

Defining and reducing human error

Editor's note: The following is the first in a series about human error and its role in medical error. This month, author Robert J. Latino, executive vice president of the Reliability Center, Inc., in Hopewell, VA, defines human error as it relates to healthcare.

The term "human error" is often used very loosely. We assume that when we use it, everyone will understand what it means. But that understanding may not be the same as what the person meant in using the term. For this reason, without a universally accepted definition, use of such terms is subject to misinterpretation.

The fundamental semantic problem is that the term has at least three meanings: It can mean the cause of something, the event itself (the action), or the outcome of the action.

The meanings are as follows:

- **Human error as cause.** A patient's adverse reaction was caused by a nurse administering a medication the patient was allergic to.
- **Human error as event or action.** A doctor forgets to match the patient record to patient identifiers. In this case, the consequence may not be considered, and the focus is on the human error as the event. This may be a near miss in which a nurse catches the error and it is corrected. Nonetheless, a human error occurred.
- **Human error as consequence.** A surgical nurse leaves a sponge inside a patient after surgery. The outcome, a sponge being left in a patient, is equated with the action of the nurse. The focus is on the outcome, yet the description is of the action.

We must come to grips with how we use the term human error and what we want it to connote. Much research has been done in this field by relatively few researchers. Having explored what human error is, how would we then define it? Again, no universally accepted definition exists for human error, so many depend on government studies and the like and use public domain

definitions that seem to suit their purposes. Here are just a few generic definitions for human error:

- An inappropriate or undesirable human decision or behavior that reduces, or has the potential for reducing, effectiveness, safety, or system performance
- An action that led the task or system outside its acceptable limits
- An action whose result was not desired by a set of rules or an external observer

Error classification

As with the term human error, the definition of "error classification" is elusive because no universal taxonomy exists. Many believe it should not exist or would be impossible to put definitive boundaries around. Some of the more common classifications of human error include "errors of commission" and "errors of omission:"

- **Errors of commission.** The Institute of Medicine's (IOM) 1999 report *To Err Is Human* reported that medical error accounted for between 44,000 and 98,000 deaths per year in the United States. To many, this was not a surprise and even underreported. The fact is that this study was based on errors of commission only. Errors of commission would include situations in which inappropriate actions were taken that resulted in something other than what was intended.
- **Errors of omission.** On the flip side, errors of omission (which were not included in the IOM report) are situations in which inaction contributed to a deviation from an intended path and outcome. Inactions may involve mistakes, slips, and lapses.

Two other classifications for error include:

- **Timing/rate.** A patient requires 50 mg of a narcotic two times per day (once at breakfast and once at dinner). The patient is actually administered 100 mg of the narcotic at lunch. This is an example where the timing and rate could contribute to an unintended outcome.

Sequence. A patient is prepped for surgery on her left ankle. The procedure requires that the patient be provided a marker so that she can place an X on the proper ankle for surgery. However, the patient is provided the marker after being given a sedative prepping her for surgery. As a result, the patient marks the wrong ankle and a wrong-side surgery occurs. The sequence of the steps in the procedure was not followed, resulting in an unintended outcome.

To put things into context, there are three primary stages of cognition (planning, storage, and execution), which relate to the three error types (mistakes, slips, and lapses).

The three error types are:

Mistakes. Mistakes occur when an intended outcome is not achieved even though there was adherence to the steps in the plan. This is usually a case in which the original plan was wrong, was followed, and resulted in an unintended outcome. For instance, a facility purchases a new type of IV pump from a new manufacturer. A nurse is not present for the inservice training to learn the new procedures on how to use the pump. The nurse begins her shift and is put in a position to use the new IV pump. Acting on previous experience, she operates the new pump using the old procedure. As a result, a patient is overmedicated and slips into a coma.

Lapses. Lapses are associated with our memories (e.g., lapses of memory, “senior moments,” etc.). These are generally not observable events.

Slips. Slips are generally externalized, observable actions that are not in accordance with a plan. These are often referred to as Freudian slips, in which a person may be thinking something but inadvertently says it so that someone else can hear it. Slips are most often associated with the execution phase of cognition.

Human error behaviors

As human beings, we are all prone to error. Accepting this, we can explore the various human behaviors that result in errors and try to further classify them. If we can

acknowledge the types of behaviors that result in certain types of errors, then we can plan to either reduce their frequency through proactive countermeasures or mitigate the severity and/or magnitude of their consequences.

The following three classes of behavior are widely accepted based on formal published research. The Generic Error Modeling System is as follows:

Skill-based behavior. This is inadequate human performance governed by stored patterns of preprogrammed instructions. This type of behavior occurs when we become so accustomed to what we do, it becomes second nature. When we become this comfortable with our environment, we open ourselves up to errors from overconfidence—the “I’ve done this a thousand times” mentality.

Rule-based behavior. This is inadequate human performance governed by stored rules accumulated via experience and training. For example, we are typically governed by policies and procedures within our work environments. As individuals, we are also governed by the laws of our land and compelled to abide by these rules. As I drive a car, I must abide by the rules or face the potential consequences.

Knowledge-based behavior. This is inadequate human performance governed by analytical processes and stored knowledge. It occurs when we face a situation that we have never faced before (or infrequently faced) and no stored rules exist for it that would provide us guidance. In such cases, we must depend on our knowledge and expertise to solve the situation. For example, much of the chaos associated with the first responders’ response to the 9/11 attacks was due to the fact that their disaster preparedness plans did not anticipate that type of attack. Therefore, first responders had to rely on their individual experience and expertise in how to effectively respond.

Error reduction design types

When addressing the issue of error reduction design types, we ask ourselves, “What can we do to reduce

> *continued on p. 12*

Human error < continued from p. 7

human error?" These are design strategies for addressing how to reduce or prevent human errors from occurring in a particular work environment.

The three error reduction design strategies are exclusion, prevention, and fail-safe:


Exclusion strategies. Exclusion strategies make it impossible for the identified human error to occur. One such exclusion strategy is "mistake proofing." For example, as consumers we cannot put a diesel fuel nozzle into an unleaded fuel tank's opening. The pump's design makes it impossible to make that error. Exclusion should be used in cases in which the potential human error can lead to catastrophic consequences.

Prevention strategies. Prevention strategies are the next tier down from exclusion and are used where the risk of human error is not as critical. In other words, the investment in making the human error impossible is not justified, so we just want to find a more economical approach to make it difficult to commit that identified human error. Examples include the checklist a pilot completes before each flight and the surgical instrument count a nurse completes before and after a surgery.

Fail-safe strategies. Contrary to the name, fail-safe strategies are invoked when we want to mitigate the consequences of human error instead of trying to

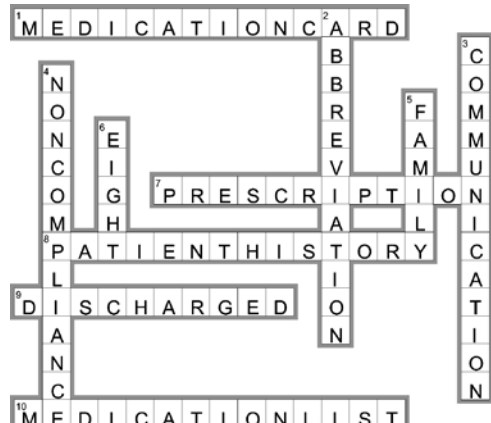
prevent it from occurring in the first place. For example, stringent preventive maintenance efforts should be in place to ensure that equipment is calibrating according to the manufacturer's specifications. If the calibration goes beyond set alarm limits, and that condition is not acknowledged and corrected immediately, catastrophic consequences could result. n

Editor's note: You can learn more about human error at the Reliability Center's Web site, Proactforreliability.com.



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Crossword answers (from p. 11)



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