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PATIENT SAFETY NETWORK

The Evolution of Root Cause Analysis

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Introduction

Root Cause Analysis (RCA) is a structured approach designed to uncover the direct causes of an adverse event and the systemic weaknesses that may have allowed the event to happen. When an adverse event occurs in health care, it is critical to understand why and implement measures to prevent it from happening again. For example, if a medication error occurs, healthcare organizations can complete a root cause analysis to identify what contributed to the error, such as a confusing process or missed alert within the electronic health record (EHR), and enact actionable steps to address system-based issues.

These investigations are an important part of any organization's commitment to patient safety because they identify and address underlying system issues that have caused or could cause harm rather than merely addressing the immediate symptoms of a problem. Without a structured RCA process in place, healthcare organizations would struggle to prevent the same incidents from happening again and again. For these reasons, the RCA method is supported by leading accrediting and federal agencies as a way to create a safer healthcare environment.

Despite the importance of RCA, its implementation in health care can be challenging.[1] RCA effectiveness relies on the ability to systematically dissect an incident, helping healthcare organizations move beyond individual blame to uncover actionable insights. However, the healthcare system is highly complex, with many interdependent parts and processes that can obscure the path to understanding an error's root cause or causes. Striking a balance between accountability and a non-punitive culture of safety can also be difficult for organizations. As a result, organizations customize how they use the RCA process to fit their specific needs and overcome its challenges. This piece focuses on how RCAs have been used over time and how these processes have changed, including the Root Cause Analysis and Action (RCA^2) framework from the Institute for Healthcare Improvement (IHI).

RCA History and Challenges

RCA has a longstanding role in health care, particularly since 1997 when the Joint Commission on Accreditation of Healthcare Organizations (now The Joint Commission) mandated its use for investigating sentinel events—serious incidents that result in patient harm or risk of serious injury.[2] While this mandate

aimed to standardize RCA practices across healthcare institutions and encourage spread, it also unintentionally led to RCA becoming a regulatory formality. At many organizations, researchers found that RCA processes were primarily used to meet accreditation requirements rather than as a genuine tool for improvement.[3] As a result, RCA was often a "check-the-box" activity, losing some of its intended impact and effectiveness in fostering a learning environment.[1]

Additionally, the way RCAs have historically been conducted presented significant challenges. The process was often handled privately, creating a “black box” effect that leaves frontline staff, patients, and families feeling excluded and unsure about the outcomes or rationale behind RCA findings.[3] This lack of transparency, in many cases, contributed to a punitive culture where staff members fear RCA investigations may lead to disciplinary actions or job loss.[4]

For RCAs to fulfill their true potential, they must shift to support a psychologically safe environment where staff are encouraged to report and learn from mistakes without fear, fostering an open, collaborative approach to safety. In addition, the RCA process must be transparent, and the results must be specific and actionable to create meaningful and sustainable changes. With these improvements, RCA can be a powerful, enduring tool for advancing patient safety and strengthening the overall culture of safety within healthcare organizations.

Introduction and Implementation of RCA^2

In 2015, the National Patient Safety Foundation, which later merged with IHI, introduced an updated approach to RCAs called “Root Cause Analysis and Action” or RCA^2. This redesigned RCA methodology aimed to address the most persistent ineffectual issues with traditional RCA, especially the focus on individual blame rather than systemic improvement. For example, RCA^2 formalizes the emphasis on understanding how organizational systems and processes contribute to adverse events, as opposed to individual-level factors. For example, “this staff member did not follow protocol” is an individual-level factor. A system-level factor would be “the processes in the protocol are not clear enough and could be improved.” By shifting focus to systems, RCA^2 aims to foster an environment where healthcare professionals can participate openly without fear of personal repercussions (excluding obvious cases of negligence) and encourage more transparent and collaborative learning from incidents.

One new component of RCA^2 is its structured approach to prioritizing harm events for investigation. Given the vast number and variety of incidents in health care, RCA^2 provides detailed guidance on determining which events require immediate and thorough examination based on factors like severity of risk to patient safety, likelihood of recurrence, and organizational impact. This prioritization ensures that resources are used effectively and that investigations focus on incidents with the greatest opportunity for system-wide improvement. By setting clear criteria for which events to analyze in-depth, RCA^2 helps healthcare organizations manage their resources while maximizing their ability to implement meaningful changes. RCA^2 also promotes smaller, independent investigation teams to reduce bias, allowing for a fresh and unbiased perspective on each incident.

RCA^2 also places a strong emphasis on developing robust, sustainable solutions to the issues identified. Beyond simply diagnosing the root causes of an event, RCA^2 encourages healthcare organizations to

brainstorm actionable interventions that address the identified issues and will have a lasting impact. For example, a strong action step would be to “add a flag to the EHR for similar test results so that clinicians are automatically made aware.” In contrast, a weak action step would be “update a policy on test result communication.” This methodology stresses the importance of implementing solutions that are resilient to future failures and includes recommendations for ensuring these solutions are integrated effectively within existing workflows. This focus on sustainable change moves RCA beyond a reactive approach, aiming to create proactive systems that continuously improve patient safety.

The RCA^2 toolkit offers a flexible approach to root cause analysis, allowing healthcare organizations to adapt RCA components based on their unique needs and readiness. Rather than being a rigid framework, the toolkit can be used in part or as a whole, making it highly customizable. For example, some organizations may start by only implementing the risk prioritization framework and leave the other pieces to a later date. This adaptability allows organizations to start small or tackle complex analyses all at once, depending on their immediate requirements and available resources, making RCA^2 an accessible model for healthcare organizations at various stages of patient safety maturity.

The toolkit’s flexibility also means it can be adapted for diverse healthcare settings beyond hospitals, including ambulatory and outpatient environments. For example, RCA^2 can support Aggregate RCA. This technique allows teams to examine patterns across multiple events within a category (such as medication errors or patient falls) rather than focusing on individual incidents alone.[5] Additionally, RCA^2 encourages the investigation of "near miss” incidents that could have caused harm but were prevented. This proactive approach helps organizations identify potential risks before they result in actual harm.

This flexibility also allows for innovation from organizations that want to expand their scope to address modern patient safety considerations. For example, one large health system incorporates human factors to understand ergonomic or cognitive challenges that might contribute to errors. Another health system addresses emotional harms alongside physical ones,[6] and another integrates an equity lens to ensure that solutions are inclusive and sensitive to diverse patient needs.[7]

Other Innovations in RCA Methodology

In addition to RCA^2, there have been other recent innovations in RCA methodology. For example, Success Cause Analysis (SCA) shifts the focus from studying adverse events to examining the factors that contribute to favorable outcomes, thereby promoting a more balanced approach to improving patient safety.[8] SCA applies root cause analysis methodology to understand the systemic factors that contributed to positive results. Another innovation is SWARMing, which aims to rapidly respond to adverse events, holding a short, focused meeting as soon as possible after the event to describe what happened and develop solutions in a blame-free environment.[9] One study found that this approach increased incident reporting by 52%.

Conclusion

RCA can serve as a powerful tool for quality improvement and is essential for fostering a robust culture of safety within healthcare organizations when implemented effectively. The introduction of RCA^2 addresses

many challenges associated with traditional RCA processes, emphasizing systemic issues over individual blame and promoting transparency and psychological safety. Furthermore, organizations seeking to enhance or integrate RCA practices can access a variety of customizable tools and resources tailored to their specific needs, ensuring that the analysis leads to meaningful and sustainable improvements in patient safety.[10,11] By embracing these advancements, healthcare organizations can better protect patients, enhance care quality, and build a safer, more accountable healthcare environment.

References

1. [Nicolini D, Waring J, Mengis J. The challenges of undertaking root cause analysis in health care: a qualitative study. *J Health Serv Res Policy*. 2011;16(1_suppl):34-41. [Available at]
2. Singh G, Patel RH, Vaqar S, Boster J. *Root Cause Analysis and Medical Error Prevention.* StatPearls Publishing; 2024.
3. Peerally MF, Carr S, Waring J, Dixon-Woods M. The problem with root cause analysis. *BMJ Qual Saf*. 2017;26(5):417-422. [Free full text]
4. Guthrie, R. Root cause analysis won't work if people fear it. *Institute for Healthcare Improvement Insights*. January 16, 2020. Accessed November 7, 2024. [Free full text]
5. Neily J, Ogrinc G, Mills P, et al. Using aggregate root cause analysis to improve patient safety. *Jt Comm J Qual Patient Saf*. 2003;29(8):434-439. [Available at]
6. Diaz-MacInnis L. Healing after harm: addressing the emotional toll of harmful medical events. Beth Israel Deaconess Medical Center. August 22, 2018. Accessed November 7, 2024. [Free full text]
7. Chandra K, Garcia M, Bajaj K, et al. A systemwide strategy to embed equity into Patient Safety Event Analysis. *Jt Comm J Qual Patient Saf.* 2024;50(8):606-611. [Available at]
8. Parkash V. Success Cause Analysis: Learning from what works to advance safety. Institute for Healthcare Improvement Insights. January 9, 2024. Accessed November 7, 2024. [Free full text]
9. Kennerly D. Learning by "SWARMing" adverse events. *Jt Comm J Qual Patient Saf*. 2015;41(11):492-493. [Available at]
10. Root cause analysis toolkit. MN Department of Health. June 20, 2024. Accessed November 7, 2024. [Available at]
11. RCA^2: Improving root cause analyses and actions to prevent harm. Institute for Healthcare Improvement. Accessed November 7, 2024. [Free full text]