COMMENTARY

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High-Reliability Uncaged: Safety Lessons From Army Aviation

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U.S. military medicine began its journey to high reliability in 2014 after a *New York Times* article described variance and errors in military health care.[1] To begin, and to better understand its challenges, the Secretary of Defense commissioned a comprehensive study of military quality and safety. The executive summary of the resulting 208-page Military Health System (MHS) Review cited Chassin and Loeb's landmark article, "High Reliability Health Care: Getting There from Here" as a reference to achieve tenets of high reliability.[2] The article is considered so foundational to high reliability in health care that it is featured on *The Joint Commission's* High-Reliability website and is widely cited in educational forums.[3] Inspired by the article's promise and references to Weick and Sutcliffe's work in High Reliability Organization (HRO) theory, the Army adopted its tenets wholesale. Weick and Sutcliffe's five HRO principles (preoccupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience, and deference to expertise) offered a logical roadmap to achieving the HRO ideal.[4] As a result, Army medical leaders disseminated the article for journal-club-type analysis. Referenced in multiple senior-level "HRO Summits," the paper became the founding document for the Army's HRO strategy.

Unfortunately, a "failure-to-launch" scenario developed. In 2017, the Army still grappled with unwanted variance and an inability to prevent outcomes associated with human error. An Institute for Healthcare Improvement (IHI) consultant insightfully noted that paradigms of civilian care had "trumped" the uniformity and compliance with best practices that one would expect from a military health care system.[5] And although fully aware that cultural change takes time, Army medical leadership had to concede that the enthusiasm generated by the MHS Review had not resulted in many significant quick wins.

To better understand obstacles, Army medicine explored inwardly. It enlisted medical experts previously embedded in Army aviation to provide their experience with that well-established HRO. Specifically, the U.S. Army Medical Command (MEDCOM) repositioned the Commander of the U.S. Army Aeromedical Research Laboratory (USAARL – MEDCOM's only active flight unit) to work as the Army Surgeon General's Deputy for Quality and Safety. The position was realigned to the MEDCOM's Deputy Commanding General for Operations (DCG-O), a former Medical Evacuation (MEDEVAC) pilot. Prior to these assignments, both leaders had conducted analysis of Army Aviation's high-reliability features. As an example, the former USAARL Commander had chaired a council of the eight senior Flight Surgeon leaders at the U.S. Army Aviation Center of Excellence (USAACE) at Fort Rucker, Alabama (including the USAACE Surgeon, the Dean of the School of Army Aviation Medicine, and the Combat Readiness Center [CRC] Surgeon). This council devoted time and attention to understanding how Army Aviation could inform Army Medicine. Some of this group's previous analysis is available in the peer-reviewed literature.[6]

The results of the collaboration may prove surprising to civilian counterparts. Specifically, Army MEDEVAC pilots and flight surgeons contended that two of the five HRO principles offered by Weick and Sutcliffe were not, in fact, features of Army aviation. On a macro-level, the enterprise embraced neither the principle of "reluctance to simplify" nor that of "deference to expertise" as tenets of high reliability. Instead, aeromedical experts postulated that such principles, as interpreted by Army Medicine, were detrimental to achieving high-reliability.

According to Chassin and Loeb, "People who work in HROs…resist the temptation to simplify their observations and their experiences of their environment."[2] Furthermore, "[simplifying] impedes safety efforts in health care."[2] The aviation community does not dispute that mishaps occur

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because of complex combinations of proximate and root causes. Even so, mishap analysis is devoted to finding the simplest solution that can be mass-produced and quickly returned to the field. Variance is only eliminated by standardization. Assuming that all problems are unique provokes the idea that all solutions are likewise distinct. Paralysis of action is the result. Aviation takes as-simple-as-possible measures to mitigate vulnerabilities.

A policy of "deference to expertise" also allows vulnerabilities of variance to exist. Chassin and Loeb state that: "when confronted by a new threat, HROs have mechanisms in place to identify the individuals with the greatest expertise relevant to managing the new situation and to place decision-making authority in the hands of that person or group. They do not invoke organizational hierarchy or expect that the person with the most seniority or highest rank will be the most effective at dealing with the problem."[2] Army aviation seeks expert and frontline advice for solutions to new problems, but hierarchical leaders enforce compliance with new standards. In other words, accountability for improvement remains with leadership. The "deference to expertise" principle is vague enough to allow detrimental interpretation. Specifically, it permits diffusion of accountability. For example, hospital leadership may subscribe to the notion that surgeons know their environment and specialty better than administrators. The result may be unpredictability, within operating rooms, of the type associated with managing a wide variety of instrument sets, techniques, and procedures. More importantly, the philosophy blinds hospital leadership to risk and diminishes its accountability when mishaps occur. On an enterprise level, deference to the expertise of local hospital commanders resulted in wide variation in the enforcement of Army policies known to improve outcomes. In Army aviation, leaders are accountable for the actions of their teams. There is deference to experts for many aspects of performance – but not those related to quality and safety. Such standards are enforced by leadership.

Based on these observations, Army Medicine, under the authority and guidance of the MEDCOM DCG-O, rebalanced its approach. The following are the HRO tenets of Army Aviation (as translated by aviation medical officers) – adopted to Army medicine:

1. **Vigilance to vulnerability.** Army medicine is attentive to risk.
2. **Regimented communication for key transactions**.[7] Army aviation uses check-list-based communication for transactions in which failure to communicate information may result in harm. Through the application of the tenets of crew resource management, Army medicine is standardizing communication at the individual, team, unit, and hospital levels in order to harness the contributions of all teammates to recognize and mitigate risk.
3. **Mishap investigation, analysis, and action**.[7] Army aviation has relied on the services of a safety center (the Combat Readiness Center or CRC) to investigate accidents for decades. The center deploys teams to investigate accidents of significant loss. It centralizes analysis to allow the creation of new doctrine or policy. Army medicine has stood up its own "AMEDD Quality and Safety Center (AQSC)" – complete with a deployable investigative team, a central database, and mechanisms to broadcast lessons and policy back to the field.
4. **Standardization and surveillance of safety protocols**.[7] Army aviation seeks the identification of best safety practices from the field; standardizes them into clear, simple instructions (and/or checklists); returns them to the enterprise; and then monitors for 100% compliance. Army medicine has reproduced this process for critical safety protocols.
5. **Leadership accountability for the performance and treatment of teams**. When a mishap occurs in Army aviation, leaders (not experts) brief details to higher supervisors and to teammates potentially at risk for the same outcome. This ensures that those with authoritative power understand their responsibility in identifying risk, mitigating risk, and improving safety conditions. Within a "safety culture," Army Medicine has replicated this process through quarterly "Patient Safety Forums (PSFs)."

In summary, the Army retained none of the verbiage of Weick and Sutcliffe's five principles. Even so, apart from striking "deference to expertise" and "reluctance to simplify," the Army principles continue to share themes with the HRO principles. Most clearly, "vigilance to vulnerability" holds much in common with "preoccupation with failure." We preferred the former because the latter was considered confusing and negative when presented without additional context. Additionally, a "sensitivity to operations" is required for and implied in all five of the Army principles and therefore does not require extraction as a free-standing principle. Finally, we considered "commitment to resilience" to be a by-product of accountable leadership and therefore captured in the final principle.

Even though the Army's enhancements of academic work exist solely to add context to its applicability in military medicine, two criticisms are likely: First, the modifications read as objectives or tasks while those of Weick and Sutcliffe exist on a higher plane of theory; aimed at changing culture, attitude, and behavior; or both. Second, Weick and Sutcliffe's taxonomic structure, at the highest level (five three-word fragments), was designed for retention of complex ideas. Army Medicine lost sight of deeper nuance.

The Army Medicine principles are, indeed, distinct on both of these levels. The Army focused on operational objectives deliberately because crafting a system obsessed with quality and safety is foremost dependent on example and

action. Weick and Sutcliffe's work, and its existence in academia, is likely designed to be the foundation of just this sort of enhancement. The Army discovered that education and theory, when used as the primary drivers of reform, foster slow and incremental change and are prone to erosion and extinction. Action – not education – was absent in the Army from 2014 to 2017.

Regarding taxonomy, we do not deny that nuanced concepts underlie each of the HRO principles. However, the device of summarizing each in three-word fragments achieved large-scale retention at the cost of variance in interpretation. We chose not to be constrained by device or word count in top-level taxonomy. Instead, we sacrificed memorability for clarity by using the minimum words necessary to ensure precision in our highest level taxonomy.

The adoption of Army Medicine principles fostered an atmosphere of action-oriented growth and change. Adding to work done by our predecessors, we reorganized assets to create the AQSC (modeled after the CRC) as previously mentioned. We employed a Root-cause-analysis Event Support and Engagement Team (RESET – modeled after aviation mishap investigation teams) to understand risk.[8] We converted investigation findings (and safety data from other sources) into concise bulletins to rapidly communicate areas of potential risk to the field (modeled after the CRC's Preliminary Loss Reports). Perhaps more importantly, we relied upon safety data to inform decision-making, performance improvement, and standardization. Important analysis and direction were (and continue to be) presented to all Army hospital leaders at quarterly PSFs (modeled after aviation Safety and Occupational Health Advisory Councils [SOHACs]). The entire process; that is, the use of the AQSC, RESET, and PSF to create, prioritize, disseminate, and monitor the compliance of communication techniques, training tools, checklists, and safety-oriented standards, was modeled after functions contained within the CRC, USAACE, and aviation's Directorate of Training and Doctrine or DOTD. None of these efforts relied upon new commitments of money or other resources.

Much work needs to be done and we look forward to publishing long-term outcomes. Short-term results are encouraging. According to the Defense Health Agency Sentinel Event and Root Cause Analysis (SERCA) Tool, the Army is the only service which has significantly reduced its number of sentinel events in 2018 as compared to this time in 2017.[9] More than halfway through 2018, the Army is well ahead of its 2017 trends for sentinel events, wrong site surgeries (WSS), and unintended retained foreign objects (URFOs).[9] Indeed, if the current rates continue through the last 5 months of 2018, the Army will reach #28 sentinel events in 2018 versus #42 in 2017 (a 33% reduction), #36 WSSs in 2018 vs #52 in 2017 (a 31% reduction), and #8 URFOs in 2018 versus #14 in 2017 (a 43% reduction).

These data, while encouraging, continue to be unacceptable. While we believe our methodology has strengths, we will continue to relentlessly obsess about – and improve upon – it until all safety events are eradicated in Army medicine. Such is our commitment.

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