Health, 2025, 17(9), 1081-1086
https://www.scirp.org/journal/health
ISSN Online: 1949-5005
ISSN Print: 1949-4998

DEEP SEE™—A Seven-Step Framework for Deeper, Bias-Aware Root Cause Analysis in Healthcare

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How to cite this paper: Bataweel, A.O. (2025) DEEP SEE™—A Seven-Step Framework for Deeper, Bias-Aware Root Cause Analysis in Healthcare. *Health*, **17**, 1081-1086.
https://doi.org/10.4236/health.2025.179070

Received: August 9, 2025
Accepted: September 15, 2025
Published: September 18, 2025

Abstract

Root Cause Analysis (RCA) remains the primary investigative tool for adverse events in healthcare, yet its limitations are increasingly recognised. Many analyses fail to account for cognitive biases, cultural influences, and complex system interdependencies, resulting in incomplete learning and weak corrective actions. This paper introduces DEEP SEE™, a seven-step framework designed to move beyond linear cause-and-effect thinking. By guiding investigators from surface-level descriptions to deeper cultural and contextual insights, DEEP SEE™ supports richer understanding and more actionable recommendations. The model is illustrated through eight representative cognitive bias scenarios adapted from real-world Morbidity & Mortality (M&M) and incident review contexts. While not a formal research evaluation, DEEP SEE™ offers a structured, bias-aware approach that can be integrated into existing patient safety review processes and provides a foundation for future empirical study.

Keywords

Root Cause Analysis, Patient Safety, Cognitive Bias, Healthcare Quality, Deep SEE™

1. Introduction—The Problem with Current RCA

Patient safety incident investigation is a critical function in healthcare risk management, enabling organizations to learn from harm and prevent recurrence [1]. RCA is the most widely adopted approach, yet its effectiveness is frequently challenged. Conventional tools such as Fishbone diagrams and the 5 Whys method often produce linear, oversimplified causal pathways that fail to address the complexity of modern healthcare [2].

Moreover, research shows that cognitive biases significantly influence clinical decision-making and error occurrence [3] [4], yet these factors are rarely explored systematically during investigations [5] [6]. Traditional Root Cause Analysis (RCA) has well-recognized limitations when it comes to systematically identifying the cognitive contributors to human error. Much of RCA practice emphasizes technical or process failures, while the deeper psychological and decision-making dimensions remain underexplored. As Hytopoulos and colleagues noted, the most challenging issue in the RCA "*is to understand the category of 'human' causes, which pertain to the psychology domain*" [7] (p. 12). This highlights how human cognitive factors—such as heuristics, biases, and mental workload—are rarely analysed with the same rigor as mechanical or procedural causes. Consequently, RCA often overlooks the systematic identification of cognitive root causes, leaving critical learning opportunities untapped.

Root Cause Analysis has been widely adopted in healthcare to investigate adverse events, near misses, and sentinel incidents. However, published critiques have highlighted persistent weaknesses, including:

- Harm-based prioritization—Events are often selected for RCA only after severe harm, overlooking near misses that hold valuable preventive insights [8].
- Limited cognitive focus—Little attention is given to the mental shortcuts, heuristics, and biases that shape decisions in real time [9].
- Linear thinking—Conventional tools emphasize single causal chains, neglecting complex interactions among human factors, systems, and environment [2] [10] [11].
- Cultural constraints—Hierarchies and peer protection can distort findings and stifle openness [12].
- Actionability gap—Recommendations often lack specificity, feasibility, or sustainable implementation planning [13].

These limitations necessitate an RCA model that integrates cognitive science, systems thinking, and cultural analysis into a single, coherent process.

Several initiatives have attempted to improve traditional RCA, most notably the RCA2 framework developed by the National Patient Safety Foundation [14]. RCA2 emphasizes timeliness, leadership accountability, and the development of stronger, more measurable corrective actions compared to earlier RCA practices. While these enhancements address the "actionability gap", RCA2 still gives limited attention to cognitive contributors, such as biases and heuristics, which remain underexplored in most investigations. DEEP SEE™ builds on this progress by explicitly integrating cognitive science and cultural analysis into the investigative process, thereby addressing dimensions not fully captured by RCA2.

2. Origin of DEEP SEE™

DEEP SEE™ (Describe, Expose, Examine, Probe, Scan, Explore, Elevate) emerged from frontline patient safety and risk management practice in acute care. The model was conceptualised by the author in 2025 to integrate:

1) Cognitive psychology—recognizing that human decision-making is shaped by heuristics and biases.

2) Systems thinking—acknowledging that healthcare outcomes result from the interaction of people, processes, technology, and the environment.

3) Cultural awareness—incorporating the influence of organizational norms, team behaviors, and implicit values.

The goal was to create an accessible tool that could be applied in M&M reviews, incident investigations, and quality improvement meetings without replacing existing reporting systems, but deepening their outputs.

3. The DEEP SEE™ 7-Step Framework

To enhance comprehension and provide practical illustrations, Table 1 summarizes the seven DEEP SEE™ steps, with concise examples and explanations of their application.

Table 1. DEEP SEE's seven components.

Step	Meaning	Example	Explanation
1. Describe	State the factual sequence of what occurred, without interpretation.	A patient received the wrong medication dose at 8:00 a.m.	Establishes a neutral, objective timeline of events to avoid assumptions or blame.
2. Expose	Identify what was visible, assumed, or taken for granted at the time.	The nurse assumed the label on the syringe was correct without double-checking.	Reveals surface-level perceptions and assumptions that influenced actions.
3. Examine	Analyze the immediate contributing factors in the environment.	The medication storage area had similar-looking vials placed side by side.	Highlight local conditions or design flaws that directly enabled the error.
4. Probe (System Gap)	Look deeper into hidden issues, systemic weaknesses, or missed safeguards.	No barcode scanning system was in place to verify medications before administration.	Identifies failures in processes or tools that should protect against human error.
5. Scan (Organizational/ Cultural Gap)	Broaden the view to organizational, cultural, or environmental contributors.	Hospital-wide staffing shortages created multitasking and frequent interruptions during rounds.	Shows how wider cultural or structural pressures increased risk across the hospital.
6. Explore (Human/Cogniti ve Gap)	Investigate human factors (e.g., thinking styles, personality traits, emotional intelligence, etc.) and cognitive biases influencing decisions.	Confirmation bias led the nurse to trust the physician's hurried verbal order without verification.	Examines the psychological processes that shape individual decision-making.
7. Elevate	Translate findings into actionable lessons and systemic improvements.	Introduce barcode verification, redesign storage, and provide training on bias awareness.	Ensures insights are converted into action that strengthens systems and culture.

This layered approach shows how DEEP SEE™ moves from facts → perceptions → environment → system gaps → organizational culture → human cognition → solutions.

4. Comparison with Existing Models

Traditional RCA tools, such as fishbone diagrams and the "Five Whys", offer value in structuring cause identification but often lack prompts for bias recognition or cultural assessment.

DEEP SEE™ expands on these by:

- Explicitly embedding bias identification (Step 4).
- Ensuring parallel context is explored (Step 3).
- Requiring cultural analysis (Step 6) before generating recommendations.
- Framing recommendations in terms of elevated learning (Step 7) rather than simply closing the case.

5. Implementation Considerations

DEEP SEE™ can be integrated into existing RCA workflows by:

- Incorporating its steps into RCA templates or investigation forms.
- Training facilitators in bias recognition and systems thinking.
- Using it as a discussion scaffold in M&M meetings to ensure a balanced exploration of individual and systemic factors.
- Supporting recommendations with EHR-based decision support tools and cultural change initiatives.

To ensure the effective use of the DEEP SEE™ framework, facilitators require structured preparation. Training should cover the following core areas:

- **Framework mastery**—Understanding each of the seven steps and applying them consistently in diverse cases.
- **Facilitation skills**—Leading multidisciplinary discussions, encouraging open dialogue, and managing sensitive conversations without blame.
- **Analytical and reporting skills**—Documenting findings clearly, identifying system, cultural, and cognitive gaps, and converting insights into actionable improvement plans.

A practical component (e.g., case simulations or role-play) is recommended to reinforce learning and prepare facilitators for real-world applications.

6. Case Illustrations: Cognitive Bias Applications

To demonstrate the versatility of the DEEP SEE™ model, it has been applied to realistic clinical scenarios adapted from Morbidity & Mortality (M&M) reviews and incident debriefs.

Eight representative cases were chosen for their relevance to specific cognitive biases frequently encountered in clinical decision-making.

1) Confirmation Bias—Missed STEMI.
2) Anchoring Bias—Escalation failure in COPD.
3) Overconfidence Bias—Unnecessary laparotomy.
4) Framing Bias—Delayed sepsis recognition.
5) Attribution Bias—Pain underestimation in patients with an opioid history.
6) Availability Bias—Missed posterior stroke.
7) Blind Spot Bias—Peer review shielding.
8) Hindsight Bias—Harsh incident judgment post-outcome.

Each scenario was mapped against the DEEP SEE™ seven-step process to highlight not only system gaps but also cognitive and cultural influences.

For example, in the case of Confirmation Bias—Missed STEMI, a 47-year-old male presented to the emergency department with chest discomfort and palpitations. He was triaged as anxious and labeled as having a panic attack, which led the attending team to overlook ordering an ECG and cardiac biomarkers. Six hours later, the patient collapsed in the waiting area, and an ECG then confirmed an anterior STEMI. Applying the DEEP SEE™ framework revealed not only the system gap (absence of an early ECG) but also the cognitive bias (confirmation bias from the initial "anxiety" label) and the organizational factor (busy ED environment reinforcing snap judgments). This brief illustration shows how DEEP SEE™ surfaces different layers of contributing factors beyond traditional RCA.

While not a formal research evaluation, these illustrative examples demonstrate how DEEP SEE™ can enrich the depth and actionability of learning from case reviews. For this initial publication, illustrative scenarios were chosen for their strong linkage to cognitive biases—an area often overlooked in traditional RCA. This thematic focus demonstrates how DEEP SEE™ can systematically surface and address bias-related decision vulnerabilities.

7. Limitations and Future Research

This paper presents DEEP SEE™ as a conceptual and practice-based innovation rather than a formally validated research instrument.

Limitations include:

1) Absence of empirical outcome data comparing DEEP SEE™ to traditional RCA methods.

2) Potential variability in application depends on facilitator skill and organisational culture.

3) Need for adaptation in non-acute or community care settings.

Future research should focus on:

- Controlled comparisons of DEEP SEE™ and conventional RCA outputs.
- Quantitative analysis of recommendation quality and implementation success.
- Exploration of its impact on organizational learning culture and bias awareness over time.

8. Conclusions

DEEP SEE™ offers a practical, bias-aware enhancement to traditional RCA in healthcare.

By guiding investigators from surface descriptions to deeper cultural and systemic insights, it addresses known limitations in current practice and supports more meaningful, sustainable learning.

Its structured approach can be readily integrated into existing review processes, providing a foundation for future empirical validation.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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