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Radiology and the Highly Reliable Organization

Friedrich D Knollmann, MD, PhD, FACR*

Department of Medical Imaging, University of Pennsylvania, Penn Presbyterian Medical Center, USA.

***Corresponding Author(s): Friedrich D Knollmann**

Department of Medical Imaging, University of Pennsylvania, Penn Presbyterian Medical Center, 39th & Market Streets, Philadelphia, PA 19104, USA.

Tel: 267-582-7978;

Email: Friedrich.Knollmann@pennmedicine.upenn.edu

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Abstract

The Highly Reliable Organization (HRO) is an organizational management notion that has gained traction in many health care organizations over the last 40 years. It is an idea conceived by psychologists that appeared in a scientific journal article on aircraft carrier safety studying organizational psychology [1]. It then spread to other applications and was based on an analysis of catastrophic events, looking for causes and ways to avoid such events through organizational interventions. More recently, medical organizations have endorsed this notion as medical care meets criteria that include fast paced high stakes environments and dominated applications of this concept [2]. Endorsed by organizations such as the Joint Commission on Accreditation of Healthcare Organizations (JACHO) and the US Department of Health and Human Services, the idea of high reliability has become a necessary requirement for clinical medicine. We review how the notion of a Highly Reliable Organization relates to the specialty of Radiology.

Introduction

What is a highly reliable organization?

The notion of a Highly Reliable Organization is rather abstract, rooted in metaphysics and transcendental philosophy. Reliability means that something can be trusted to happen on a regular basis. The oath of Hippocrates demands to first do no harm – as the common moral denominator of medical practice. Highly amplifies the subject, and the focus on organization creates some relief for the individual. Being reliable leads to trust and is unambiguous as a shared positive value. Immanuel Kant's Theoretical Philosophy provides basic principles of the ethics of perfection – Do the most perfect thing that can be done by you! [3].

The notion of reliability comes from organizational psychologists through medical associations, as a leadership initiative, to provide vision and guidance.

It is based in administrative aspiration and guided by the need to define quality and safety [4], enforced by accreditation requirements of the CMS. To operationalize safety and quality as accreditation requirements, the Joint Commission has endorsed the notion of High Reliability, and this requirement has led to the success of consultant organizations such as Vizient offering services to instill High Reliability thinking in Healthcare Organizations.

In doing so, the original principles defining a Highly Reliable organization have been translated into other principles. From the onset, an intriguing feature of the Highly Reliable Organization has been its elusive definition [5]. Still, the HRO was characterized by being required to operate safely and reliably in order to subsist, in a high stakes complex and dynamic environment. Observing such environments, research found expertise, continuous learning, and multi-channel redundant processes.

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The way it is implemented has been variable over time, and as a transcendental notion, it needs to be applied and translated into decisions and action.

For the field of Radiology, this translation is offered through further analytical steps that offer other transcendental principles, aka a framework, from each of which practical directives are derived, for instance to change culture, create safety, and good quality of care, through enhanced communication, which in combination lead to high reliability and the absence of any catastrophic events.

Its translation into actionable strategies has been attempted by deriving tactics from a strategic "framework" proposed by the health care consulting firm Vizient [6]. This framework consists of the domains of culture, knowledge, learning system and leadership, and managing the work, and shall be translated into action through components that are not necessarily deductible from the domains. The components of culture for instance are explained by personal accountability, teamwork, a healthy environment, and connections and alignment – that offer little opportunity for controversy. These components are maxims the sum of which according to Kant defines a person's character.

Culture has been defined elsewhere as the whole way of life, or the values, believes, and practices by which men and women live – an all-encompassing space that is comprised by the values and believes of all individuals in an organization. Culture has been found to be the second most complex word in the English language [7], with the result being more than the sum of its parts.

Accountability and alignment are social functions encoded in roles and formal expectations related by communication acts and revealing problems in an administrative bureaucracy [8]. There is a rich history of how role expectations have evolved starting with the Regulations for the order and discipline of the troops of the United States [9], over the principles of scientific management that sought to improve productivity [10], connecting material role expectations to moral expectations and medical ethics [11].

HRO as a change initiative is subject to the management insight that culture is probably the most difficult aspect of the framework to change and comes last, not first in the change process [12]. It still remains a key leadership target [13].

Using a dialectical approach, high reliability stems from the negation of its opposite, negative outcomes [14]. The negation of catastrophic events by becoming highly reliable leads us to the desired outcome. An organization cannot be unreliable and reliable at the same time.

How does this relate to Radiology? A pragmatic approach is to apply the metaphysical principles of becoming highly reliable to the threats of catastrophic failures that can be experienced in clinical practice, such as missed diagnoses and subsequent death of our patients. It is related to the desire to be not affected by any harm and immortal, events that we know are necessary parts of the human condition. As a higher-level notion, it is tied to the constitution of the World Health Organization that defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity [15].

What do we do with HRO as a strategic initiative?

Guided by an enlightened understanding of human Reason, all thought is subject to critical review to determine if a way of thinking can withstand free and public probing [16].

These applications are the result of an AI generated essay on our topic:

Highly Reliable Organizations are entities that operate in complex, high-hazard domains for extended periods without serious accidents or catastrophic failures. These organizations, such as nuclear power plants, aviation, and increasingly healthcare institutions, adhere to five key principles:

1. Preoccupation with Failure: Constant vigilance and the anticipation of potential failures are crucial. HROs recognize that even minor issues can escalate into significant problems if not addressed promptly.

2. Reluctance to Simplify: HROs resist oversimplifying interpretations of events. They acknowledge the complexity of operations and maintain a nuanced understanding of their processes.

3. Sensitivity to Operations: Continuous awareness of the state of systems and operations is maintained. This situational awareness helps in identifying and responding to anomalies swiftly.

4. Commitment to Resilience: HROs develop the capacity to recover from errors and unexpected events. They emphasize learning from failures to strengthen future operations.

5. Deference to Expertise: Decision-making authority is given to those with the most relevant expertise, regardless of their hierarchical position. This ensures that knowledgeable individuals can act swiftly to mitigate risks.

However, the complexity and precision required in radiology also present significant risks. Errors in imaging interpretation, procedural mistakes, and equipment malfunctions can have severe consequences for patients. Therefore, integrating HRO principles into radiology is essential to ensure high reliability and patient safety.

Applying HRO principles in radiology

1. Preoccupation with Failure: In radiology, this principle translates to a proactive approach to identifying and addressing potential sources of error. Regular audits, peer reviews, and continuous quality improvement programs can help in early detection of issues. For instance, implementing double reading protocols, where two radiologists independently review the same images, can reduce the risk of diagnostic errors.

2. Reluctance to Simplify: Radiology departments must recognize the complexity of their operations. This involves thorough documentation of imaging procedures, maintaining detailed records of patient interactions, and understanding the multifaceted nature of imaging technologies. Avoiding oversimplification ensures that radiologists and technicians remain vigilant and thorough in their work.

3. Sensitivity to Operations: Maintaining situational awareness in radiology is crucial. This can be achieved through real-time monitoring of imaging equipment performance, tracking patient flow, and ensuring that radiology staff are aware of any changes in patient conditions or procedural protocols. Implementing advanced imaging informatics systems can aid in maintaining this operational sensitivity.

4. Commitment to Resilience: Radiology departments should focus on building resilience by preparing for unexpected events. This includes developing robust contingency plans for equipment failures, power outages, or sudden surges in patient volume. Training staff to handle emergencies and conducting regular drills can enhance the department's ability to respond effectively to unforeseen challenges.

5. Deference to Expertise: Empowering radiology staff to make critical decisions based on their expertise is essential. Creating an environment where radiologists, technologists, and support staff can collaborate and contribute their knowledge without hierarchical constraints fosters a culture of safety and reliability. Encouraging continuous education and professional development also ensures that staff remain current with the latest advancements in imaging technology and best practices.

Radiology, as an indispensable component of modern healthcare, stands to benefit significantly from the principles of Highly Reliable Organizations. By prioritizing the anticipation of failure, embracing complexity, maintaining operational sensitivity, fostering resilience, and deferring to expertise, radiology departments can enhance their reliability and ensure the highest standards of patient care. As the field continues to evolve with technological advancements, integrating HRO principles will be critical in navigating the complexities and ensuring the safety and well-being of patients.

Challenges

The elusive definition of an HRO sets the tone. Its abstract nature has led champions to propose tautological explanations, and its roots in administrative discourse reflects that this is less a scientifically founded approach, but originates from an outside perspective of patient care.

It is easy to find that the nature of patient care is probably the highest stakes area and has therefore been shaped by a long tradition of HRO. Thus, organizational psychologists learn from the practice of medicine about its principles. Nonetheless, pundits have argued that suboptimal outcomes still occur in medicine, and becoming an HRO is to improve outcomes. Who would argue that suboptimal outcomes occur? The rise of the notion may also reflect the changing composition of the health care workforce that is increasingly composed of non-clinical health care workers [17] who are not bound by the Hippocratic oath so that the idea of zero harm seems new and original, but find guidance in the definition of health by the WHO [9].

The maxim of becoming an HRO is justification for consulting firms [18] selling their services, as a pathway laid out in business schools. This pathway is usually costly and its cost savings potential beyond other business techniques uncertain.

The aspirational goal of an HRO can be implemented in ways that already exist and by laying out a plan that consists of other abstract ideas that are only loosely related to each other.

Is an HRO possible?

One such derived mantra, zero harm, is an expression of one of the oldest maxims of health care, to do no harm, contained in the historic Hippocratic Oath. Are HRO the emperor's new clothes? In management science, the idea is also well established [19] as an ethical imperative.

Zero harm remains an aspiration because mortality is part of the human condition, and raising the expectation of zero harm is illusional. An expectation of zero harm contributes to the legal climate in the US and encourages the scapegoating of healthcare providers for financial and psychological gain, a process that drives up costs and depletes access to medical care.

While zero harm may be an elusive goal, reducing negative outcomes can be measured. An uncontested ethical imperative and the measurement of poor outcomes provide the basis for evaluating the reliability of a process. Processes with more frequent good outcomes distinguish highly reliable organizations from less reliable organizations, making the HRO a realistic and measurable goal.

How can Radiology contribute to High Reliability in action?

Opportunities for applying HRO principles to the medical specialty of Radiology can follow the patient value chain, from utilization management, obstacles to access and wait times, over patient misidentification, laterality errors, adverse contrast reactions, contrast extravasation, radiation exposure, interpretive errors, complications of interventional procedures, to result communication and follow up and results management.

Notwithstanding controversies above, there are numerous opportunities to relate HRO principles to anything happening in Radiology. Examples include most quality and safety initiatives that can be viewed with a HRO perspective [20] which encompasses other systematic approaches to quality improvement [21].

Utilization management

Access to radiologic services can be hindered by communication barriers that can be addressed by quality improvement initiatives [22]. Utilization management is greatly aided by the use of evidence-based criteria for when imaging tests are appropriate [23]. While appropriateness criteria help reduce overutilization [24], underutilization of screening examinations is another important target of utilization management [25]. The increasing role of non-physician providers in ordering imaging studies reveals another opportunity for utilization management [26]. Timeliness of imaging services closely ties into utilization management as increased demand can lead to wait times [27].

MRI safety is another potential application of HRO principles to avoid the risks of harm incurred when patients with ferromagnetic implants are referred for MRI [28].

Adverse contrast reactions and contrast extravasation

Many detailed best practices for the management of contrast agent related issues have been summarized in the ACR contrast manual [29]. Modern MR contrast agents have been found to elicit acute reactions in about 1% [30]. Patients with a known reaction may benefit from substituting the causative agent [31]. Anaphylactic reactions are the most common cause of liability claims related to contrast agent administration [32]. The long-term retention of gadolinium-based contrast agents has emergent as another important concern that has led to the development of newer agents [33].

Radiation exposure

Radiology studies using ionizing radiation require dedicated efforts to reduce the exposure to as low as reasonably possible. Since radiation exposure is measurable, it lends itself to quanti-

tative quality improvement efforts [34] and HRO initiatives.

The use of standardized CT protocols can aid in reducing variability in radiation exposure [35]. Occupational radiation exposure for radiology has declined in recent decades, but increased in nuclear medicine and directs further efforts [36]. Patient exposure to radiation on the other hand has declined in recent years as a result of safety initiatives [37]. There are still opportunities in select studies that have been performed more frequently which ties population exposure to utilization management [38].

Interpretive errors

Interestingly, incorrect diagnoses due to interpretive error have not been central to the published discourse on HROs but lend themselves as longstanding quality and safety targets. Radiology is special in that the interpretive error is easier to prove than in other areas of practical medicine [39] as the subject matter is objectively documented in images that can be used as an enduring resource for alternative interpretations. A large body of the radiological literature is centered on diagnostic accuracy [40] and can thus inspire the notion of a HRO. A culture of a nurturing reaction to errors is expected to result in greater success of preventative action [41]. The increasing workload is another important factor for interpretive errors [42]. Artificial intelligence applications lend themselves to avoiding interpretive errors for instance on laterality [43]. Systematic analysis of image quality facilitates the minimization of interpretive errors [44]. In addition to true interpretive errors, errors of detection of abnormal findings can also be targeted by education, feedback, and advanced technological aids [45]. Feedback and surgical correlation are important factors in decreasing interpretative errors by establishing a learning organization [46].

Results communication and management

Imaging result communication poses a challenge to patient safety and highly reliable communication can be sought using HRO principles, for instance by tracking the follow through with management recommendations in radiology reports [47], or rapid result communication after trauma [48]. Report status on turnaround times is another important quality metric that can be quantified and communicated [49]. Communication of study results to the patient adds another channel to ensure that the report is received and action taken when needed [50].

Procedural complications

Procedural complications are an essential consideration for quality and safety in Interventional Radiology and compare favorably to alternative invasive procedures [51]. Vascular procedures and biopsies have been identified as the most common interventions leading to malpractice claims [52].

All these applications share safety and reliability as common goals, and the notion of a Highly Reliable Organization can serve as common language and a mind map for finding the truth in space and time [53] as we heal and save lives.

HRO and the scientific practice of radiology

The notion and principles of HRO intimately relate to other principles of the practice of medicine. As a field of science, the medical specialty of Radiology deducts from the principles of science laid out in Fichte's Foundations of Science [54] that describe a system of human knowledge centered on individual subjects while HRO is centered on the organization. The changing composition of the medical workforce is an important development as traditional healthcare providers follow a common scientific education grounded in the principles of medical education described in the seminal Flexner report [55]. With the changing composition of the health care organization, new considerations arise, such as the education of non-physicians and their role in patient care as well as the role of artificial intelligence in patient care. As new providers increasingly emerge without traditional medical school education, the practice of medicine faces new challenges for which an organizational perspective gains importance. HRO offers guiding principles that widen the perspective towards the emerging patient centered health care reality. The long history of systematic quality and safety improvements in the practice of radiology inspires the concept of the Highly Reliable Organization and can guide organizations towards a shared purpose of trust as its moral and ethical mandate.

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