THE Root Cause Analysis HANDBOOK

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If you have any suggestions or feedback, please email ihq@nhg.com.sg.

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Foreword

As we present the second edition of our Root Cause Analysis in Healthcare handbook, I am reminded of the enduring wisdom in Albert Einstein's words: "We cannot solve our problems with the same thinking we used when we created them."

In the ever-evolving landscape of healthcare, our commitment to quality and safety remains unwavering. Despite the remarkable advancements in medical science and technology, we continue to face challenges in the form of errors and adverse events. It is precisely these challenges that underscore the critical importance of Root Cause Analysis (RCA) in our field.

RCA is more than just a problem-solving tool; it is a systematic approach that allows us to delve deep into the complex web of factors contributing to adverse events in healthcare. By identifying root causes, we move beyond addressing symptoms to tackling the fundamental issues within our systems and processes.

This updated handbook serves as a comprehensive guide to RCA, equipping healthcare professionals with the knowledge and skills needed to conduct thorough investigations. It emphasises the importance of viewing problems from a systemic perspective, encouraging us to look beyond individual errors to understand the broader context in which they occur.

As we continue our journey towards building a culture of safety and continuous improvement, RCA remains an invaluable asset. It provides us with the means to redesign our systems, enhance reliability, and ultimately, improve patient outcomes.

I encourage all members of our healthcare community to embrace the principles and practices outlined in this handbook. By doing so, we not only address current challenges but also proactively work towards preventing future adverse events.

Let this second edition serve as a renewed commitment to quality, safety, and the relentless pursuit of excellence in healthcare. Together, we can create a healthcare system that is not only responsive to problems but also resilient in preventing them.

Dr Tung Yew Cheong
Group Chief Quality Officer
National Healthcare Group

Contents

Introduction

What is (RCA) Root Cause Analysis?

The system in which patients receive care and healthcare providers work is highly complex. This results in situations where error may lead to an adverse outcome or where operational problems result in inability to meet the patient's needs or system requirements.

In order to address these issues, we need to apply solutions to either prevent errors from happening or to solve problems that prevent us from achieving our goals. To do so, we need to deeply understand the nature of the causes of these errors or problems.

Root Cause Analysis (RCA) is a systematic approach to identifying the causal factors and root causes that have contributed to a problem or an adverse event.

The better we understand why things happen, the better we can develop targeted interventions or corrective actions to prevent their recurrence. RCA helps us to look beyond the apparent causes and unravel the root causes of problems so that we can effectively solve problems.

Types of RCA

There are 2 major types of RCA that can be performed:

A) Incident RCA
B) Process RCA

Incident RCA

When an incident involving a specific patient or staff is encountered, RCA provides a structured approach to the investigation of the incident and enables us to inquire deeper until we arrive at the underlying root causes. Incidents leading to patient harm are usually not the result of a single system failure, and the root causes of the error(s) are rarely recognisable at the time of the incident. When an incident has occurred, an RCA should be performed as soon as possible. Using a specific set of steps and tools, we will then be able to:

- Determine what happened
- Determine why it happened
- Determine what to do to reduce the likelihood of recurrence

Process RCA

A Process RCA focuses on solving problems and issues encountered during a defined process. These problems often result in less-than-optimal outcomes or failure of the goal of the process to be achieved. In this type of RCA, the intent is to ask "what" and "why" until all aspects of a process are reviewed and all contributory factors and root causes for the problems are identified.

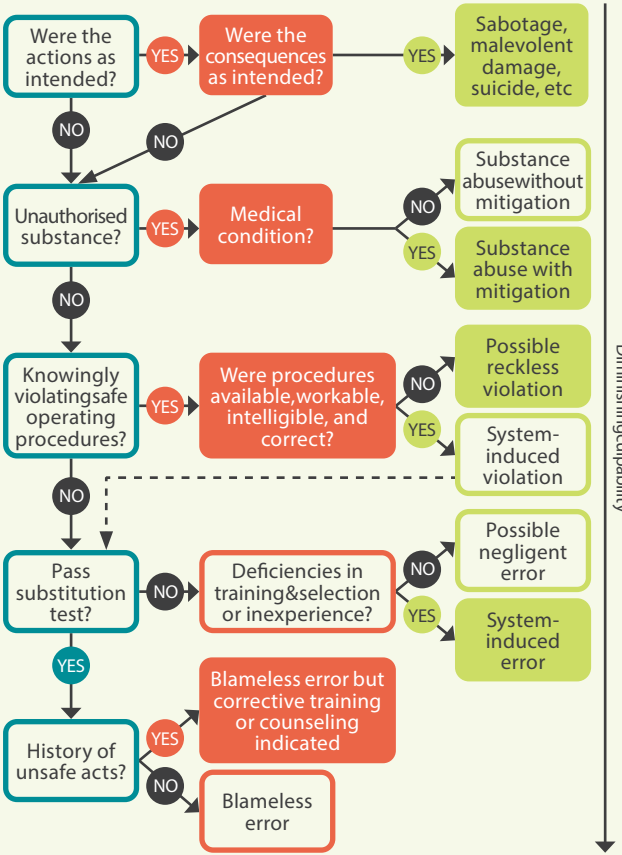
Principles of RCA

System vs. Individuals

Evidence tells us that 70-80% of problems or errors are caused by systems and not by individuals. An RCA should be focused on system failures and root causes, not assigning blame to individuals. Since every system is perfectly designed to achieve the results that it achieves, it is important for us to analyse the issue, distill the root causes, and redesign processes that are reliable to prevent recurrence. When something goes wrong, we ask "What happened?" and "Why it happened?" instead of "Who did it?" so that system failures can be rectified.

Culpability Decision Tree

In NHG, our institutions adopt James Reason's Culpability Decision Tree (CDT) to determine the degree of culpability for individuals who have committed unsafe acts. The CDT helps managers and supervisors to systematically think through the issues behind an active act by a staff member that lead to an error and adopt a transparent and fair approach to decision-making. This helps to build trust among staff and promotes a just culture in the organisation as staff are less likely to be blamed for issues that arise from poor system design. The CDT process is documented in institutions' policies on non-punitive reporting.



(Source:Reason,J.1997.*Managingtherisksoforganizationalaccidents*.Hampshire, England: Ashgate Publishing Ltd.)

Severity Assessment Code Matrix

Given that healthcare organisations have limited resources, a severity assessment code matrix serves as a risk prioritisation tool by helping to triage reported incidents. It enables the organisation to objectively determine if an RCA is required.

Consequence Likelihood	Extreme	Major	Moderate	Minor	Insignificant
Frequent (almost certain)	1	1	2	3	3
Probable (likely)	1	1	2	3	3
Occasional (possible)	1	2	2	3	4
Uncommon (unlikely)	1	2	3	4	4
Remote (rare)	2	3	3	4	4

Example of a Severity Assessment Code Matrix

Organisations may wish to perform an aggregated RCA which involves the analysis of similar incidents to look for common causes. Data and information from these events are collected and reviewed as a group. Trends or recurring issues are then flagged to identify system deficiencies for correction.

Investigation Principles

Principles relating to the investigation during an RCA include:

- The investigation process should be proportionate to the incident/problem and any associated risks.
- The investigation should begin and end in a timely manner.
- The investigation process should be open and transparent.
- The investigation team should keep the relevant stakeholders appropriately informed.
- The investigation should be based on evidence.

Getting Started

Defining the Problem

One of the first steps taken by the RCA team should be to define the problem by describing as clearly and accurately as possible what is the focus of the investigation. This is usually expressed as the harm that had occurred (in an incident) or the inability to reach the desired outcome for a problem.

Examples:

- The Patient suffered a fall which resulted in a fractured hip.
- Patients were not able to receive their discharge medications in a timely manner.

In defining a problem, it is important to describe what is wrong, what needs to be addressed, and focus on the problem, not why or how it occurred. Do not start with a "solution". It is tempting to assume that we know how to fix the problem before a thorough examination. However, assumptions are often wrong and may hinder subsequent analysis. Jumping to conclusions can result in "quick-fixes" that do not adequately address system gaps and the same issue or problem is likely to recur.

Immediate Action

When an adverse event has taken place, the prompt and proper care of the affected patient should be the organisation's first concern. Every possible attempt should be made to prevent ongoing and future harm and to reverse the harm that has occurred if possible. Appropriate care should be directed at ensuring that the patient's condition is stabilised, and that all required follow-up is provided.

The RCA team

Selection of Team Members

The selection of team members of the RCA team is critical and it is typically recommended that an RCA team consists of four to six people. Other important criteria for team members include:

- Knowledge and expertise in the specific process under investigation
- Multi-disciplinary, different backgrounds to provide different perspectives
- Open and unbiased attitude

Ideally, staff who serve on an RCA team should be provided with the necessary resources to do their investigation, including time for meetings, literature search, and interviews. This epitomises the leadership commitment to the RCA process.

Just-in-Time Training

Prior training for everyone in the RCA team is advantageous but not essential. A good facilitator can be engaged to guide unskilled members and provide just-in-time training on the RCA process and wider system issues. A facilitator is a good resource person but should not be considered as a formal member of the RCA team.

Meeting dates and times should be planned in advance to avoid potential delays. At the first meeting, an orientation of the RCA process should be conducted so that team members have a common understanding. It might also be helpful to establish ground rules of behaviour and expectations, including:

- Decision-making: the kind of consensus or majority needed
- Opportunity to speak: everyone should have an opportunity to contribute and to be heard
- Disagreements: everyone must agree to disagree

Respecting Confidentiality

As part of an RCA team, you will be given access to materials, records, and information to help you analyse the event or problem in question. It is your responsibility to keep these confidential. There are many ways you can protect RCA information:

- Only discuss the case with members of your RCA team, in a place where others will not overhear the conversation.
- Store hard copies of documents and physical materials in a secure area.
- Do not move electronic files to your personal computer.
- Send emails with patient information only to team members' official email addresses.
- Do not share reports or documents with staff outside the RCA team.

Gathering Information

Sources of Information

To support the RCA process, many different types of information could be gathered. Note that all information collected during the RCA process is protected against discovery by non-authorised persons in the Healthcare Services Act and must be kept confidential.

Examples of information gathered to support RCA include:

- Physical evidence related to any event
- Documentary evidence
- Witness statements
- On-site observations
- System and process data
- Staff information
- Technical or maintenance data
- Benchmarking information
- CCTV recordings

Physical, Technical, and On-site Evidence

It is critical to preserve physical evidence. All implicated drugs, biological specimens, equipment, and documentary records (including paper, electronic, and video) must be immediately secured. These immediate actions may be performed in parallel to the initiation of the RCA process.

All relevant physical evidence including equipment, devices, and materials should be inspected by a knowledgeable team member or consultant. They should be labeled with information on the source, location, date and time collected, basic content, and

The team may want to consider a site visit to make diagrammatic sketches, take photographs, examine the equipment and surroundings, and perform simulations. Getting a sense of the physical layout and actual processes may provide teams with a clearer understanding of the problem.

Documentary Evidence

Documentary evidence refers to all materials in paper or electronic format that is relevant to the event. It includes patient records, physician orders, medication profiles, laboratory test results, video recordings, policies, guidelines and procedures, maintenance information, and letters from the patient or family.

Witness Statements

In an RCA, asking questions through staff interviews is a straightforward approach to finding out what happened based on first-hand accounts from those who either witnessed or were involved in the event. The purpose is to determine facts and possible systemic causes, and identify opportunities for improvement, not assign blame.

Care must be taken to assess the credibility of statements made during interviews. Be aware that people may sometimes forget information or remember it incorrectly, and the same situation may be perceived differently by individuals.

System and Process Data

Information about the expected and actual performance of the system, sub-system, and processes often provide key insights and allows the RCA team to identify focus areas for deeper analysis. For example, in a multi-step process, data about non-performance, turn-around times, defects, and re-works will prompt the RCA team to delve into questions of "Why?", and "What conditions permit failures to occur?" It is often useful to ask staff involved in the process to explain their understanding of why the system is performing at a certain level.

Stages in an RCA Interview and Useful Tips

Preparing for Interview

In planning for the interview, the team will need to review previously collected information, establish the interviewee list, develop interview questions, determine how information will be recorded, and prepare responses to potential questions that interviewees are likely to raise.

To ensure privacy and confidentiality, interview staff one at a time in a quiet, relaxed setting where interruptions are minimised. If an adverse event is the reason why an RCA is being done, the process of recounting the incident may be upsetting and staff support must be made available when needed.

Opening the Interview

When opening the interview, introduce yourself and all team members, greet the interviewee, and state the focus and purpose of the interview and details of the incident being investigated.

It is important to emphasise the goal of the RCA, which is to identify system issues and prevent future recurrence of the incident. Reinforce that the interview is not part of the disciplinary process. This will help to overcome defensiveness, hostility, and apprehensiveness. Assure the interviewee that the information provided will be kept confidential.

Indicate the amount of time required for the interview and state that notes will be taken so that the staff knows what to expect. Remind the interviewee the importance of offering factual information, confining comments to actual observation, and avoiding hearsay.

Conducting the Interview

During the interview, ask open-ended questions to elicit more than a "Yes" or "No" response. Do not prompt the interviewee or ask leading questions. Use "Why?" questions appropriately as they can be intimidating. Tailor the language of the questions to each interviewee. Phrase questions in a non-threatening manner. Avoid the use of jargon, technical terms, and grammatically complex questions.

Examples of Open-Ended Questions

1) Exploratory Questions
   - "What can you tell me about…?"
   - "What can you recall about…?"
   - "What do you think…?"
2) Follow-up or Probing Questions
   - "What do you mean by…?"
   - "Can you tell me more about…?"
   - "Can you please describe that further?"
   - "How did this come about?"

Interviewees' responses to your questions can sometimes be affected by the way they are put across. This is an opportunity to learn, not to find fault. Do not be confrontational, intimidate the interviewee, embarrass him, or jump to conclusions. Avoid giving your opinions. Stay neutral and objective. Send positive, supportive messages throughout the interview.

Instead of...	Try this...
"Why didn't you stop the procedure if you had concerns?"	"What prevented you from asking to stop and check?"
"Why didn't you inform the doctor about the change in the patient's condition?"	"Tell me what is the process when there is a change in patients' condition."
"What else were you doing while preparing medications?"	"Help me understand what is the process when preparing medications."

In drilling down to understand exactly how a particular incident happened, start asking from a general perspective before you ask more specific questions.

Example: On questioning the registration process, questions like - "How many registration counters are usually manned?"; "What is the routine process of registering a patient?"; "Was there anything different with that particular patient on that day?"; "What prevented you from following the usual process that day?" are useful.

Throughout the interview, allow the interviewee sufficient time to answer your questions. Be attentive and avoid interrupting him. Keep the conversation focused on processes, not individuals. Take note of non-verbal cues (e.g. body position and hand signals) and any underlying feelings of the interviewee.

Closing the Interview

To conclude the interview, check that the team has obtained all necessary information and summarise the main points to ensure that the information is accurate. Advise the interviewee on what will happen after the interview and whether a subsequent session is required. Ask if he has any questions or concerns, express appreciation for his time, honesty and assistance, and invite him to contact the team with additional information, if necessary.

Understanding the Process

Establishing the Sequence of Events

A clear understanding of "What Actually Happened?" is important in RCA. As U.S. philosopher John Dewey once said, "a problem well-defined is a problem half-solved". It will be easier to solve a problem if we take the time to fully understand the nature of the problem.

Once the information surrounding the event has been collected, the team establishes the series of events as accurately as possible. This is critical in identifying what caused the event and what can be done to prevent recurrence. A Time-Person chart may provide a picture of what different people are doing at specific timings, especially if multiple persons are involved in an incident.

A chronological flowchart is usually used to depict the sequence of events graphically.

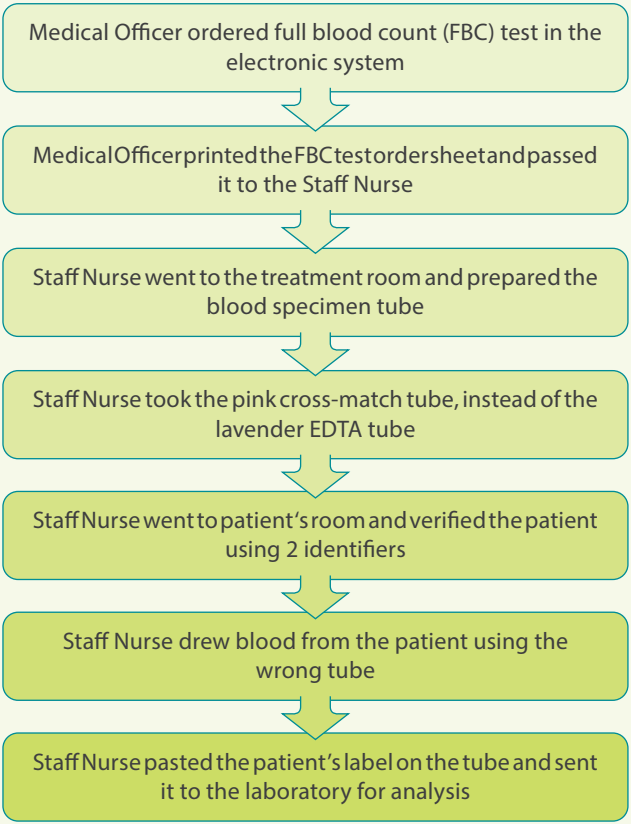
Flowchart

A flowchart describes the sequence of steps in a specific clinical, administrative, or operational process. It helps the RCA team to investigate the problem, understand complex processes, and identify process gaps and opportunities for improvement. The use of a flowchart also provides team members with a common understanding of what occurred and helps to avoid differing interpretations.

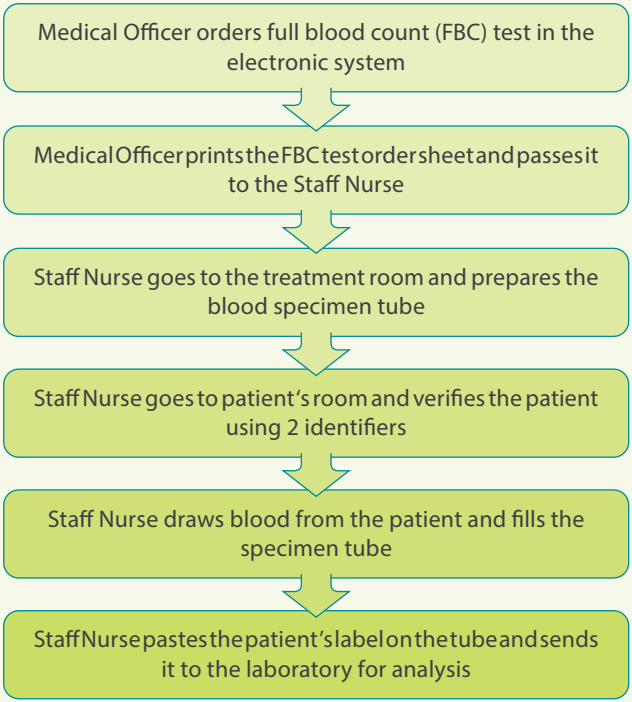
Steps in Developing a Flowchart:

1) Determine the start point and end point of the process.
2) List all activities sequentially or chronologically, ensuring that each of these derives directly and logically from the preceding one.
3) Identify the persons (or functional roles) performing the activities.
4) Connect all process steps with arrows to establish the process flow.

Note that the flowchart should describe the facts of "what actually happened", and not "what should be happening as per policy".



Example of a Chronological Flowchart for an incident



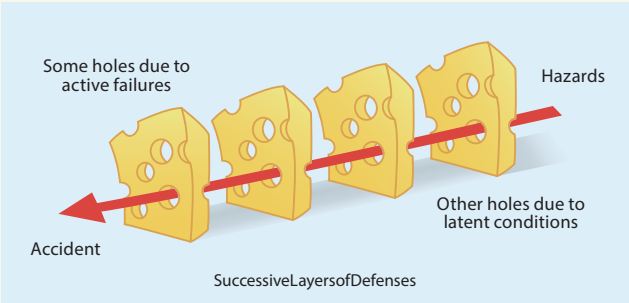
Example of a Flowchart for a process

Determining the Cause and Effect

The Swiss Cheese Model

James Reason's Swiss Cheese Model illustrates how accidents occur due to a complex chain of contributory events. Some contributory events are hazards that pre-exist in normal working conditions, while others are unsafe acts committed by individuals. Each layer of defence can prevent hazards from resulting in failures. However, each defence layer has its own limitations.

An accident occurs when an individual commits an unsafe act and all defence layers fail to control the hazards due to their limitations. Understanding the failure points in our processes and the contributory events to these failures is crucial in the prevention of incident recurrence and improvement of existing processes.



(Source: Reason, J. 1997. *Managing the risks of organizational accidents*. Hampshire, England: Ashgate Publishing Ltd.)

Why is "Human Error" Not an Acceptable Root Cause?

While it may be true that a human error was involved in an adverse event, the very occurrence of a human error implies that it can happen again.

Human error is inevitable. If a well-intentioned, well-trained healthcare provider working in a typical work environment makes an error, chances are there are system factors that caused the error. It is critical that we gain an understanding of those system factors so that we can find ways to remove them or mitigate their effects.

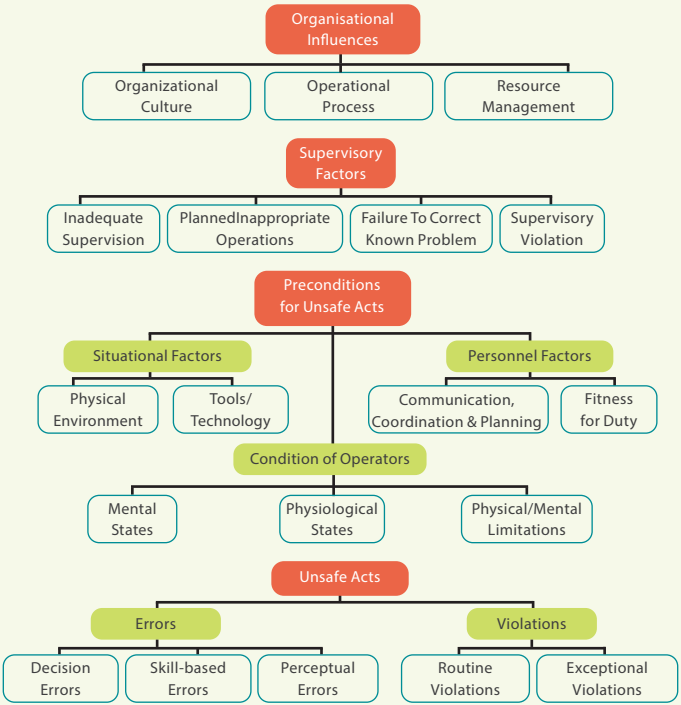
When the healthcare provider concerned is disciplined, counseled or retrained, we may reduce the likelihood that the event will recur with that provider, but we do not address the probability that the event will occur with other providers in similar circumstances. Wider training is also not an effective solution; there is always turnover and a high-profile event today may be forgotten in the future.

Solutions that address human error directly (such as remediation, training, and implementation of policies) are weak solutions. Solutions that address the system (such as physical plant or device changes and process changes) are stronger solutions. This is why it is essential to understand the system factors facilitating human error and to develop system solutions.

(Adapted from: National Patient Safety Foundation (NPSF). 2015. *RCA²: Improving Root Cause Analyses and Actions to Prevent Harm.* Boston, MA: National Patient Safety Foundation.)

Human Factors Analysis and Classification System (HFACS)

Citing human error as a root cause oversimplifies complex issues. The HFACS framework is a tool used to analyse and categorise human error, focusing on underlying systemic and organisational contributors to incidents.



(Source: *The HFACS Framework*. 2014. https//www.hfacs.com/hfacs-framework.html)

Cause and Effect Analysis

Understanding the relationship between the effect and root causes of the incident is vital in formulating effective solutions that prevent recurrence.

All incidents or problems have a direct (or proximate) cause, which is the condition that directly resulted in the incident. When looking at the "chain of causation", RCA teams often mistake direct or intermediate causes for a root cause. Avoid the tendency to conclude the analysis prematurely and take action before the root causes have been identified. By solely targeting the direct or intermediate causes, the team will not be able to adequately address the problem. While some short-term improvement may be observed, this will not prevent the problem from recurring.

Direct Cause	Cause that leads directly to the Effect
Intermediate Cause	Cause that results in Direct Cause
Root Cause	Initiating Cause (origin) of a casual chain that leads to the Effect

(Source: Wilson, Paul F., Dell, Larry D., Anderson, Gaylor F. 1993. *Root Cause Analysis: A Tool for Total Quality Management.* Milwaukee, Wisconsin: ASQC Quality Press.)

Avoiding Hindsight Bias and Outcome Bias

Knowing the eventual outcome of an event can influence how the RCA team views activities leading up to the event. This is known as "hindsight bias" and it makes the accident trajectory look as though it should have been foreseeable or predictable, even though this is not the case.

"Outcvome bias" is the tendency to judge a decision or action by its success or failure, instead of evaluating it based on what was known at that point in time. When analysing failures, RCA teams should be aware of, and try to avoid both types of biases.

Examining Multiple Contributory Factors and Root Causes

Given that there are many contributory factors to adverse events or near misses, the RCA team should strive to identify multiple factors and not stop the analysis when only a single factor is found. Tools such as "5 Whys" and "Ishikawa Diagram" may be useful in identifying contributory factors and root causes, but their use is not mandatory.

The National Patient Safety Agency's Contributory Factors Classification Framework provides a systematic approach in assisting RCA teams in figuring out what happened and why. They reveal vulnerabilities in work processes and systems, and are useful to consider for any event or near miss, even though they may not be applicable to every situation.

Individual (Staff) Factors	Team Factors	Patient Factors
• Physical issues • Psychological issues • Social domestic issues • Personality issues • Cognitive factors	• Role congruence • Leadership • Support and cultural factors	• Clinical condition • Physical factors • Social factors • Mental/ Psychological factors • Interpersonal relationships

Communication Factors	Task Factors	Education and Training Factors
• Verbal communication • Written communication • Non-verbal communication • Communication management	• Guidelines, policies, and procedures •Decision-making aids • Procedural or task design	• Competence • Supervision • Availability/ Accessibility • Appropriateness

Organisational and Strategic Factors	Work Environment Factors	Equipment Factors
• Organisational structure • Priorities • Externally-imported risks • Safety culture	• Administrative factors • Design of physical environment • Environment • Staffing • Workload and hours of work • Time	• Displays • Integrity • Positioning • Usability

(Source: NHS National Patient Safety Agency - National Reporting and Learning Service *RCA Investigation Resources*)

5 Whys

5 Whys is a simple tool used to identify the root causes of a problem (or undesirable effect), so that effective solutions can be formulated to prevent recurrence. By asking "Why?" repeatedly, we can arrive at the origin of the problem and unravel the root causes and their relation to the problem observed.

How do we use the 5 Whys?

1) Write down the problem.
2) Ask why it occurs.
3) Continue to ask "Why?" until the root cause of the problem has been identified.
4) It may take fewer or more than five "Whys" to reach the root cause.

There may be more than one root cause to the problem or issue at hand. It is also common to find the same root cause for two or more contributing factors.

If you are unsure of whether you have identified a root cause, consider these questions below:

- Will the event have occurred if this cause had not been present?
- Will the problem recur due to the same contributory factors if this cause is corrected or eliminated?

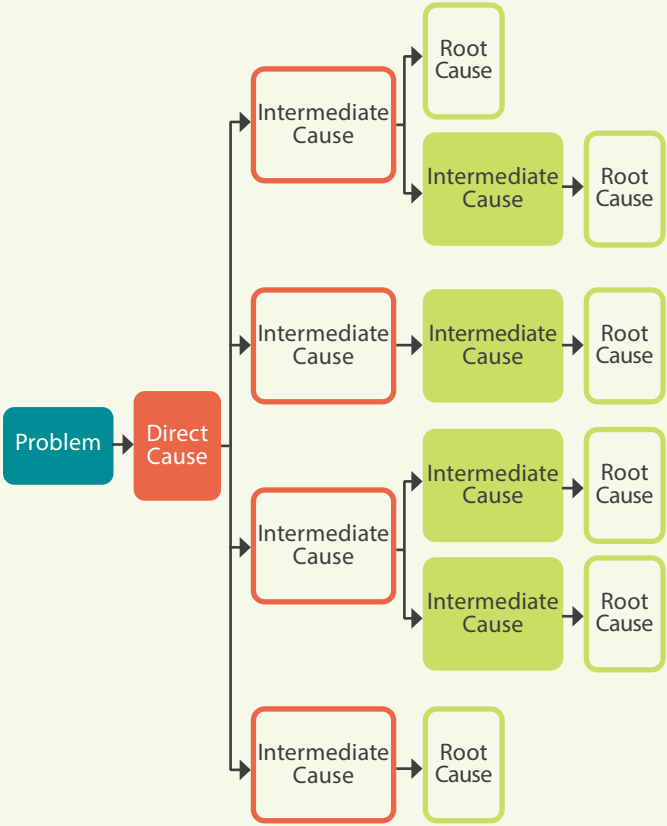
Causal Tree Diagram

The Causal Tree Diagram is another tool that can be used to establish the cause and effect relationship.

How do we use the Causal Tree Diagram?

1) Write down the problem on the left side of the diagram.
2) List the direct and intermediate causes as branches to the right of the problem and connect them using arrows.
3) Repeat this until each branch reaches its logical end (i.e. when the root causes have been identified).

An example of the Causal Tree Diagram can be found on the next page.


Problem
Direct Cause
Intermediate Cause
Root Cause
Intermediate Cause
Root Cause
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Effective Solutions

Effective Solutions

Overview of Error Reduction

Healthcare systems and processes are highly complex and human-dependent in nature. Hence, it is important to implement system-level error reduction strategies to address the root causes of errors and prevent their recurrence.

In designing for safety, we should adopt a systems approach to error reduction instead of focus on blaming individuals. We must recognise that errors will occur and therefore seek to reduce their frequency of occurrence. If this is not possible, we have to build safety mechanisms into our systems to improve the detection of errors and seek to mitigate harm if these errors reach the patient.

Rank Order of Error Reduction Strategies
Eliminate opportunity for errors
Increase difficulty in committing errors
Increase ease of doing the right things
Increase visibility of errors when they occur
Mitigate harm when errors reach patients
Implement policies, inspection, and training programs

Developing Recommended Solutions

The time taken to do RCA would have been well-spent if effective and practical solutions are found for the root cause(s) identified." Effective and sustainable solutions are essential components of RCA. Many RCAs fail to address the identified root causes adequately due to the lack of effectiveness, feasibility, and practicality.

	Environment	Task	Technology
Description	How can the *physical environment* be modified to reduce risk or improve performance?	How can the task or activity can be redesigned to reduce risk or improve performance?	How can the *tools, equipment or technology* be modified to reduce risk or improve performance?
Considerations	Room/space dimensions, lighting, noise level, temperature, organisation, cleanliness, physical layout, architecture, better flow, clutter	Memory aids, checklist utilisation, re-written procedures, pacing/ reordering of task steps	Warnings/alarms, failsafe mode, automation, reduce task demands, system redundancy, maintenance procedures

Human Factors Intervention Matrix (HFIX)

HFIX is a tool that help teams look for effective solutions from different perspectives. The tool identifies 5 possible areas where solutions can be developed – Environment, Task, Technology, Teamwork and Supervisory. RCA teams can use this tool to brainstorm possible solutions in different areas for a particular root cause identified.

Individual/Team	Supervisory/ Organisational
How can aspects of the *individual or team* be changed to reduce risk or improve performance?	How can the *supervisory or organisational factors* be updated to reduce risk or improve performance?
Recruitment/hiring, training, verbal communication protocols, team briefing/debriefing, clear definition of responsibilities	Improve supervisor's communication with staff, policies be changed to improve safety, leadership's communication of safety, safety culture

Hierarchy of Actions

Solutions can be categorised into stronger, intermediate, and weaker actions based on the likelihood that they will result in the desired effect. The strengths of these actions are based on principles of human factors and reliability. Stronger actions take into account the limitations of human behaviour and the interaction between people, systems, tools, tasks, and the environment through the use of design.

Consider reviewing previous RCAs (if available) to understand what had been implemented to address similar root causes. This would help the team to reflect on the reasons for recurrence.

	Characteristics	Action Category
Stronger Action	• Removes human error and variation through technology and/or design • Eliminates the chance of choosing the wrong option • Designed for the system to operate without additional issues or concerns for the person • Can be replicated successfully under any circumstance or by a different person • Requires minimal supervision or measurement of compliance	• Architectural or physical plant changes • Usability testing of new devices before purchase • Engineering controls (forcing functions) • Simplify process • Standardise equipment or process (wherever applicable) • Tangible involvement by leadership

	Characteristics	Action Category
Intermediate Action	• Reduces reliance on the person to remember to do the right thing • Does not fully remove human error and / or variation • Helps the person remember the process or promote clear communication	• Redundancy • Increase in staffing or decrease in workload • Software enhancements, modifications • Eliminate or reduce distractions • Checklists and cognitive aids • Eliminate look-alikes and sound-alikes • Standardised communication tools (e.g. "Read back") • Enhanced documentation or communication
Weaker Action	• Supports the process but relies solely on the person • Does not necessarily prevent the cause or event from occurring	• Double checks • Warnings and reminder labels • New procedure, policy, memorandum • Training and education • Additional study or analysis

(Adapted from: VA National Center for Patient Safety. *Root Cause Analysis Tools*.)

Prioritising Recommended Solutions

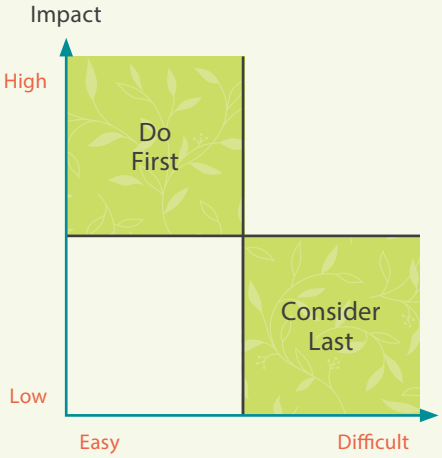
To evaluate recommended solutions, consider the feasibility, likelihood of success, costs, downsides (including possible unintended consequences), implementation time, acceptability to staff, patients and other stakeholders, and barriers to implementation associated with each of them.

Organisation Processes
How does the proposed action affect other areas and processes?
What process-related changes might be required?
Can the affected areas absorb the changes and additional responsibilities?

Resources
What financial resources will be required to implement the action?
What other resources (e.g. manpower, time) are required for successful implementation and sustained effectiveness?
How will these resources be obtained?

Schedule
When can implementation be completed?
How will implementation of this action affect other schedules? How can this be handled?

Prioritise solutions based on expected impact and ease of implementation. To ensure that solutions are realistic, accepted, and owned, it is important that frontline staff and those with appropriate local knowledge are involved in, or consulted on this process.



Feasibility, Acceptability, Cost, Effectiveness and Sustainability (F.A.C.E.S)

F.A.C.E.S is another tool that can be used to assess and prioritise solutions proposed. This requires users to rank (from 1 to 5) solutions from 5 different perspectives – Feasibility, Acceptability,

Criterion	Low 1	2
Feasibility Can the change be implemented relatively easily or quickly?	The intervention does not exist today nor is it likely to become available in the near future; it is highly impractical and not suitable for your organization.	
Acceptability Will those being impacted by the intervention readily accept the change?	The intervention will not be tolerated by those it impacts. People are likely to consistently resist the change and attempt to work around the change.	
Cost/Benefit Does the benefit of the intervention outweigh the costs?	The cost of the intervention is exorbitant relative to its minimal expected impact on safety and performance.	
Effectiveness How effective will the invention be at eliminating the problem or reduces its consequences?	The intervention will not directly eliminate the problem or hazard and it relies heavily on willful compliance with the change and/or requires humans to remember to perform the task correctly.	
Sustainability How well will the intervention last over time?	The impact of the intervention will diminish rapidly after it is deployed and/or will require extraordinary effort to keep it working.	

(Source: Reason, J. 1997. *Managing the risks of organizational accidents*. Hampshire, England: Ashgate Publishing Ltd.)

Cost, Effectiveness and Sustainability. A higher total score indicates a better solution. Scores of "2" and "4" are used when a solution falls in between the descriptors.

Medium		High	
2	3	4	5
The intervention exists but is not readily available or will require modifications to better fit the context in which it is intended to be used.			The intervention is readily available and could be implemented in a relatively short period of time without much effort.
The intervention will be tolerated by those it impacts. There may be moderate resistance but attempts to undermine the change will not be wide spread.			The intervention will be readily accepted by those it impacts. People are likely to welcome the change and make every attempt to ensure it works.
The intervention is moderately expensive but cost could be justified by its expected benefit. Return on investment (benefits) is relatively equal to cost.			The cost of the intervention is nominal relative the expected impact on safety and performance.
The intervention reduces the likelihood of the problem or hazard occurring but relies in part on the human memory and/or willful compliance with the change.			The intervention will very likely eliminate the problem or hazard and it does not rely on willful compliance with the change or require humans to remember to perform the task correctly.
The benefits of the intervention may have a tendency to slowly dissipate over time and will require moderate efforts to maintain its benefits.			The impact of the intervention will persist over time with minimal efforts being required to maintain its benefits.

Developing An Action Plan

A well-defined action plan sets out how recommended solutions will be implemented, with designated leads responsible for each action, all within a certain time frame. These are the components specified in an action plan:

- Recommended solutions to be implemented
- Process owners in charge of implementation
- Proposed time frame for completion
- Actual implementation date
- Tracking and review of results

The individual responsible for each action should have the authority and the resources to implement the action. Assigning the responsibility to multiple individuals can dilute accountability and undermine the probability of successful implementation.

Note that the formulation of action plans may sometimes require other stakeholders (outside of the RCA team) to be involved, including those with budgetary responsibility and an understanding of competing priorities (i.e. supervisors and managers).

The key to establishing a successful RCA process lies in leadership support. Hence, action plans and RCA findings should be shared with the relevant management teams for consideration and concurrence. Keep senior leaders informed on a regular basis on the progress of the RCA, as this is critical to the implementation of its recommended solutions.

Root Cause	Recommended Acions	Process Owner	Target Date for Implementation	Resources Required	Completion Date	Measures of Effectiveness

Example of an Action Plan

Measuring the Effectiveness of Solutions

Quantitative measurement is essential in evaluating the effectiveness of the implemented solutions addressing the root causes and preventing recurrence of the incident. Sufficient data should be collected to measure the effectiveness of the solutions.

Ideally, each action identified by the RCA team should have an accompanying measure, which may be either a process or outcome measure. Process measures monitor the implementation of steps in a process, while outcome measures track the results and effectiveness of the action. Another type of measure known as a balance measure helps to detect any adverse or unwarranted effect arising from the implementation of the action.

Closing the Feedback Loop

It is essential that staff, patients, and their families involved in the event be provided with feedback on the findings of the RCA investigation.

Many organisations do not provide timely feedback to these individuals. When the feedback loop is broken, the staff and patients involved may come to the conclusion that the event was either ignored or that no action was taken. This lack of feedback can negatively impact future involvement of staff, if they believe their efforts to effect change are futile.

As far as possible, the lessons learned from the RCA should be shared openly within the organisation. This helps to create a

Summary

Root Cause Analysis (RCA) is a valuable tool that helps organisations identify what, how and why something happened, so as to prevent recurrence. It helps us learn from past performance and develop strategies to improve reliability, safety, and quality.

An organisation must identify the underlying key root causes for a particular problem so that it can develop a set of interventions targeted specifically at those root causes. The RCA process involves data collection, documentation of causes, root causes identification, and recommendation generation and implementation.

What Constitutes a Thorough and Credible RCA?

Some of the common problems with RCAs include incomplete investigations, ineffective corrective actions, failure to follow through on action implementation, and lack of evaluation to assess the outcomes. A checklist to help you determine if your RCA is thorough and credible is located on the next page.

A Thorough RCA:	A Credible RCA:
• Identifies contributory factors directly associated with the event or near miss	• Is initiated and completed in a timely manner after the identification of an adverse event
• Analyses related systems or processes	• Receives support from leaders of the institution
• Identifies underlying system-related causes through a series of "why?" questions	• Involves people most closely involved with the systems and processes under review
• Arrives at potential improvements in systems or processes to decrease the likelihood of such events in the future	• Presents findings that are consistent (i.e. not contradictory or leave obvious questions unanswered)
• Outlines a plan to address opportunities to improve systems or processes	• Presents conclusions that all team members endorse
• Explains (i) who will carry out the plan, (ii) when that person(s) will carry out that plan, and (iii) the methods for measuring effectiveness	• Considers relevant literature

(Adapted from: JCAHO (Joint Commission on Accreditation of Healthcare Organizations). 2005. *Root Cause Analysis in Health Care: Tools and Techniques.* 3rd Ed. Oakbrook Terrace, IL: JCAHO.)

Conclusion

Despite remarkable advances in medicine, the occurrence of errors persists. Many, if not most adverse events, are the result of inherent system and process problems. These problems cause failures to occur, harm to individuals, or hinder the achievement of goals for a process.

Adverse events are almost never caused by the failure of a single element in the healthcare system. Often, there are multiple underlying latent failures that lead to the incident, many of which can be identified using Root Cause Analysis (RCA). This process of uncovering root causes is critical; implementing strategies targeted at the root causes is the best way to prevent similar problems from recurring. It is about redesigning systems and processes to make them more reliable and resistant to human error.

At NHG, we will continue to embrace the use of RCA to investigate problems and improve quality and safety. This helps us in our effort to build a culture of safety and improvement.

Useful Resources

Joint Commission on Accreditation of Healthcare Organizations (JCAHO). 2005. *Root Cause Analysis in Health Care: Tools and Techniques.* 3rd Ed. Oakbrook Terrace, IL: JCAHO.

National Patient Safety Foundation (NPSF). 2015. *RCA²: Improving Root Cause Analyses and Actions to Prevent Harm.* Boston, MA: National Patient Safety Foundation.

NHS National Patient Safety Agency - National Reporting and Learning Service *RCA Investigation Resources* http://www.nrls.npsa.nhs.uk/resources/collections/root-cause-analysis/

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VA National Center for Patient Safety. *Root Cause Analysis Tools.* (Rev 02.26.2015)

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