

## Root Cause Analysis and Patient Safety Interventions

**Interview:** John Gosbee, M.D.; Human Factors Engineering and Healthcare specialist. National Center for Patient Safety, Department of Veteran Affairs; Ann Arbor, MI

**Introduction:** Dr. Mike Astion conducted this interview with Dr. John Gosbee an international expert on root cause analysis (RCA) to obtain an overview of the topic and some tips for applying this valuable tool. It first appeared in *Laboratory Errors and Patient Safety* (LEPS) in 2005. Root cause analysis is a systematic, detailed method for determining the causes underlying an unwanted event<sup>1,2</sup>. Root causes are identifiable and can usually be eliminated or controlled. The main steps in root cause analysis are:

- Data collection
- Data analysis facilitated by a variety of charting tools
- Development of root cause statements
- Specific recommendations that prevent or reduce the likelihood of recurrence

The Department of Veteran's Affairs through its National Center for Patient Safety (NCPS) has taken a leadership role in the patient safety movement. Many of the concepts and tools discussed in this interview are available through the NCPS web site<sup>3</sup>. LEPS strongly endorses the various tools and publications on this web site, and encourages their application in the clinical laboratory setting.

**LEPS:** In the laboratory, there is large number of potential adverse events. How do you decide what events get a root cause analysis?

**Dr. Gosbee:** In the department of Veteran Affairs, we have a method, called the Safety Assessment Code<sup>4</sup>, for screening events based on the probability of recurrence and the likelihood for patient harm. The events deserving deeper analysis are those that are likely to recur and which have seriously harmed patients, or have a high likelihood of serious harm. Stated another way, if you think you are *vulnerable* to a recurrence of a serious event, that is the type of event you want to analyze. It is useful to think of the screening process as a scoring of vulnerabilities.

**LEPS:** Does the patient outcome matter in determining whether a root cause analysis is performed?

**Dr. Gosbee:** All events involving significant harm deserve a root cause analysis. However, it is important to get beyond the "no harm - no foul" mentality. Our nationwide policy requires that a root cause analysis be performed on any case that is a close call (near miss) and receives the highest score (which is a three) by the Safety Assessment Code. This policy leads to root cause analysis being performed on many "close calls", and this is a sign of a healthy patient safety culture.

**LEPS:** Can you use a laboratory-related close call that reveals a significant vulnerability?

**Dr. Gosbee:** A good example might be specimen mislabels in which one patient's labels are swapped with another. Conceptually, label swaps make you highly vulnerable to an adverse event since lab results from two patients may be exchanged and this has been associated with false diagnosis and incorrect treatment. Therefore, there is no need to

wait for an actual adverse event to perform the root cause analysis of a label swapping incident. It is worth performing the analysis on a near-miss event, even if the label swap you analyze only involved a minor correction to a result.

**LEPS:** Who performs the root cause analysis?

**Dr. Gosbee:** A multidisciplinary team consisting of three to five people usually performs the analysis.

**LEPS:** Do team members need special training?

**Dr. Gosbee:** It requires some training to use some of the tools, such as the charting tools, and to develop effective root cause statements. However, it is not rocket science. Most healthcare workers can be trained to perform a root cause analysis. Many healthcare facilities now have a patient safety or quality improvement officer who can train and then advise employees at the facility. This training provides tools that will help personnel take a more insightful look at errors even when root cause analysis is not performed.

**LEPS:** Do you have any tips for choosing people for the team?

**Dr. Gosbee:** It is useful to choose at least one team member from completely outside the field. For example if you are doing a root cause analysis on a laboratory-related event you might choose a nurse, or the hospital chaplain. Some of my colleagues jokingly state that there should be a 5 year old on every team. The sentiment underlying that remark is that is helpful to have somebody who keeps asking "why", and does not stop at the first layer of inquiry.

**LEPS:** Is it useful to include trainees, for example students or a resident on the analysis team?

**Dr. Gosbee:** This is a good idea for a few reasons. First, you are teaching the trainee about how to approach errors, and how to use root cause analysis. This helps indoctrinate them into a culture of patient safety at a time in their career when they are open to new ideas. In addition, trainees are curious and this forces the team to do a more thorough and thoughtful analysis. Lastly, trainees often spend more time than other practicing physicians using the systems being analyzed, so they have more knowledge and possibly more vested in fixing the brokenness.

**LEPS:** Are there common pitfalls to avoid when choosing an analysis team?

**Dr. Gosbee:** Do not choose the same team every time. It is better to choose mostly new members to the team each time, and allow a great many employees to participate over time. In addition, it is best to view patient safety or quality improvement officers as advisory to the team, rather than as the head of each team.

**LEPS:** Are there some best practices to implement and pitfalls to avoid regarding performing the root cause analysis and implementing subsequent interventions?

**Dr. Gosbee:** Here are three significant principles to consider:

- Balance your effort between performing the root cause analysis and developing and implementing the interventions suggested by the analysis. This includes leaving time and resources to evaluate the effectiveness of the intervention.

Burning up all your energy on the analysis leaves nothing for the intervention, and no gains will be made in patient safety.

- Avoid a shallow root cause analysis that produces low-level interventions like "recommend increased training" or "recommend increased attention to detail". It is probably better not to perform an analysis at all if all it produces is thin interventions. Similarly, within an organization, if root cause analyses tend to produce thin interventions, that organization needs help regarding their approach to errors.
- The root cause analysis team needs buy-in from the top administrators in the organization. Without this support, it is difficult to implement high-level interventions.

**LEPS:** You teach that increased training, increased vigilance, and warning labels are low-level interventions that are rarely effective. Are there guidelines to what interventions are most effective?

**Dr. Gosbee:** The strength of interventions can be a controversial topic. However, in our training materials, we use the following guide to the strength of interventions. This should be taken as a guideline, not as an absolute rule.

- **Weaker Actions**
  - Double checks
  - Memorandum's
  - Policy changes
  - Training
  - Warning labels
- **Intermediate Actions**
  - Checklists
  - Enhanced Communication (e.g., read back of orally communicated results and orders)
  - Matching work volume to staffing:
  - Eliminate look and sound alike
  - Eliminate/reduce distractions:
  - Minor enhancements to software:
- **Stronger Actions**
  - Physical plant changes
  - Major software enhancements:
  - Simplifying processes and removing unnecessary steps.
  - Standardize on equipment or processes
  - New device with usability testing before purchasing.
  - Tangible involvement by leadership in support of patient safety.

**LEPS:** How do you keep high-level interventions from becoming high-level disasters?

**Dr. Gosbee:** That is an important point. High-level interventions can only improve patient safety if they are implemented successfully. Unfortunately, there are many examples where potentially strong interventions are poorly implemented and create more problems than they eliminate. This is why you have to dedicate sufficient time to

develop, implement, measure (and subsequently modify) the intervention. In addition, it is absolutely essential that human factors engineering be the compass for choosing devices, and for designing systems and work areas.

**LEPS:** What is human factors engineering?

**Dr. Gosbee:** In a recent article<sup>5</sup>, I defined it as follows:

"Human factors engineering (HFE) is a discipline concerned with the design of tools, machines, and systems that take into account human capabilities, limitations, and characteristics. The goals are to design for safe, comfortable, and effective human use. Ergonomics, usability engineering, and user-centered design are considered synonymous."

A common mistake when investigating errors is to focus on personnel's inability to operate an instrument<sup>6</sup>. This usually leads to blaming, and the recommendation for more training as the primary intervention. Frequently, a human factors analysis will reveal that the instrument is poorly designed and was not usability tested before being placed into service. The underlying problem is not that the personnel fail to understand how to operate the instrument. The problem is that the instrument has an error-prone design. A humorous example I use is that an error analysis has neglected human factors if the intervention is focused on eliminating the instrument error by simply training the staff to realize that this instrument has three "on" buttons.

**LEPS:** How do you avoid doing a root cause analysis or any error analysis that produces a low level intervention?

**Dr. Gosbee:** The usual answer to this question is you need to chart out the process you are analyzing and continually ask "why" questions to get to the root causes. This advice is reasonable, but overly simplistic. My specific recommendation for avoiding weak interventions is to apply the 5 rules of causation<sup>7</sup> when developing root cause statements. David Marx developed these 5 rules, and we have adapted them for healthcare. The 5 rules lead you to a deeper analysis and effective interventions (*see Table 1 for a description of the rules with examples from laboratory services*).

**LEPS:** Taking a bigger picture view, how far have healthcare organizations come in their approach to errors? For example, if the goal is for healthcare to get to New Jersey, and we started in Seattle, where are we? Have we left Seattle?

**Dr. Gosbee:** The bad news is that some organizations got as far as Montana and then turned back, went south, or started circling. These organizations are not using human factors engineering as a guide and they cannot get beyond thinking that all interventions are the same. The good news is that many hospitals, including some in the Veteran's Affairs system, are past the Mississippi river and getting closer to the goal every day.

#### References:

1. Root cause analysis. VA National Center for Patient Safety. [www.patientsafety.gov/rca.html](http://www.patientsafety.gov/rca.html)
2. Rooney JJ, Vanden Heuvel LN. Root cause analysis for beginners. *Quality Progress*. July 2004: 45-53. [www.asq.org/pub/qualityprogress/past/0704/qp0704rooney.pdf](http://www.asq.org/pub/qualityprogress/past/0704/qp0704rooney.pdf)
3. VA National Center for Patient Safety. [www.va.gov/ncps](http://www.va.gov/ncps)
4. Safety assessment code matrix. VA National Center for Patient Safety. [www.va.gov/ncps/matrix.html#MatrixSafety](http://www.va.gov/ncps/matrix.html#MatrixSafety)

5. Gosbee J. Human factors engineering and patient safety. *Quality and Safety in Health Care*. 2002; 11:352-354.
6. Gosbee J, Anderson T. Human factors engineering design demonstrations can enlighten your RCA team. *Quality and Safety in Health Care*. 2003; 12:119-121.
7. Using the five rules of causation, adapted for patient safety from David Marx. VA National Center for Patient Safety. [www.va.gov/ncps/causation.html](http://www.va.gov/ncps/causation.html)

**Rule 1. Clearly show the cause and effect relationship.** If the cause is minimized or eliminated it should reduce or eliminate recurrences.

**Incorrect root cause statement:** A technologist was tired.

**Correct root cause statement:** Technologists are frequently asked to work extra shifts; as a result, fatigued technologists are more likely to fail to follow through on communicating critical (panic) value calls.

**Rule 2. Use specific and accurate descriptors for what occurred.** Do not use negative words such as poorly, inadequately, haphazardly, improperly, carelessness, complacently.

**Incorrect:** Bad requisition

**Correct:** The requisition was printed in 8-point font and was difficult to read. The check boxes did not line up in a column. Some newer, but frequently ordered tests, were not yet on the requisition and had to be written in with free text, which was often hard to read. These characteristics of the requisition increased the likelihood of ordering the wrong test, or failing to order a desired test.

**Rule 3. Identify the preceding cause(s), not the human error.**

**Incorrect:** The technologist made a math error.

**Correct:** Due to an instrument with a narrow dynamic range, a work environment that was distracting because of a construction project, and a workload that was higher than normal due to staff absences, there was an increased likelihood of a math error, which resulted in the lab reporting a falsely high bilirubin result.

**Rule 4. Identify the preceding cause(s) of procedure violations.** Procedural violations (not following rules) cannot be directly managed. The cause of the procedural violation can be directly managed. Violating a procedure is often because of a local norm (group expectation). Address the incentives that created the norm.

**Incorrect:** The nurse did not follow the procedure for labeling the specimen.

**Correct:** Nurses and medical assistants performing phlebotomy often carry prelabeled blood tubes from more than one their patients. This caused one patient's specimen to receive a different patient's label. One patient had a delay in care related to a delay in receiving lab results and the other patient had erroneous lab results posted in their record.

**Rule 5. Failure to act is only causal when there is a pre-existing duty to act.**

**Incorrect:** The technologist did not double check the specimen transportation box for missed specimens before giving it back to the courier.

**Correct:** There was an absence of an established procedure for checking and documenting that the transportation box was searched for missed specimens before returning it to service. This increased the probability that a specimen might be lost, delayed or rendered unusable. This resulted in a lost specimen, and the patient had to return to for a redraw, and had a delay in adjusting their anticoagulation treatment.

**Table 1. The 5 rules of causation illustrated with examples related to clinical laboratory services.** Adapted from Dr. John Gosbee, " Patient Safety Interventions Instructors Guide", and used by permission.