Root Cause Analysis (RCA)

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Learning Objectives - RCA

• To understand the basics of Root Cause Analysis (RCA)
• To learn about the techniques to implement RCA
• To be able to analyze the causes and contributing factors for an incident
Outline - RCA

• Definitions
• Description & Tenet / Overview
• Background
• Conducting an RCA
• Example
Operational Definitions - RCA

- **Sentinel event** – an unexpected occurrence involving death or serious physical or psychological injury, or risk thereof.

- **Error** – failure to complete a planned action as intended or the use of an incorrect plan of action to achieve a given aim.

- **Near miss** – an event or situation that could have resulted in an accident, injury or illness but did not either by chance or through timely intervention. Also known as a close call, good catch or near hit.
Operational Definitions - RCA

- **Safety Culture** – the shared commitment of leadership, management and employees to ensure the safety of the work environment [for staff and patients]

- **Active error** – error that occurs at the point of human interface with a complex system

- **Latent error** – errors due to failures of system design
Root Cause Analysis (RCA)

- Retrospective analysis
- Serious, adverse events (and near misses) with rare occurrences
- Identify underlying problems that increase likelihood errors
- RCA is a “systems analysis”
  - Examine relationships between different layers & other aspects of systems design
- Impartial analysis (Culture of Safety)
Three Levels of Root Cause

- Physical Roots
  - Symptoms
- Human Roots
  - Inappropriate Human intervention
- Latent Roots
  - Deficiencies in Process

Causes from all of these areas are important in RCA

Failure of Analysis

“Witch Hunting”

RCA

Background - RCA

- Originated in engineering (1960s)
  - Rare error events (e.g., industrial, airline accidents)
- Industrial psychology & human factors engineering

<table>
<thead>
<tr>
<th>RCA Approaches (“Schools”)</th>
<th>Field(s) or Scope</th>
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<tbody>
<tr>
<td>Production-based</td>
<td>Manufacturing</td>
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<tr>
<td>Process-based</td>
<td>Expanded to include business processes</td>
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<tr>
<td>Failure-based</td>
<td>Engineering Maintenance</td>
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<tr>
<td>Safety-based</td>
<td>Accident analysis Occupational Safety &amp; Health</td>
</tr>
<tr>
<td>Systems-based</td>
<td>Amalgamation - adds in change management, risk management &amp; systems analysis</td>
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</tbody>
</table>
Background - RCA

• Healthcare
  – TJC sentinel event standards 1999
    • RCA and corrective action plan is expected
    • Encourage but not require self-reporting
  – U.S. Department of Veterans Affairs (VA) Administration National Center for Patient Safety (NCPS) (est. 1999)
    • RCA process required for VA radiotherapy medical events; findings shared as “lessons”
RCA Overview

1. Collect information (What happened?)
2. Identify causes (Why it happened?)
3. Recommendations for remediation
4. Implement and Monitor
We can’t solve problems by using the same kind of thinking we used when we created them.
RCA Step 1: What happened?

- Focus on “what” rather than “why”
  - A narrative can be helpful

- Helpful tools
  - Process Mapping
  - Ask questions and listen
  - Let the interviewee ‘connect the dots’
RCA Step 2: Why it happened?

• Identify causes
  – Focus on the “whys”

• Helpful tools
  – Brainstorming
  – 5-Whys: force and in-depth analysis
  – Cause & Effect (Fishbone) Diagram
Brainstorming

- A method for a group of people to generate a large number of ideas in a short period of time
- Designate a note taker & moderator (separate people)
- Start with a statement of the problem
- No bad ideas, all ideas recorded
  - Criticizing or discussing the ideas is not allowed
The 5 Whys

• Simple procedure of asking ‘why’ 4 or 5 times as to the cause of an error or near-miss to force an in-depth analysis

• At each successive ‘why’ question, the group probes deeper

• Results are recorded for use in the RCA
Cause & Effect Diagram

aka: Ishikawa or Fishbone Diagram
RCA Step 3: Recommendations

• Requires domain experts

• Low cost, high impact
  • Focus on sphere of influence
  • Cost-benefit analysis

• Examples
  – Checklists
  – No interruption zone
  – Time out
  – Intuition
RCA Step 4: Implement & Monitoring

- Monitoring System
  - National reporting system: RO-ILS
  - Department reporting system

- For a RCA to be useful it has to encompass:
  - Corrective Actions
  - Learning
  - Follow-up
When to conduct an RCA

- Any single obviously serious event
  - Federal or state level investigation
  - Institutional level investigation
  - Departmental level investigation

- Systematic events
  - Equipment failure, process failure, etc.

- High frequency sporadic events
  - Human error, etc.
Other Analysis Techniques

• Re-enactment (people, computer simulation)
• Re-construction (reassemble debris for clues)
• Barrier analysis (process industries)
• Bayesian inference
Other Analysis Techniques

• Failure mode and effects analysis (FMEA)
• Fault tree analysis (FTA)
• Why-because analysis
• Pareto analysis (“80/20 rule”)
• RPR Problem Diagnosis (IT)
RCA – Key to Success

• Leadership & involved persons participation
• Internally consistent
• Consider relevant literature, experience
• Investigate soon after incident
RCA Systems

- **US RCA Approach**
  - U.S. Department of Veterans Affairs (VA) National Center for Patient Safety (NCPS)

- **UK RCA Approach**

- **Canadian RCA Approach**
  [http://www.patientsafetyinstitute.ca/English/toolsResources/IncidentAnalysis/Pages/Tools.aspx](http://www.patientsafetyinstitute.ca/English/toolsResources/IncidentAnalysis/Pages/Tools.aspx)
Example - Event Reported

**Location:** Awesome Studio
**Sub Location:** Studio A

**Event Type:** Incident

**Narrative:** (Briefly describe the event that occurred or the unsafe condition, 4000 character limit)

Chipmunks were out of control and injured

Reporter’s Role: Agent

This data is being collected in a patient safety evaluation system to improve patient safety, healthcare quality and/or healthcare outcomes and for reporting to a Patient Safety Organization. This data is privileged and confidential under the protections afforded by the Patient Safety and Quality Improvement Act of 2005 (Pub. L. 109-155, Title X, Subtitle B, Part III).
What Happened

https://www.youtube.com/watch?v=CvflNIM87il

Incident Learning Systems and Root Cause Analysis for Safer Radiation Oncology: A Hands-On Workshop
RCA Step 1: What happened?

• Narrative
  • In the recording studio, the chipmunks were tired so they couldn’t sing
  • Manager decided to give them coffee
  • Manager brought the large coffee with caramel and whip cream.
  • Chipmunks finished the coffee
  • Chipmunks were out of control and injured after drinking coffee
RCA Step 1: What happened?

- Process Map

1. Chipmunks were tired with cont recording
2. Manager decided to give them coffee
3. Manager brought coffee
4. Chipmunks finished coffee
5. Chipmunks were out of control and injured

Incident
RCA Step 2: Why it happened?

• The 5 Whys

Q1. **Why** were the Chipmunks out of control and injured?
   A1. They drank coffee

Q2. **Why** did they drink coffee?
   A2. The manager asked them to

Q3. **Why** did the manager ask them to drink coffee?
   A3. So they could keep recording

Q4. **Why** did they need to keep recording?
   A4. They only had the studio for one more hour
Cause & Effect Diagram

Manager asked

Limited record time

To keep recording

Drank coffee

LOVE coffee

Kids love sweet stuff

Studio singing

Chipmunk injured

aka: Ishikawa or Fishbone Diagram
RCA Step 2: Why it happened?

• The 5 Whys

Q1. Why were the Chipmunks out of control and injured?
   A1. They didn’t have the proper focus

Q2. Why didn’t they focus?
   A2. They like to play

Q3. Why do they like to play?
   A3. They are chipmunks and that’s what they do
Cause & Effect Diagram

aka: Ishikawa or Fishbone Diagram
RCA Step 3: Recommendations

- Don’t record chipmunks any longer
- Don’t give chipmunks coffee
  - What if chipmunks LOVE coffee?
- Recommend a new manager that better understands chipmunks – not ideal (no direct control, only a recommendation (weak))
- Work in padded recording studio
- Make sure there is enough recording time for breaks
- Order small coffee / decaf only?
- Make sure chipmunks play before recording
RCA Step 4: Implement & Monitoring

- Choose and always use the proper size cup for Chipmunks
- Give play time before recording
- Keep tracking record time and break time
1. Which statement is true for the RCA?

| 20% | 1. It is a prospective analysis |
| 20% | 2. It is systems analysis       |
| 20% | 3. It focuses on high occurrence events |
| 20% | 4. It determines incident severity |
| 20% | 5. It identifies potential failure modes |

Answer: 2. It is systems analysis

Ref: Towards Safer Radiotherapy, BIR/IPEM/NPSA/SCR/RCR, The Royal College of Radiologists, 2008
2. Which technique is not used for RCA?

20% 1. Cause & Effect Diagram
20% 2. Re-construction
20% 3. Barrier Analysis
20% 4. 5 Whys
20% 5. FMEA

Answer: 5. FMEA

Ref: Duke Okes, Root Cause Analysis (The Core of Problem Solving and Corrective Action), ASQ Quality Press, 2009
3. When do we stop asking Why?

**Answer:** 4. After identification of actionable root cause

Ref: Michael L. George, John Maxey, *The Lean Six Sigma Pocket Toolbook*