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Article: Are All Root Cause Analysis (RCA) Approaches Created Equal?

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This Month, The **Peri-FACTS®** Video Channel presents Implementing Electronic Medical Records

ARE ALL ROOT CAUSE ANALYSIS (RCA) APPROACHES CREATED EQUAL?

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Learning Objectives for **Peri-FACTS®** Case #968: Upon completion, the learner will be able to:

- Distinguish between analytical processes and tools for conducting root cause analyses (RCA).
- List the five basic steps to any investigation.
- Compare the results of the 5-Whys Approach, Fishbone Diagram, and Logic Tree when used on the same case study.
- Describe the value of a broad and comprehensive RCA as opposed to using less stringent approaches due to time pressures or meeting minimal regulatory compliance requirements.

INTRODUCTION

A root cause analysis (RCA) is a descriptive phrase used to analyze the steps and results of a process. When applied to an adverse medical event, its purpose is to describe the steps that produced the adverse outcome and to identify correctable individual or systems errors. A more formal definition for RCA is the establishing of logically complete,

evidence-based, tightly coupled chains of factors from the least acceptable consequences to the deepest significant underlying causes.

The Joint Commission has required the application of RCA since the mid-1990s. But are we getting value from our RCA efforts?

A recent study, published in the New England Journal of Medicine, showed that hospital infection rates, medication errors, complications from diagnostic techniques or treatments, and other such "harms" did not change between 2002 and 2007 (Reuters, 2010). Experts estimate that each RCA in a hospital setting requires 20 to 90 person-hours to complete (Wu, 2008). The basic question for the medical field is: Has the risk of recurrence actually been reduced by going through the RCA process? Surprisingly, research indicates that it generally is not known whether risk has been reduced by the RCA process; this is causing concern that some of the considerable resources and efforts expended on RCA are being wasted (Wu, 2008). How can so many well-intentioned individuals spend so many hours doing RCA and a quantifiable benefit not be known? We will explore why regulatory compliance with RCA guidelines is not openly correlating with increased patient safety.

THE MATERNAL DEATH CASE STUDY

Let's apply a few analytical tools to the following case study to contrast their capabilities when used on the same case.

On the morning of July 5, 2006, a 16-year-old patient came to St. Mary's Hospital in Madison, Wisconsin to deliver her baby. During the process of her care, an infusion intended exclusively for the epidural route was connected to the patient's peripheral intravenous (IV) line and infused by pump. Within minutes, the patient experienced cardiovascular collapse. A cesarean section resulted in the delivery of a healthy infant, but the medical team was unable to resuscitate the mother and she died. The medication error and its consequences were devastating for the patient's family, the nurse who made the error, and the medical team that labored to save the patient's life (Pil, 2010). Before applying the various RCA tools to this case, let us first provide some background on the commonly used RCA processes and tools in the marketplace today.

ANALYTICAL PROCESS REVIEW

Many of the tools referred to as root cause analysis tools fall short of the essential elements of RCA. Typical tools in this category are the 5-Whys, the fishbone diagram, and many form-based RCA checklists. Many of these tools came from the quality initiatives in Japan, which flourished in the 1970s and 1980s and remain ingrained in American corporations today.

We refer to these as tools and, just like tools in a toolbox, we must use the right tool for the right project. Therefore, we must have a clear understanding of the scope of the project before deciding which tool is most appropriate. When determining the breadth

and depth of analysis required, we must explore the magnitude and severity of the undesirable event at hand. Let's look at how various processes would be used to do this.

1. Troubleshooting typically is done by individuals rather than teams. This process often is referred to as RCA but falls short of the criteria to qualify as RCA.

2. Brainstorming involves throwing out ideas as to the causes of a particular event. Usually, such sessions are not structured in a manner that explores cause-and-effect relationships. Like troubleshooting, brainstorming also falls short of the criteria to be called RCA.

3. Problem Solving comes closest to meeting the RCA criteria. Problem solving usually is team-based and uses structured tools. Some of these tools may be cause-and-effect based. Problem solving oftentimes falls short of the RCA criteria if it does not require evidence to back up what the team members hypothesize.

4. Root Cause Analysis is the establishment of logically complete, evidence-based, tightly coupled chains of factors that look at the least acceptable consequences and the deepest significant underlying causes of an event (Latino, 2007).

Table 1: Comparison of Analytical Processes to RCA Essential Elements

Analytical Process	Disciplined Data Collection Required?	Typically Team (T) Versus Individual (I) Based	Formal Cause-And-Effect Structure	Requires Validation of Hypotheses Using Evidence	Identification of Physical(P), Human (H) and Latent (L) Root Causes
Troubleshooting	N	I	N	N	P
Brainstorming	N	T	N	N	P or H
Problem Solving	N	T	N	N	P or H
Root Cause Analysis	Y	T	Y	Y	P, H & L

STEPS OF A BASIC INVESTIGATION PROCESS

The following are the essential elements (Latino, 2005) of any investigative occupation and, therefore, a root cause analysis process as well:

1. Identification of the underlying problem to be analyzed.
2. Identification of the cause-and-effect relationships that contributed to the undesirable outcome.
3. Disciplined data collection and preservation of evidence to support cause-and-effect relationships.

4. Identification of all physical, human, and latent root causes associated with undesirable outcome.
5. Development of corrective actions/countermeasures to prevent same and similar problems in the future.
6. Effective communication to others in the organization of lessons learned from analysis conclusions.

ANALYTICAL TOOLS REVIEW

Analytical tools are only as good as their users. Used properly, any of these tools can be used to produce useful results. However, some of these tools are used simply because they are quick to produce a result, require few resources, and are inexpensive to use. They often may lack the breadth and depth necessary to meet the needs of RCA.

5-WHYS

The 5-Whys is a method created by the Japanese to drill down to reach the bedrock of an issue—the root cause. While there are varying forms of this approach, the most common understanding is to ask the question "WHY?" five times to uncover *the* root cause. Ultimately, the responder reaches a point beyond which, on that single issue, there is no more information.

The form looks as follows:

> Latent root causes:
>
> **Question**: Why did that (the event) happen?
> **Responder**: Because. . .
> **Question**: Can you expand that explanation?
> **Responder**: Yes. . .
> **Question**: But why did that happen?
> **Responder**: Because. . .
> **Question**: But then why was that done?
> [Ultimately, the responder cannot drill deeper into the issue].

Note how this approach examines an issue (or event) down to its deepest level, but in doing so narrows the discussion, thus eliminating the possibility that other confounding variables exist.

5-Why Pros:

1. Quick results because usually conducted on a person-to-person basis; a group is not doing the questioning.
2. No financial expense to asking questions.

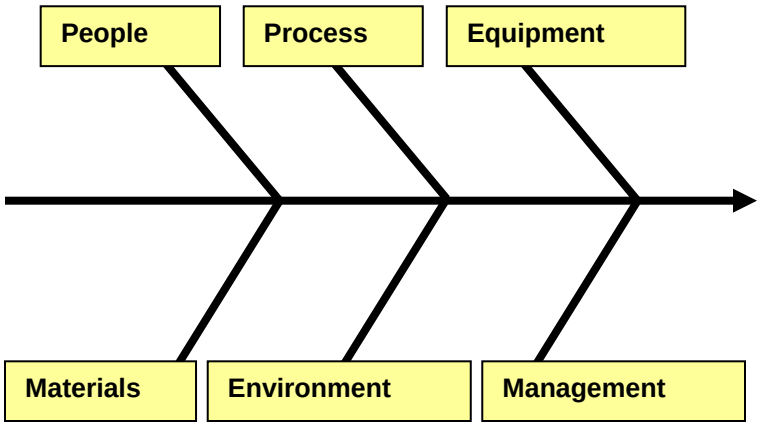
5-Why Cons:

1. Asks “WHY” versus “HOW COULD”–WHY connotes the desire for a singular answer and in the form of an opinion. HOW COULD explores all possibilities and not just the most likely.
2. Assumes there always is a linear path. Does not accommodate errors occurring in parallel and combining to cause a bad outcome.
3. Assumes there is a single root cause and does not encourage the exploration for multiple contributing factors that cause an undesirable outcome.
4. Normally aligned with troubleshooting where it is used by an individual versus a team. While this has its place, it does not encourage other perspectives. (This is the primary difference between asking WHY and HOW COULD).
5. Typically not associated with disciplined collection of evidence to support hypotheses.

THE FISHBONE DIAGRAM

The fishbone diagram is another popular analytical quality tool. This approach gets its name from its form, which is the shape of a fish. The spine of the fish represents the sequence of events leading to the undesirable outcome (the fish head). The fish bones represent categories that should be evaluated as potential contributing factors to the sequence of events. These category sets change from user to user.

Figure 2: The Fishbone Diagram Sample



Fishbone Pros:

1. Team-based approach
2. Explores multiple cause categories for root causes
3. Capable of producing timely results

Fishbone Cons:

1. Categorical approach: If we do not pick the correct categories to explore, we can miss relevant root causes. Does not accurately reflect direct cause-and-effect relationships correlating to undesirable outcomes.
2. Typically relies on brainstorming under each category (fishbone) to generate potential root causes.
3. Oftentimes hearsay is permitted to serve as validation of a hypothesis (fact) as opposed to using concrete evidence.

FORM-BASED RCA

In addition to these most commonly used approaches described above, many simply use standard RCA forms to generate a root cause analysis. This basically is a one-size-fits-all mentality. Checklists often are provided, which give people the false sense that the correct answer must be within the listed items.

No "pick-list" RCA process ever can be comprehensive enough to consider all the possibilities that could exist in each working environment. However, the innate human tendency to follow the path of least resistance makes using pick lists very attractive. As noted author Eli Goldratt says, "An expert is not someone that gives you the answer, it is someone that asks you the right question." That is exactly what RCA is all about.

Figure 3: Form-Based RCA Sample

<table>
<tr><td colspan="2">RELIABILITY GENERAL HOSPITAL</td></tr>
<tr><td colspan="2">Patient Care Assessment Program–Follow-up Form</td></tr>
<tr><td>Incident Report</td><td>Instructions: Please fill in all sections</td></tr>
<tr><td>Patient Name:</td><td>Patient Unit #:</td></tr>
<tr><td>Service:</td><td>Admit Date:</td></tr>
<tr><td colspan="2">Individual(s) consulted during investigation:</td></tr>
<tr><td colspan="2">Description of event:</td></tr>
<tr><td colspan="2">Outcome:</td></tr>
<tr><td colspan="2">Evaluation:
• Likely causes
• Systems errors
• Proposed modifications or corrections, etc.</td></tr>
</table>

IS THERE A BETTER WAY TO CREATE A ROOT CAUSE ANALYSIS?

The ideal RCA produces a logic algorithm as an expression of cause-and-effect relationships that lead to a particular sequence to cause an undesirable outcome to occur. The data leads the analysis, not the loudest expert in the room. The strength of the tool is such that it can, and is, used in court to represent solid cases.

A logic tree starts off with a description of the facts associated with an event. These facts will comprise what is called the top box (the event and the modes). Modes are the manifestations of the failure, and the event is the final consequence that triggered the need for an RCA. The event can be thought of as the *least acceptable consequence of failure*. While we may know what the modes are, we do not know how they were permitted to occur. So we proceed with the questioning of *how could* the mode have occurred?

This is an important point in the analysis because we are seeking to understand why someone thought the decision they made was the correct one. At this point in the analysis, we do switch the questioning to *why* (switch to inductive reasoning) because we are exploring a set of answers particular to an individual or group. These answers are what we call latent root causes or the systems errors in place that led to the bad outcome. The latent roots are the rationale for the decisions that triggered the consequences to occur and, therefore, the *deepest underlying causes*. These are called latent because

There are many definitions and formats for conducting root cause analyses (RCA). The PROACT® RCA Approach is one example where Enterprise Risk Management (ERM) combines medical analysis with today's computer technology and provides synergism for the benefit of patient safety.

Peri-FACTS® has no financial arrangement with the originator of the PROACT® Enterprise Risk Management system.

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Figure 4: The Logic Tree

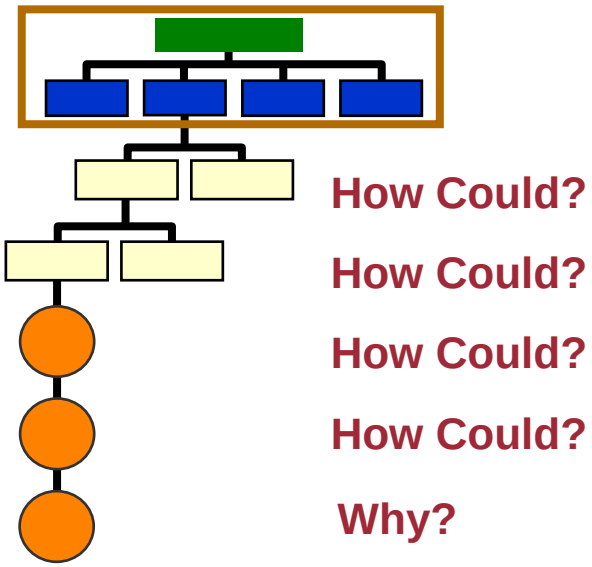
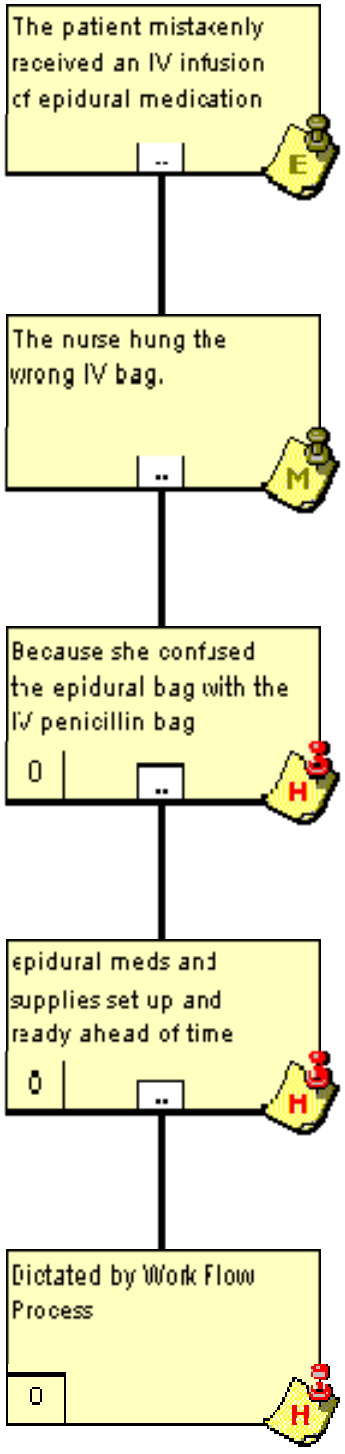


Figure 5: 5-Whys Expressions of Maternal Death RCA
The Patient Died of a Cardiovascular Event

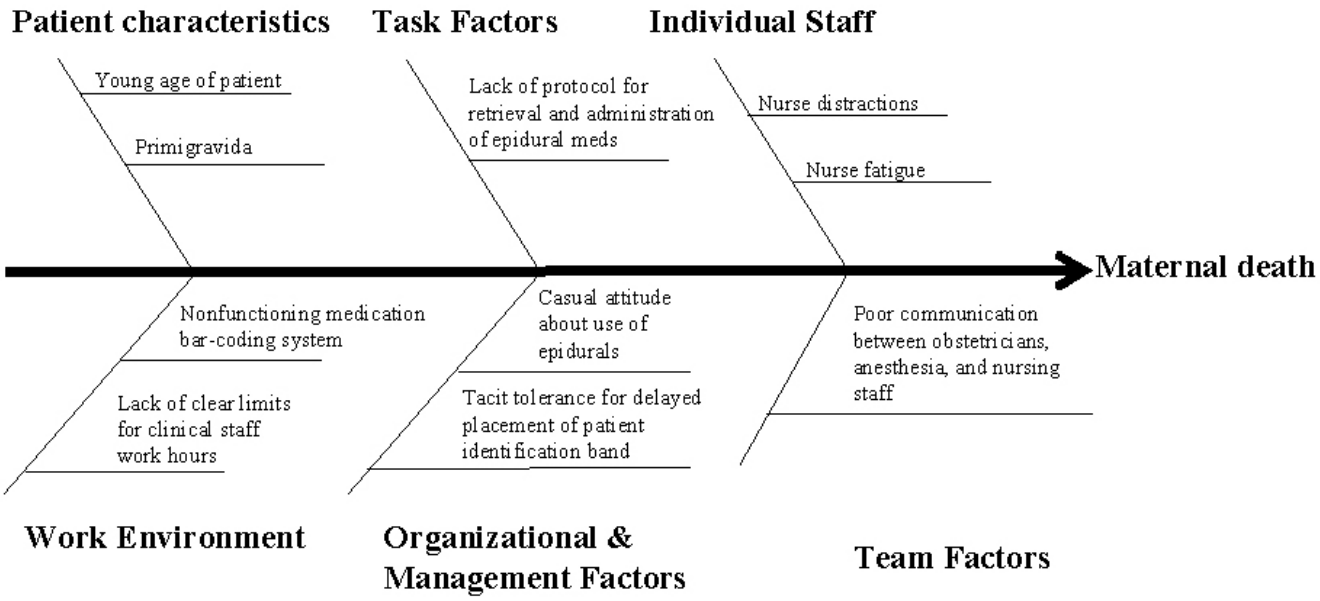


Pil, Tricia (2010). Root Cause Analysis: Turning a needless maternal death into better care for all. http://www.scienceandsensibility.org/?author=83 (Accessed November 18, 2010)

they are always there lying dormant. They require a human action to be triggered and, when triggered, they start a sequence of physical root causes to occur. This error-chain continues, if unbroken, to the point that it results in an undesirable outcome that requires an immediate response.

Now that we have a basic understanding of the RCA processes and tools, let's apply the most popular RCA tools to our case study described earlier.

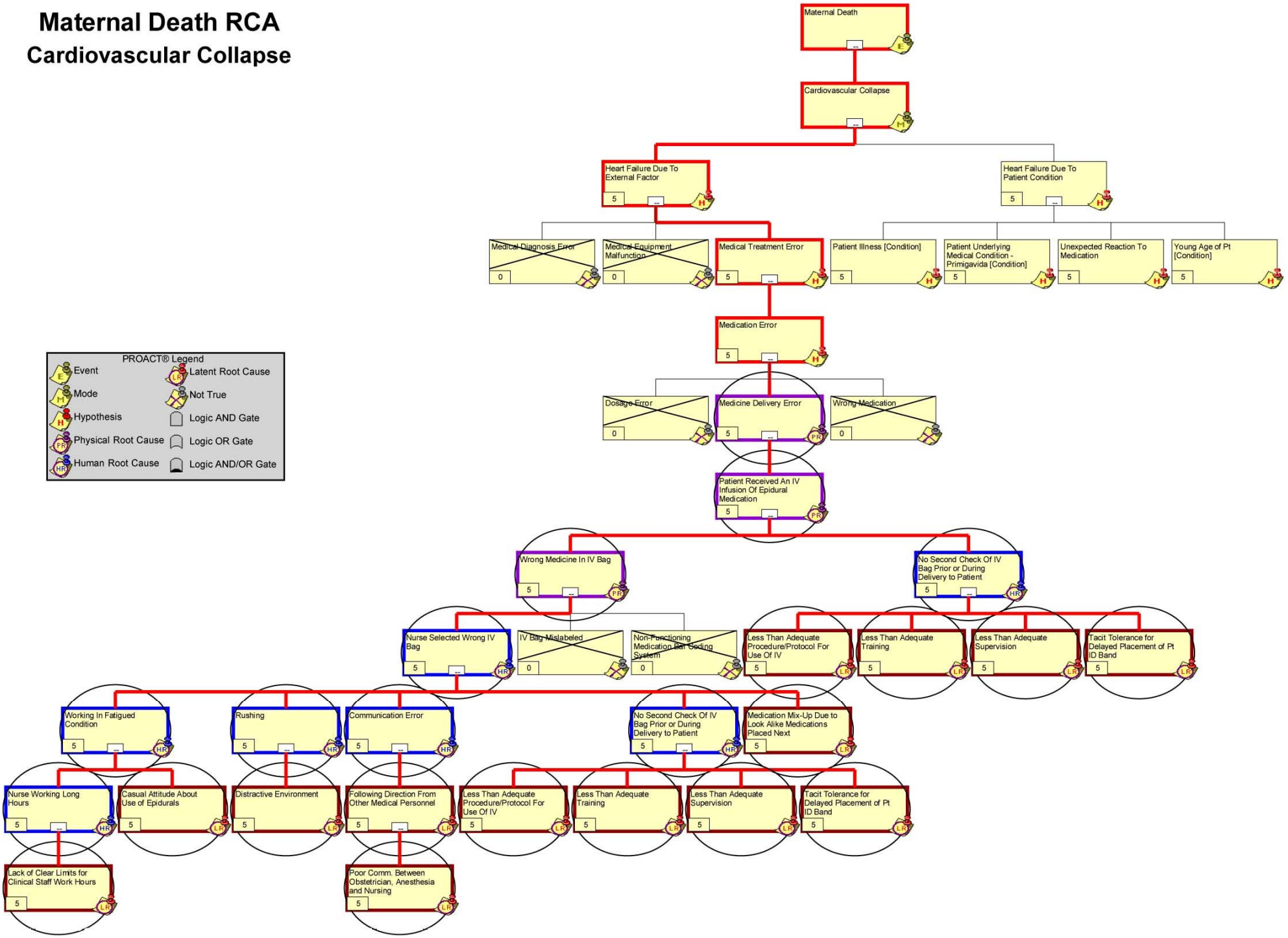
Figure 6: Fishbone Expression of Maternal Death RCA



Pil, Tricia (2010). Root Cause Analysis: Turning a needless maternal death into better care for all. http://www.scienceandsensibility.org/?author=83 (Accessed November 18, 2010)

Maternal Death RCA

Cardiovascular Collapse



Based on the above examples of the various tools applied to the same situation, we could construct a "filter" of what tools would have likely identified which root causes and which tools likely would not pick up other root causes.

Table 2: Comparison of RCA Tool Results

Root Causes Identified	5-Whys	Fishbone	IDEAL RCA
Distracted By Work Flow Process	X	X	X
Young Age of Patient		X	X
Primigravida Condition		X	X
Less than Adequate (LTA) Protocols for Retrieval and Administration of Epidural Medications		X	X
Nurse Distractions		X	X
Nurse Fatigue		X	X
Lack of Clear Limits on Clinical Work Hours		X	X
Casual Attitude About Use of Epidurals		X	X
Tacit Tolerance for Delayed Placement of Patient ID Band		X	X
Poor Communication Between Obstetrician, Anesthesia, and Nursing Staff		X	X
Distractive Work Environment Resulting in Time Pressure Errors		.	X
LTA Training–Prior to IV Bag Delivery			X
LTA Supervision–Prior to IV Bag Delivery			X
LTA Training–During IV Bag Administration			X
LTA Supervision–During IV Bag Administration			X
LTA Procedure/Protocol For Use Of IV			X
Medication Mix-Up. Like Medications Placed Adjacent to Each Other		.	X

CONCLUSION

Buntin published an article entitled *Plague of Errors-Hospital Infection Rates are Rising and Killing 90,000 Patients a Year. Can the States put a Stop to It?* (Buntin, 2005). In this article, the following statement is made regarding the results of a doctor's use of true root cause analysis, "….By drilling down to the root cause(s) of the problem, Shannon's [Dr. Shannon] team managed to identify causes that might otherwise have gone undetected. In the year before Shannon instituted his reforms, 37 patients developed central-line infections, and 51 percent of those died. In the year that followed the implementation of his team's reforms, only six patients developed an infection, and only one of those patients died." This suggests that RCA—when done correctly—saves lives.

A complete RCA attempts to "rewind the video" of the event happening. It is starting with facts and reeling backwards from that point on (just like a detective's investigation). Evidence collected will determine what did and did not occur. The logic tree will drill past the physical and human levels to uncover the systems issues or the latent root causes that influenced decision-making. Without correcting the systems issues, there is a greater likelihood of recurrence of the event somewhere, sometime. By correcting the systems issues, we will correct the undesirable behaviors (decision-making processes) that triggered the adverse events to occur.

RELATED READING

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8. Wu AW, Lipschutz Angela KM, and Pronovost PJ (2008). Effectiveness and Efficiency of Root Cause Analysis in Medicine. Journal of the American Medical Association, (299)6:685-686.

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