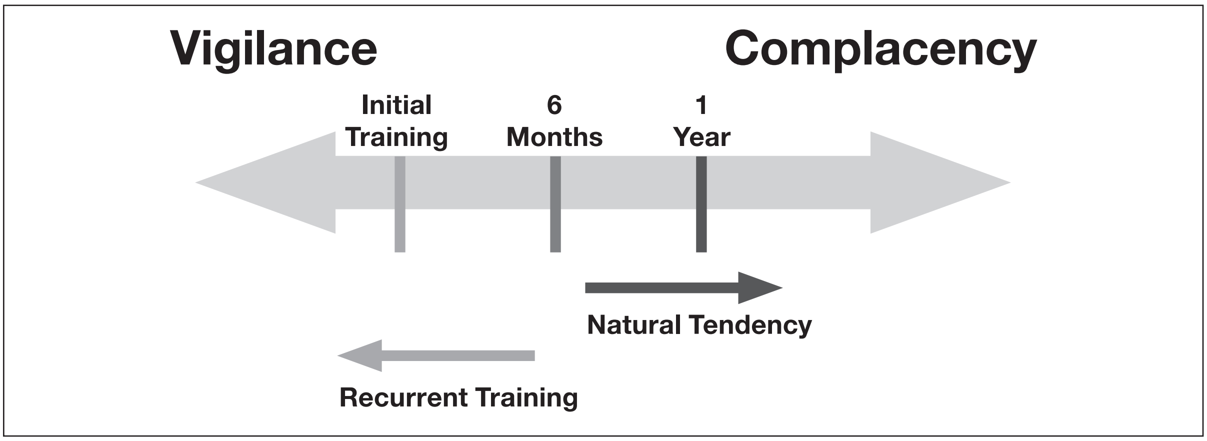
Adapted from Caldwell & Caldwell, 2003

The primary focus to address fatigue thus far in healthcare has been work hour restrictions. But these alone have not been successful in preventing patient harm due to provider fatigue, in part because measures to combat duty time-related fatigue are not uniformly adhered to (Dubeck, 2014). For example, staffing pressure often causes nurses to submit to forced overtime; in such instances, safety nets in the form of stated duty time limitations are bypassed. Work hour restrictions for physician residents have existed since 2003. These include limits to an 80-hour work week and the requirement that first-year residents do not work more than 16 hours continuously. Some have argued that resident work hour restrictions, on balance, have not reduced patient harm, partially because of an increase in patient handoffs or the possibility that residents are doing the same amount of work in less time. In the latter instance, any fatigue-related benefits would be negated by the time-pressure threats to SA. There are no equivalent mandatory duty hour restrictions for nurses; however, the Institute of Medicine recommends that nurses not work for more than 12 hours in a day or 60 hours in a week (Ibid.). Several states prohibit mandatory overtime for nurses. It is important to remember that fatigue is not just related to continuous hours worked but also to the preceding activities of daily life and the disruption of the circadian rhythm that attends working at night.

The case study above demonstrates the consequences of chronic fatigue in healthcare workers: apathy, indifference, irritability, slowed responses, or, in this case, no response. Consequently, the surgeon's SA was dangerously low. Had it not been for an experienced and assertive nurse, the patient would not have received prompt assessment, diagnosis, and intervention. The outcome could have been catastrophic. This case is subtle, a close call, and a signal that should be of great concern to a healthcare leader.

practiced in the skills required to do the job. This clinician may also make it a priority to obtain enough rest so as to be alert and capable when coming to work. Over time, however, humans become comfortable, and tasks are completed routinely—we get into a rhythm. We gain experience; we learn short cuts to manage workload and time pressures. We insidiously become less familiar with technical and theoretical knowledge. We may skimp on sleep the night before coming to work. We stop thinking about how to manage high-risk, low-frequency scenarios. What can change this?

Figure 2.2: Complacency vs. vigilance continuum



In healthcare, it is often involvement in a close call or, worse yet, an adverse event with patient harm that jolts us back to the vigilance side of the continuum. **From the patient's perspective, this is not a good system.** The solution is to invest in perpetual training at specified intervals to prevent drift into complacency or normalized deviance. For example, the airline industry factors in training as the cost of doing business—this is never sacrificed. Pilots are taken offline and sent to training and simulator checking (i.e., competence evaluation) events at intervals varying between six months and one year. In this system, pilots are aware that a training and testing event is coming, which forces them back into the books reviewing theory, normal procedures, limitations, and how to deal with high-risk, low-frequency abnormalities. In a sense, vigilance is forced upon them (we will discuss methods of creating a standardized perpetual training program in Chapter 10).

It is important to make one additional point with regard to an organizational commitment to training as an SA countermeasure: That is, training must be twofold. One element of the training must include the **technical knowledge** and requirements of the job. For example, if a nurse is working on a general surgery unit, then training must include specifics about managing the postsurgical population. As well, the training must include a review of the nontechnical skills set required to manage patients and make safe decisions in a team environment. This would encompass a multidisciplinary comprehensive **crew resource management** (**CRM**)-**based team training** program to insufficient space between lines, present a font that is too small, include superfluous or distracting information, and may not have the proper contrast between the background and procedure content. Another reason checklist uptake may be lacking is that the design philosophy does not match the task. For example, tasks that are completed routinely from memory many times in a day or week require a checklist design that is much different from that which is designed for critical or emergent situations.

Read-and-verify design

Read-and-verify checklists are designed to optimize movement through the checklist *after* a task has been completed from memory. The user first completes the task and then, as the name suggests, verifies that no steps have been missed. Read-and-verify checklists are best used for routine, frequently accomplished tasks where the steps in a process are well-known and can be completed via workflow patterns that have been learned through repetition. Some examples of clinical tasks that might benefit from a read-and-verify checklist are as follows:

- Setting up an infusion pump
- Discharging a patient from the hospital to home
- Transferring a patient to another level of care
- Sending a patient to the operating room
- Starting an IV line
- Medication administration
- Setting up an operating room for a case
- Admitting a patient to the hospital
- Inserting a central line
- Receiving a patient after surgery on a general surgery unit

The presentation of a read-and-verify checklist is straightforward, simple, and uncluttered (Sculli & Sine, 2011). Figure 4.1 is an example of a read-and-verify checklist used in aviation prior to takeoff. Preparation for takeoff is routine in a cockpit, accomplished multiple times in a day or week by a flight crew, and is analogous to the healthcare tasks listed above. Pilots prepare the aircraft for takeoff using *flow patterns* that they learned in training and have burned in their memory to place certain aircraft systems in the appropriate configuration. Then, prior to the actual takeoff, pilots run through the checklist to verify that all items have been completed.

Figure 4.1: Read and verify checklist: Before takeoff

Before Takeoff	
Window Heat	ON HIGH
Anti-Ice	ON
Flight Instruments & Radios	SET
Yaw Damper	ON & CHECKED
Flight Controls	CHECKED
Stabilizer Trim	SET
Flaps/Slats	15 & GREEN
Electrical	NO LIGHTS
Fuel Pumps	SET FOR TAKEOFF
Fuel Heat	OFF
Hydraulics	PRESS & QTY NORMAL
Elevator & Rudder Lights	OFF
Air Cond & Press	SET FOR TAKEOFF
EPR & Airspeed Bugs	SET
Transponder	ALTITUDE
Take Off Briefing	COMPLETE

As you look at the checklist, we ask that you not focus on the actual aviation content but rather on the design and presentation. Notice that on the left side of the checklist, there are nouns. On the right side of the checklist, there are either verbs in the past tense (i.e., "set") or responses indicating the condition of a system (i.e., "on"). The fact that responses are in the past tense makes sense because when the checklist is used, the task has already been completed from memory. This noun-verb or noun-system condition couplet is visually joined by a series of dots, along with the uncluttered presentation, depicts the straightforward and usable nature of the read-and-verify checklist.

Figure 4.2 shows two examples of read-and-verify checklists implemented as part of a larger checklist development/design project on a cardiac ICU (CICU) in a major, 1,070-bed academic medical and referral center in the Upper Midwestern United States (Turkleson, 2015). The checklists, which display key steps for preparation and set up of a percutaneous ventricular assist device, were developed from manufacturers' guidelines. The designers of these checklists first established that the tasks at hand were routine functions completed within the natural flow of work from memory.

Nurses rated specific questions using a Likert scale (1 through 5). The questions were asked after experiencing high-fidelity patient simulation scenarios requiring management of the device in both normal and crisis scenarios. Initial simulations scenarios were managed without the checklists. Subsequent simulations were managed with the checklists (Turkleson, 2015). Outcomes are presented below in Figure 4.8.

Figure 4.8: CICU checklist development/design project

Checklist development/design project involving CICU staff in a major, 1,070-bed academic medical and referral center in the Upper Midwestern United States.

Management of patients with a percutaneous ventricular assist device in normal and crisis scenarios	Without checklist read-and-verify/read-and-do Design	With checklist read-and-verify/read-and-do Design
Overall self-confidence	3.11	3.36
Self-confidence related to skills and knowledge	3.79	4.23
Admitting a patient	3.37	4.08
Ongoing monitoring	3.63	4.31
Determine proper placement and position of catheter	3.89	4.15
Alarm detection/recognition	3.58	4.23
Alarm management	3.47	4.31
Manage a cardiac arrest	3.68	4.31

1=Strongly Disagree, 2=Disagree, 3=Undecided, 4=Agree, 5=Strongly Agree.
Values are mean scores. n= 19 out of 26 possible.

In addition to the above results, video review of the simulation sessions revealed significant improvements in critical processes of care with use of the checklist. Nurses were less likely to omit key practice guidelines (e.g., verification of anticoagulation, device location, identification and resolution of critical alarms). Nurse perceptions of the utility and relevance of the checklists were also quite positive. See results in Figure 4.9.

Leadership Checklist

The discussion above hopefully provides assistance to leaders in the evolution toward HRO leadership. The checklist below is based on that discussion and the leadership guidelines established by two patient safety organizations, Institute for Healthcare Improvement and leaders from the Pennsylvania Patient Safety Reporting System (Botwinick et al., 2006; Clarke et al., 2007).

Leader actions to promote high reliability and patient safety

High-reliability markers for leadership	Implementation	
Patient safety is a top priority at all levels in the organization A patient safety infrastructure exists to support a safety culture	• Place patient safety on board meetings and executive meeting agendas • Establish a qualified and credentialed patient safety officer (PSO) and patient safety committee that report directly to top leaders • Educate other leaders to make patient safety literate • Provide adequate staff and information technology to ensure patient safety • Align patient safety initiatives throughout organization with overall organization vision and strategy • Foster the just and fair culture (see Chapter 8) • Focus improvement efforts on the care delivery system • Reward safety behaviors, NOT productivity	✔
Key stakeholders within the organization are fully engaged in safety	• Develop local patient safety champions and safety action teams • Use evidence-based data to achieve buy-in from healthcare providers including physicians • Involve patients and families in patient safety	✔
Communication within and across disciplines is standardized and reliable	• Commence leadership walk rounds • Conduct safety forums • Mandate and promote the development and use of standardized briefings and debriefings • Mandate and promote the use of standardized handoffs • Initiate team training based on crew resource management tools and techniques – Mandate perpetual training at yearly intervals for all clinicians in all areas – Include practice and competency evaluation using simulation-based learning as a component • Practice routine scenarios (e.g., normal patient assessment • Practice managing crisis (e.g., operating room fire, cardiac arrest) – Ensure that clinicians are free of patient care responsibilities on the day(s) training occurs	✔

Case study

A 56-year-old man was admitted from a nursing home to an academic medical center for replacement of a gastrostomy tube. The patient had a history of intracardiac thrombus. The medical team determined that he was not adequately anticoagulated (international normalized ratio [INR] 1.4), so the resident ordered warfarin 10 mg/day x 3 days (an increase from the patient's usual dose of 5 mg/day). On day 2, while rounding, the attending wanted to confirm that the intracardiac thrombus was still present to justify ongoing anticoagulation and wanted the warfarin stopped until an echocardiagram could be obtained. The medical center had a robust computerized physician order entry (CPOE) system and allowed providers to enter orders using handheld devices and smartphones in real time. When the attending stated that he wanted anticoagulation stopped, the resident began to enter the order into her smartphone. At that moment, she received a text from a friend about an upcoming party upon which she confirmed her attendance. The resident never completed the order and moved onto the next problem. The warfarin continued over the next three days. Everyone on the team thought the medication had been stopped, so the INR was not checked.

On day 4, the patient developed shortness of breath, tachycardia, and hypotension. An echocardiogram revealed hemopericardium and cardiac tamponade. The patient required emergency open heart surgery to perform a pericardiocentesis and a pericardial window. The INR was 8.5 at the time. The patient did not survive. (Case adapted from the Agency for Healthcare Research and Quality, 2014).

Although we can examine many elements in the chain of events, let's focus on the resident physician's actions. As a leader, perhaps chief of medicine or chief operating officer of a healthcare institution, what is the best course of action to take with the resident in the wake of this patient's death? No doubt the patient's family was devastated when they were told that their loved one did not survive the surgery, which was, after all, the result of a grave and undetected medication error. Perhaps the news media has gotten wind of the story and aired a series of devastating reports about the quality of care in your facility (Headline: "Physicians at XYZ Medical Center Texting Friends Instead of Caring for Patients"). Perhaps you have been contacted by the family's attorney, who is laying the groundwork for a lawsuit. When the resident realized that her actions led to this patient's demise, she was distraught and at times inconsolable. In the days after the event, she felt as though her colleagues were silently questioning her competence. She felt alone, scared, and concerned about legal action and her future as a physician. The truth is that this is a scene that plays out all too often in many healthcare organizations. Specifically, the question here is, should the resident be disciplined? Should she be terminated? After all, it's pretty irresponsible to be texting friends when you are supposed to be discontinuing medications. When one puts it that way, it seems that discipline is in order. However, this case is not that simple, and it may very well be that disciplining this clinician could be the absolute worst thing her supervisors could do, having devastating effects on the organization's culture for years to come. Before we discuss a course of action to take here, let's first discuss some important concepts about high-reliability organizations and human error.

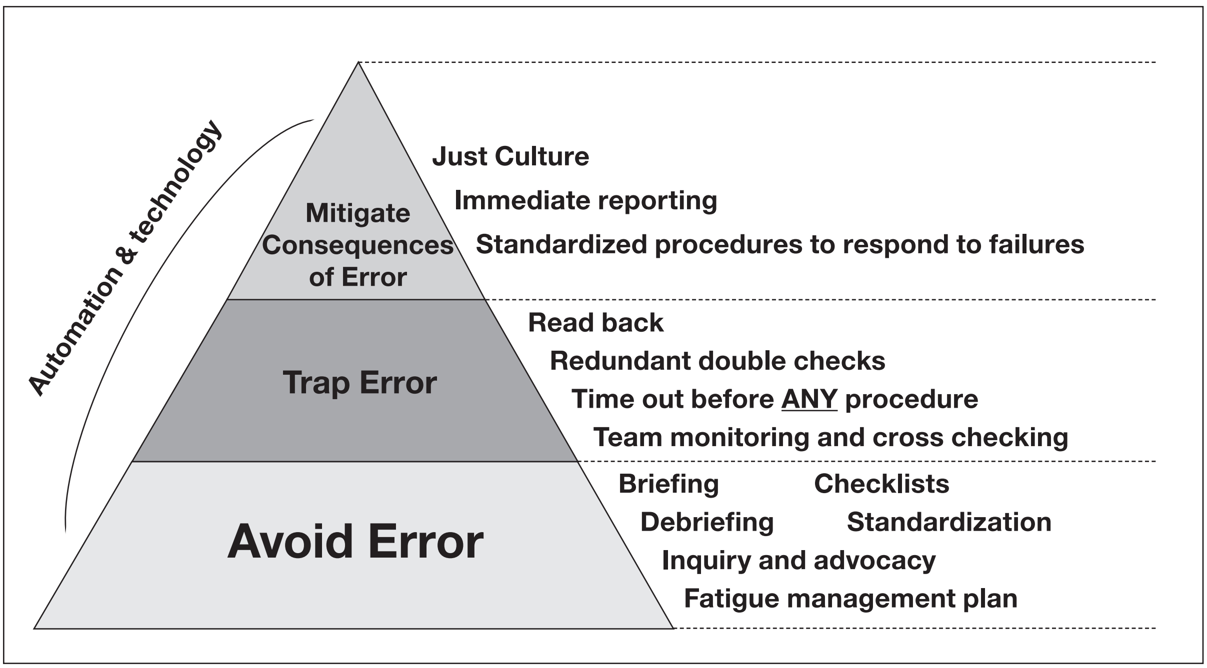
Zero Error and Error Management

In a high-reliability culture, a paradigm exists that simply states that it is not realistic to expect zero human error. **Human error is ubiquitous; it is inevitable**. As much as we dictate policy and guidelines, as much as we practice and train, humans will commit errors; it is a constant (Reason, 2008; Helmreich et al., 1999). Whether errors are in the form of cognitive **slips** (unintended failures of execution, such as a pharmacist selecting the wrong dose when filling a prescription) or **mistakes** (misapplying a problem-solving method that is part of our knowledge and expertise, such as a physician treating a patient for myocardial infarction when the cause of the chest pain is a pulmonary embolus), they will never be fully eliminated—never.

In the course of conducting a team training session with emergency department physicians, we asked the following question: How many of you believe that zero human error is realistic? Can this be achieved? In most cases, everyone comes to agreement that the answer to this question is no. In one particular case, however, a physician raised his hand and stated, "I believe that this is possible," meaning that zero human error can be achieved in ongoing operations. He went on to explain that in the intensive care unit (ICU), the central line-associated bloodstream infection (CLABSI) rate was zero and had been for several months. Although this is a desirable outcome, it is not the point of the "zero error" question. What this physician is referencing is not error, but outcomes. While the CLABSI rate is zero now, it will not stay that way; there will be peaks and valleys. Also, we assert that in the ordering of the central line; insertion, routine care, and maintenance accessing the line; and discontinuation of the line, there were most likely minor errors made or almost made. What keeps the CLABSI rate low is not that these errors were eliminated, but that they were detected and managed.

A high-reliability culture accepts that human errors will occur. It's fine to strive for zero error, but we must be realistic and understand that in a system where humans are interacting with information, equipment, and each other in high-stress environments, errors will happen. It's better to think about them before they occur and be ready to catch them or respond to them effectively after they occur. The next paradigm that exists in a high-reliability culture is, therefore, that **errors must be managed**. Error management is critical to high-reliability operations. This means that in addition to the presence of technologies and equipment designed to monitor for and prevent errors from occurring within a system (e.g., lockout logic on a patient-controlled analgesia pump), humans learn specific behaviors designed to avoid, trap, and mitigate the consequences of error (Amalberti et al., 2005; Musson & Helmreich, 2004; Helmreich, 2000; Helmreich et al., 1999). In other words, humans apply these behaviors so that the errors within the system are either avoided, detected and remedied, or responded to promptly so the negative outcomes resulting from the error can be diminished. Error management builds a system that is fault-tolerant, meaning errors can occur but the system still functions successfully. **Figure 8.1** demonstrates a model from the discipline of crew resource management (CRM) adapted to healthcare that we call the "Error Management Pyramid" (Sculli & Sine, 2011; Helmreich et al., 1999). This model depicts behaviors that avoid, detect and trap, or mitigate the consequences of an error if it were to reach a patient. For example, with regard to error trapping in the middle portion of the pyramid: A physician gives a nurse a telephone order for an intravenous (IV) bolus, or "IV push" narcotic, for administration to a patient in severe pain. The nurse *hears* a larger dose than what the physician actually stated. However, as the nurse conducts a read back, the physician catches the error and corrects the dose. The nurse now reads back the appropriate and intended dose and soon after administers it to the patient. The read back becomes a "trapping" behavior stopping a potential error from gaining steam and moving through the system where it can be acted upon.

Figure 8.1: The error management pyramid



As a healthcare leader, the salient point to take away from this discussion is that prior to deciding how to handle clinicians who commit errors, **the following paradigm must be embraced and accepted:**

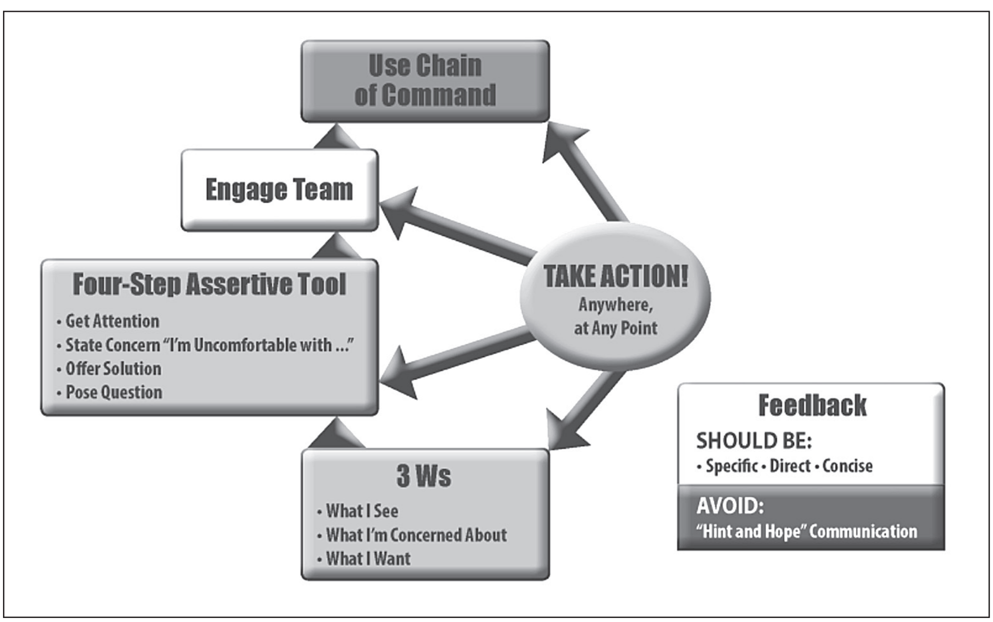
- Human error is a law of nature; it is not a choice. It is ubiquitous and inevitable. No one is exempt.
- You must manage error within the system via technology, automation, and perpetual training of staff on error management behaviors.

This statement fails to relay the nurse's underlying clinical concerns or her sense of urgency or outline an alternative plan for managing this patient. Unfortunately, 30 minutes later, the patient experiences a complete airway obstruction from a postoperative hematoma and collapses, pulseless. A code blue is initiated and an emergency tracheotomy is performed. The patient survives but has a protracted and difficult rehabilitation. While the preceding nurse-physician dialogue is fictional, this type of dysfunctional interaction between and among clinicians exists in a variety of clinical settings (Carbo et al., 2011).

The Effective Followership Algorithm (EFA)

Critical thought and engagement alone may fall short in synthesizing effective statements or offsetting inadequate leader responses. Followers, therefore, must possess not only an ability to concisely package clinical information in real time but also an adeptness in the art of escalated assertiveness, creating the appropriate inertia to move leaders toward modifying planned operational decisions or changing course altogether (Sculli & Sine, 2011; Sculli et al., 2011; Sculli et al., 2013; Salas et al., 2007). The EFA (see Figure 9.1) was developed to compliment critical thinking and active involvement—key attributes for effective followership—and to avoid the suboptimal "hint and hope" trap (Sculli & Sine, 2011; Aerbersold et al., 2013). The EFA is designed to flow vertically, offering simple standardized verbal templates as well as action steps. Generally when using the algorithm to engage decision-makers, one begins at the bottom and works upward in order of escalation; however, there are exceptions. The EFA is explained below.

Figure 9.1: Effective followership algorithm

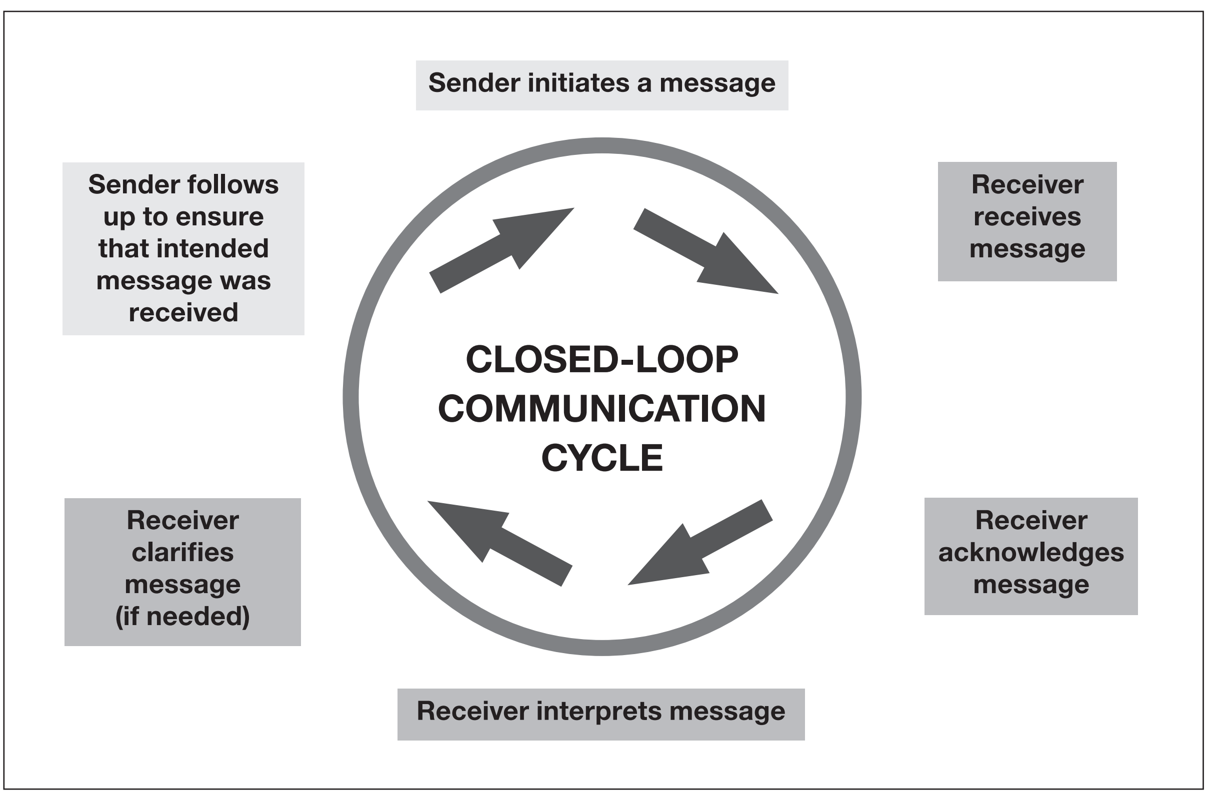


to 18.3 per 100 admissions. Preventable adverse events decreased from 3.3 to 1.5 per 100 admissions (Starmer et al., 2013). These improvements occurred without increasing the time spent in the handoff process.

Building models of behavior that support closed-loop communication

Closed-loop communication—readbacks and repeat-backs—is critical to ensure patient safety. One only needs to look at U.S. healthcare to confirm this fact. The root cause of 85% of adverse events is communication errors (Stahel, 2008). Additional studies have demonstrated that technical errors that physically harm patients are associated with teamwork and communication disruptions (El Bardissi et al., 2008). Said another way, a team beset by miscommunication will have more technical errors. Closed-loop communication represents the best strategy to prevent such miscommunication. Repeat-backs are necessary, whether between a cardiac surgeon and a scrub technician regarding the suture material and needle type for a given coronary artery anastomosis or between a hospitalist and an intensivist when discussing the appropriate course of action to manage a septic patient. Closed-loop communication helps combat the negative effects of ambient noise, linguistic differences, and many other potential misunderstandings when humans message each other.

Figure 9.2: Closed-loop communication cycle



Building a High-Reliability Organization

A Toolkit for Success

Second Edition

Building a High-Reliability Organization: A Toolkit for Success, Second Edition is a practical guide to becoming a high-reliability organization (HRO) focused on improving hospital processes for patient safety and quality care. Authors Gary L. Sculli, MSN, ATP; Douglas E. Paull, MD, FACS, FCCP, CHSE, and David Sine, CSP, ARM, CPHRM, DrBE, look at the role of leadership in transforming their facilities into HROs. Each chapter includes case study analysis and valuable leadership checklists.

This edition provides methodology intended to improve processes and standardization across organizations. Through the use of checklists, the authors demonstrate how situational awareness and structure can be created leading to the HRO goal of preventing adverse events and errors from occurring. Additionally, the second edition includes significant new information about Just Culture, much of it based on the national Just Culture program that Gary Sculli started in 2016.

This book will help you:

- Possess a clear understanding of what constitutes high-reliability healthcare
- Understand which elements and behaviors must be included in an overall plan to achieve high reliability at the front lines of care
- Be able to promote evidence-based, reliable methods to improve safety, including team training, standardization, and investment in patient safety infrastructure
- Become a transformational leader in your healthcare organization
- Be able to apply the principles of a fair and just culture to promote the reporting, discussion, and disclosure of adverse events

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