

FLYING LESSONS: CREW RESOURCE MANAGEMENT IN HEALTHCARE

Authored by:

Colin Konschak, FACHE, CEO

Blake Smith, Principal

INTRODUCTION

Patient safety has come under closer scrutiny in recent years and experts agree that human factors are major contributors to adverse events in healthcare. In its 1999 landmark report, “To Err is Human: Building a Safer Health Care System,” the Institute of Medicine (IOM) stated that anywhere from 44,000 to 98,000 patients die each year as a result of medical errors at an estimated annual cost of \$29 billion.ⁱ Medical errors, two-thirds of which are preventable, are the eighth leading cause of death in the U.S. each year.ⁱⁱ As medicine relies on increasingly complex technologies, this problem will only intensify. For example, *The New York Times* recently conducted a study that found an alarming number of injuries related to radiation therapy. The injuries, which should have been avoidable, were caused by faulty programming, poor safety procedures, software flaws that should have been recognized, and inadequate staffing and training.ⁱⁱⁱ

Like medicine, aviation relies on teams of experts working together to carry out complex procedures that, if not executed properly, can have serious consequences. If 98,000 people died in plane crashes each year, it would be the equivalent of a fatal jet crash – 268 passengers – every day. Airlines, however, have taken steps to prevent such catastrophes and health care providers are taking note.

FOLLOWING AVIATION’S LEAD

In 1977, two Boeing 747s collided on a runway in the Canary Islands, killing 582 people. It was the largest accident in aviation history and it led to an industry-wide examination on the cause of aviation accidents. It turned out that up to 80 percent of aviation accidents were caused by human error.^{iv} This revelation prompted NASA to convene an aviation safety workshop in 1979, which led to the development of Crew Resource Management (CRM), an error-reducing method that has revolutionized air travel safety.

CRM is a management system that optimizes crew performance by reducing the effect of human error. It encompasses communications, situational awareness, problem solving, decision making and teamwork. Concerned with cognitive and interpersonal skills rather than technical knowledge, CRM attempts to make optimum use of available resources such as equipment, procedures and people in order to promote safety and enhance efficiency.

Obviously airlines are doing something right: According to the National Transportation Safety Board, the fatality risk fell to 68 per billion fliers this decade, less than half the risk in the 1990s. Since 2002, the risk fell to 19 per billion, an 86 percent drop since the 1990s.^v This improvement can be partially attributed to CRM and the Federal Aviation Administration requires that all commercial airline and military pilots undergo CRM training.

CRM was first applied to healthcare in the operating room of University Hospital in Basel, Switzerland, in 1994.^{vi} In 2001, the IOM recommended that this type of training be used to increase patient safety and it is also advocated by the National Academies, the Agency for Healthcare Research and Quality and the Institute for Healthcare Improvement.^{vii,viii} Today, CRM training programs are being used in a variety of healthcare settings, including operating rooms, anesthesia departments, emergency departments, intensive care units and labor and delivery departments. Standard cockpit procedures such as communication protocols, checklists and team briefings are increasingly being used to improve patient care. Several journals, including the British Medical Journal, the Journal of the American Medical Association and the Journal of Critical Care, have published research suggesting hospitals that adopt these measures have fewer malpractice suits and post-surgical infections, as well as lower patient recovery times and higher employee satisfaction.^{ix}

AVIATION ISN'T MEDICINE BUT THERE ARE SIMILARITIES

CRM aviation training and healthcare parallel by using systematic methods.

Experts may not agree on how to incorporate CRM into health care, but few would disagree that there are parallels between aviation and medicine that make CRM a potentially valuable tool. Both industries:

- Have a risk of adverse events that are the result of human error, especially failures in communication, leadership and decision-making
- Depend on technological innovations
- Require long periods of technical training
- Rely on teams led by leaders with strong roles
- Involve situations where personnel can spend hours performing mundane tasks and then be required to act swiftly under extreme stress
- Encompass a work environment where human error poses a significant risk of serious adverse events
- Rely on personnel that suffer from critical performance impairment when exposed to excessive levels of stress, fatigue, or other adverse physiological factors^{x,xi}

Just as the Boeing B-17 was once deemed “too much airplane for one man to fly,” many medical procedures are now too complex for clinicians to carry them out without a systematic method in place. While there are relatively low levels of standardization in equipment and protocols in medicine and sick patients are infinitely more varied than aircraft, tools such as checklists, which have long been used in aviation, can go a long way toward ensuring that unnecessary errors are avoided. In 2001, Peter Pronovost, a critical-care specialist at Johns Hopkins Hospital used a checklist to try and reduce line infections – which occur in 80,000 people a year in the U.S. - in the ICU. The checklist included steps that

had been known and taught for years: (1) wash hands with soap, (2) clean the patient's skin with chlorhexidine antiseptic, (3) put sterile drapes over the entire patient, (4) wear a sterile mask, hat, gown and gloves, and (5) put a sterile dressing over the catheter site once the line is in. After one year, the ten-day line-infection rate went from 11 percent to zero. Fifteen months later, only two line infections had occurred during the entire period. Pronovost and his colleagues calculated that a checklist had prevented 43 infections and eight deaths, and saved two million dollars – at just one hospital.^{xii}

CRM STRATEGIES THAT TRANSLATE TO HEALTHCARE

CRM addresses the human factors that contribute to error in aviation, but these factors apply wherever humans work. In high-risk occupations such as medicine, the potential for error is even greater. In a report on the human factors in healthcare, the Australian Commission for Safety and Quality in Health Care put it succinctly: “In healthcare, work environments are rich with hazards: every instrument is a potential weapon, every drug a potential poison, and every worker a potential killer.”^{xiii} While there is no universal CRM program, below are some common elements that translate well to healthcare:

Briefings and Debriefings:

In aviation, briefings by the captain to the cockpit and cabin crews are standard operating procedure. They allow the captain to communicate the intended course, flight plan, expectations of delay or bad weather, and how crew members should behave in certain situations. Crew members are also asked to verify their understanding of the flight and communication plans, often referred to as establishing a “shared mental model.”^{xiv} Briefings are a critical component of effective teamwork, promoting intra-team collaboration and communication. In medicine, briefing skills are used before surgery, at the beginning or end of a shift, and at patient handoffs. For example, before beginning any procedure, surgical teams are supposed to verify the intended patient, the procedure, the site of the surgery and confirm that the site has been correctly marked. Debriefings are just as valuable as briefings. They occur after the completion of a shift or procedure and provide a structured platform for performance feedback, thereby promoting constant learning and improvement.^{xv}

Conflict Resolution:

CRM includes training crews in acceptable ways to challenge the actions of other crewmembers and to assert safety concerns in a manner that is acceptable to everyone.^{xvi} The idea is to arrive at what is right, not who is right. Conflict is complex and resolving it can be complicated, which can result in the loss of situational awareness – the perception and understanding of factors and conditions that affect safety. There are different approaches to conflict resolution and determining which is most effective depends on the circumstances. Self-awareness, which involves avoiding the barriers to effective communication,

being a good listener and being able to distinguish personality traits and behavior from genuine performance, is an important factor.^{xvii}

Standardized Communication and Procedures:

Poor communication among caregivers was the most frequently cited root cause of all sentinel events reported between 1995 and 2004.^{xviii} Effective communication involves transmitting messages that all team members can clearly understand, which requires standardized communication in terms of structure and nomenclature. It is also important to verify that the message has been received and understood. The five skills associated with this CRM skill are: (1) inquiry; (2) listening; (3) advocacy/assertion (4) resolving conflict; and (5) closing the loop.^{xix}

Developing standard operating procedures and checklists reduces the likelihood of important steps being inadvertently omitted. While it may seem redundant to have written documentation of procedures that health care practitioners know well and perform routinely, these measures have proven very useful in reducing errors.

Education:

CRM typically includes educating team members on issues relevant to safety and human performance limitations. For example, pilots might be instructed on how fatigue may impair cognitive performance and thereby lead to an increased likelihood of committing an error.^{xx} In healthcare, team members might be taught about their own potential for error, why errors occur, and which situations are likely to increase the risk of error. They might be given practical strategies for dealing with human fallibility, such as how to stop errors before they cause harm or how to mitigate the effect of harm, as well as how to learn from errors that take place.^{xxi} Simulation scenarios are one example of an effective tool for learning how to deal with unexpected emergencies.

Error Reporting:

The aviation industry has benefited from a system for reporting errors and such a system is also applicable to healthcare. Voluntary reporting increases the likelihood that staff will deal effectively with errors that might otherwise lead to serious adverse events. It also serves as a mechanism to ensure that team members learn from their errors and take steps to prevent their recurrence. Creating a culture that encourages the reporting of mistakes can ultimately lead to safer practices.^{xxii} Again, focusing on what went wrong rather than who made a mistake is a helpful approach.

CRM CAN MAKE A DIFFERENCE

There is an expanding body of evidence that CRM strategies can be successfully applied in the healthcare setting. This is increasingly recognized by healthcare agencies and organizations, including: The Joint Commission, the Quality Interagency Coordination Task Force established by President Clinton, the National Quality Forum, the Agency for Healthcare Research and Quality, and the American Medical Association.^{xxiii} Studies show that CRM training can improve the effectiveness of multidisciplinary teams in acute care.^{xxiv} Examples of successful CRM strategies that have been used to increase patient safety abound in the literature and the popular press. Below are a few that highlight how CRM techniques have been used in a variety of settings to help health care providers reduce medical errors:

Poor communication among caregivers was the most frequently cited root cause of sentinel events.

- In Michigan, the infection rate in ICUs decreased by 66 percent within the first three months of a widespread initiative to use checklists. Michigan's infection rates fell so low that its average ICU outperformed 99 percent of ICUs nationwide. In the first 18 months of the initiative, hospitals saved an estimated \$175 million and more than 1500 lives.^{xxv}
- A 19-item surgical safety checklist developed by the World Health Organization reduced the death rate within 30 days of surgery by 47 percent in a study that involved eight hospitals around the world. Major complications dropped from 11 percent to 7 percent. The checklist included items such as marking the body part to be operated on before giving the patient anesthesia; before making the first incision, making sure that everyone in the operating room knew one another and what their roles would be; and checking that all needles, sponges and instruments were accounted for after surgery.^{xxvi}
- The clinical error rate went from 31 percent to 4.4 percent in a group of nine hospital Emergency Departments where formal teamwork structures and processes were implemented.^{xxvii}
- After implementing a teamwork initiative to promote a culture of patient safety, the Adverse Outcome Index (the percentage of patients with one or more of 10 identified adverse events) improved 47 percent for high-risk premature births, 14 percent for term deliveries, and 16 percent overall from 2001 to 2004 at Beth Israel Deaconess Medical Center.^{xxviii}

The clinical error rate went from 31% to 4.4% in 9 Emergency Departments that used formal teamwork structures.

CHALLENGES

As a result of three decades of utilization, CRM principles and practice have now become an integral part of how pilots and crews do their jobs. For many pilots, CRM has been a constant throughout their careers and its principles have become an integral part of what it means to be a good pilot. This type of shift in the culture of a profession does not happen overnight. It takes place gradually over a long period of time. Despite its proven track record and the endorsement of the AMA and other organizations, the adoption of CRM into the healthcare industry has been slow.

Part of the reason may be the approach that healthcare has taken in trying to develop CRM systems. Not surprisingly, this has involved the development of CRM training programs through rigorous scientific research. In fact, this may not be the most practical method of improving system safety. Consider that the major advances in CRM have been the result of accident investigation, incident analysis and expert opinion. While the scientific model may work for developing therapeutic interventions, it may not be as efficient for developing systems that are more sociological and anthropological in nature.^{xxxix} CRM training in healthcare may need to be highly customized for the size of an institution, the nature of the procedures being performed, and the culture of the organization.^{xxx}

Another barrier has been that while professional training and education in medicine have traditionally focused on developing technical proficiency, CRM focuses on facilitating human interaction. Shifting the focus toward communication and information flow rather than skill requires a cultural shift in medicine. In one recent study, surgical teams were compliant with only 60 percent of the CRM practices emphasized during extensive CRM training.^{xxxi} Health care professionals need to believe in the inherent value of CRM skills in order for their practice to take hold. They need to shift their focus from documenting specific tasks to actually doing things safely.

Currently, the leading role in developing CRM programs in healthcare is being filled by private corporations. CRM programs can be expensive to develop and these companies are understandably protective of their products. However, it may be more productive to view patient safety as akin to practice guidelines, which are typically shared, debated, continually improved upon and eventually embraced by the larger community.^{xxxii}

CONCLUSION

As medicine becomes increasingly complex, in terms of both procedures and the equipment used to carry them out, avoiding errors that could inflict injuries or fatalities is of increasing concern. CRM has been successfully used in aviation to reduce errors that lead to accidents. Its guiding principles, which include communication, situational awareness, problem solving, decision making and teamwork are applicable to medicine and are a valuable tool that can be used to increase patient safety.

ABOUT THE AUTHORS

Colin Konschak, FACHE – Chief Executive Officer, Divurgent

Colin is the Chief Executive Officer at Divurgent. He is a highly accomplished executive with over 20 years of experience with extensive experience in healthcare operations, P&L management, account management, strategic planning and alliance management.

His broad healthcare sector experience encompasses pharmaceutical, provider, payer, information technology and consulting. He is a registered Pharmacist, possesses an MBA in health services administration, is board certified in healthcare management and is a Six Sigma Black Belt. Colin is a Fellow in both the Healthcare Information Management System's Society (HIMSS) and the American College of Healthcare Executives (ACHE).

Colin is the author of numerous industry papers and textbooks, most recently co-authoring “Hacking Healthcare: Understanding Real World Threats”; the healthcare industry’s only text on the topic of cybersecurity. Colin has been an adjunct professor in both Old Dominion University and William and Mary's MBA program, teaching courses in Healthcare Operations and Strategy.

Blake Smith, Principal

In his role as Principal, Blake leads Divurgent’s go-live teams and delivery by applying his decade of experience in technology support and his extensive project experience at nearly every level of activation support and management. During his tenure with Divurgent, Blake has proven that he intimately understands each aspect of an activation, from strategic support planning, to tactical consultant management, to thoughtful project closing and knowledge transfer.

A hands-on leader, Blake has served in significant roles during the transformation of almost a dozen major medical facilities and health systems – and at Divurgent, has reinvigorated and streamlined at-the-elbow (ATE) and consultant onboarding and resource management from start to finish. His level of activation management experience goes beyond application knowledge – having been involved with organizations large and small and implemented every major EHR, Blake can offer Divurgent’s clients a purview perspective on their activation, from pre-live training programs to post-live optimization and maximization efforts.

REFERENCES

- ⁱ Corrigan JM, Donaldson MA, Kohn LT. *To Err is Human: Building a Safer Healthcare System*. Committee on Quality Health Care in America, Institute of Medicine; 2000. <http://www.nap.edu/openbook.php?isbn=0309068371>. Accessed January 7, 2010.
- ⁱⁱ Fact Sheet. Johns Hopkins Center for Innovation in Quality Patient Care. http://www.hopkinsmedicine.org/innovation_quality_patient_care/quality_safety/. Accessed January 11, 2010.
- ⁱⁱⁱ Bogdanich W. Radiation offers new cures and ways to do harm. *The New York Times*. January 24, 2010. <http://www.nytimes.com/2010/01/24/health/24radiation.html>. Accessed January 25, 2010.
- ^{iv} Vos S. In aviation, human factors are an entire field of study. *McClatchy Newspapers*. September 25, 2006. http://www.comairflight5191crash.com/source/news/mcclatchy_092506.html. Accessed January 27, 2010.
- ^v Levin A. Airlines go two years with no fatalities. *USA Today*, January 11, 2009. http://www.usatoday.com/travel/flights/2009-01-11-airlinesafety_N.thm. Accessed January 22, 2010.
- ^{vi} McConaughy E. Crew Resource Mangement in Healthcare – The Evolution of Teamwork Training and MedTeams®. *J Perinat Neonat Nurs*. 2008;22(2):96-104.
- ^{vii} Committee on Quality of Healthcare in America. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Institute of Medicine; 2001. http://www.nap.edu/catalog.php?record_id=10027#toc. Accessed January 7, 2010.
- ^{viii} Murphy K. What pilots can teach hospitals about patient safety. *The New York Times*. October 31, 2006. <http://www.nytimes.com/2006/10/31/health/31safe.html?ex=1319950800&en=a64123f3e689ea9f&ei=5088&partn er=rssnyt&emc=rss>. Accessed January 22, 2010.
- ^{ix} Murphy K. *ibid*.
- ^x *Setting the Human Factor Standards for Health Care: Do Lessons from Aviation Apply?* The Australian Commission for Safety and Quality in Health Care. Commonwealth of Australia; 2004. [www.safetyandquality.gov.au/internet/safety/publishing.nsf/Content/E2115B84DFEAD48CA257483000D8463/\\$File/aviation.pdf](http://www.safetyandquality.gov.au/internet/safety/publishing.nsf/Content/E2115B84DFEAD48CA257483000D8463/$File/aviation.pdf). Accessed January 22, 2010.
- ^{xi} Marshall D. *Crew resource management: from patient safety to high reliability*. Denver, CO: Safer Healthcare Partners, LLC; 2009.
- ^{xii} Gawande A. The checklist. *The New Yorker*. December 10, 2007. http://www.newyorker.com/reporting/2007/12/10/071211fa_fact_gawande. Accessed January 22, 2010.
- ^{xiii} *Setting the Human Factor Standards for Health Care: Do Lessons from Aviation Apply?* *ibid*.
- ^{xiv} Musson D, Helmreich R. Team training and resource management in health care: current issues and future directions. *Harvard Health Policy Review*. 2004; 5(1):25-35.
- ^{xv} Marshall D. *ibid*. p 315.
- ^{xvi} Musson D, Helmreich R. *ibid*.
- ^{xvii} Marshall D. *ibid*. pp 265-66.
- ^{xviii} Marshall D. *ibid*. p. 243
- ^{xix} Marshall D. *ibid*. p. 243
- ^{xx} Musson D, Helmreich R. *ibid*.
- ^{xxi} *Setting the Human Factor Standards for Health Care: Do Lessons from Aviation Apply?* *ibid*.

-
- ^{xxii} *Setting the Human Factor Standards for Health Care: Do Lessons from Aviation Apply?* *ibid.*
- ^{xxiii} Marshall D. *ibid.* pp 74-76
- ^{xxiv} Juljac-Samardzic M, Dekker-van Doorn CM, van Wijngaarden JD, van Wijk, KP. Interventions to improve team effectiveness: a systematic review. *Health Policy*. October 24, 2009.
<http://www.journals.elsevierhealth.com/periodicals/heap/article/PIIS0168851009002589/abstract>
 Accessed January 25, 2010.
- ^{xxv} Pronovost P, Needham D, Berenholtz S, et al. An intervention to decrease catheter-related bloodstream infections in the ICU. *New England Journal of Medicine*. 2006;355 (26):2725-2732.
- ^{xxvi} Haynes AB, Weiser TG, Berry WR, et al; and Safe Surgery Saves Lives Study Group. New England Journal of Medicine. 2009;360 (5):491-9.
- ^{xxvii} More J, Simon R, Jay GD, et al. Error reduction and performance improvement in the emergency department through formal teamwork training: evaluation results of the MedTeams project. *Health Services Research*. 2002;37(6):1553-1581.
- ^{xxviii} Mann S, Marcus R, Sachs B. Lessons from the cockpit: how team training can reduce errors on L&D. *Contemporary OB/GYN*. 2006;51(1):34-41.
- ^{xxix} Mussan D, Helmrieck R. *ibid.*
- ^{xxx} Mussan D, Helmrieck R. *ibid.*
- ^{xxxi} France DJ, Leming-Lee S, Jackson T, Feistritz NR, Higgins MS. An observational analysis of surgical team compliance with perioperative safety practices after crew resource management training. *Am J Surg*. 2008;96(4):546-53.
- ^{xxxii} Mussan D, Helmrieck R. *ibid.*