Safety Interventions

Strategies for Effective Design

By Earl Blair

Organizations often decide to intervene when a safety-related issue is identified. The intervention might be initiated in response to an unwanted event, or it may be planned proactively. There are countless ways to intervene, so it is important for safety professionals, as consultants to their organizations, to provide advice regarding what kind of intervention will be most effective. Sometimes, a specific intervention may not be feasible for the organization, which safety professionals must consider when providing guidance.

Interventions can take many forms. Organizations sometimes take a low-level approach and employ safety interventions that are less than optimally effective. For example, they may implement temporary fixes instead of permanent solutions, or select interventions that are contingent on behavior instead of removing an existing hazard. However, while engineering modifications are usually optimal, some organizations may deem them cost prohibitive.

IN BRIEF

- **This article explores concepts perceived to make safety interventions more effective.**
- **Several intervention methods are reviewed to help safety professionals develop strategies as advisors and consultants to their constituents.**
- **Distinctions between soft-fix interventions and hard-fix interventions are explained, and suggestions for and examples of successful design and execution are presented.**

Two concepts that are similar to safety interventions are corrective actions and safety controls. A corrective action is defined in ANSI/ASSE Z10-2012, Health and Safety Management Systems, as an "action taken to eliminate or mitigate the cause of a system deficiency, hazard or risk (e.g., fix an existing problem)." Interventions may include these types of actions, as well as behavioral corrections in some cases.

Safety controls are described by the Z10 standard as well. This standard charges organizations to establish a process for feasible risk reduction and ranks controls in order of preference in Section 5.1.2, Hierarchy of Controls (p. 53). The preferred order of controls is as follows:

a) elimination;
b) substitution of less-hazardous materials, processes, operations or equipment;
c) engineering controls;
d) warnings;
e) administrative controls
f) PPE.

These controls suggest various ways to intervene and are ranked in order of perceived effectiveness. In some cases, the issues may be complex and it may be challenging to determine the best controls or solutions that are actually feasible.

Strategies for Safety Interventions

Merriam-Webster's defines intervene as "to interfere with the outcome or course especially of a condition or process (as to prevent harm or improve functioning)." Stolovitch and Keeps (2004) make some practical distinctions about interventions:

> Simply stated, an intervention is something that is specifically designed to bridge the gap between current and desired performance states. It can be complete unto itself or part of a basket of interventions. It is a deliberately conceived act or system that is strategically applied to produce intended performance results. (p. 110)

They separate interventions into two categories: 1) learning interventions, which involve alterations in mental structures or behavioral change and 2) nonlearning interventions, which are actions or events designed to change conditions that facilitate attainment of performance.

As noted, interventions include the element of strategy. Robson, Shannon, Goldenhar, et al. (2001), offer this simple explanation of a safety intervention: "An attempt to change how things are done in order to improve safety performance." It could be a new program, practice or initiative.

Some interventions are more effective than others. Safety professionals who are adept at identifying interventions that are most likely to have a positive impact on safety performance can add value to their organizations. Thus, understanding what makes safety interventions effective not only improves the organization, it also can help a professional advance his/her career.

In the hierarchy of safety controls, interventions

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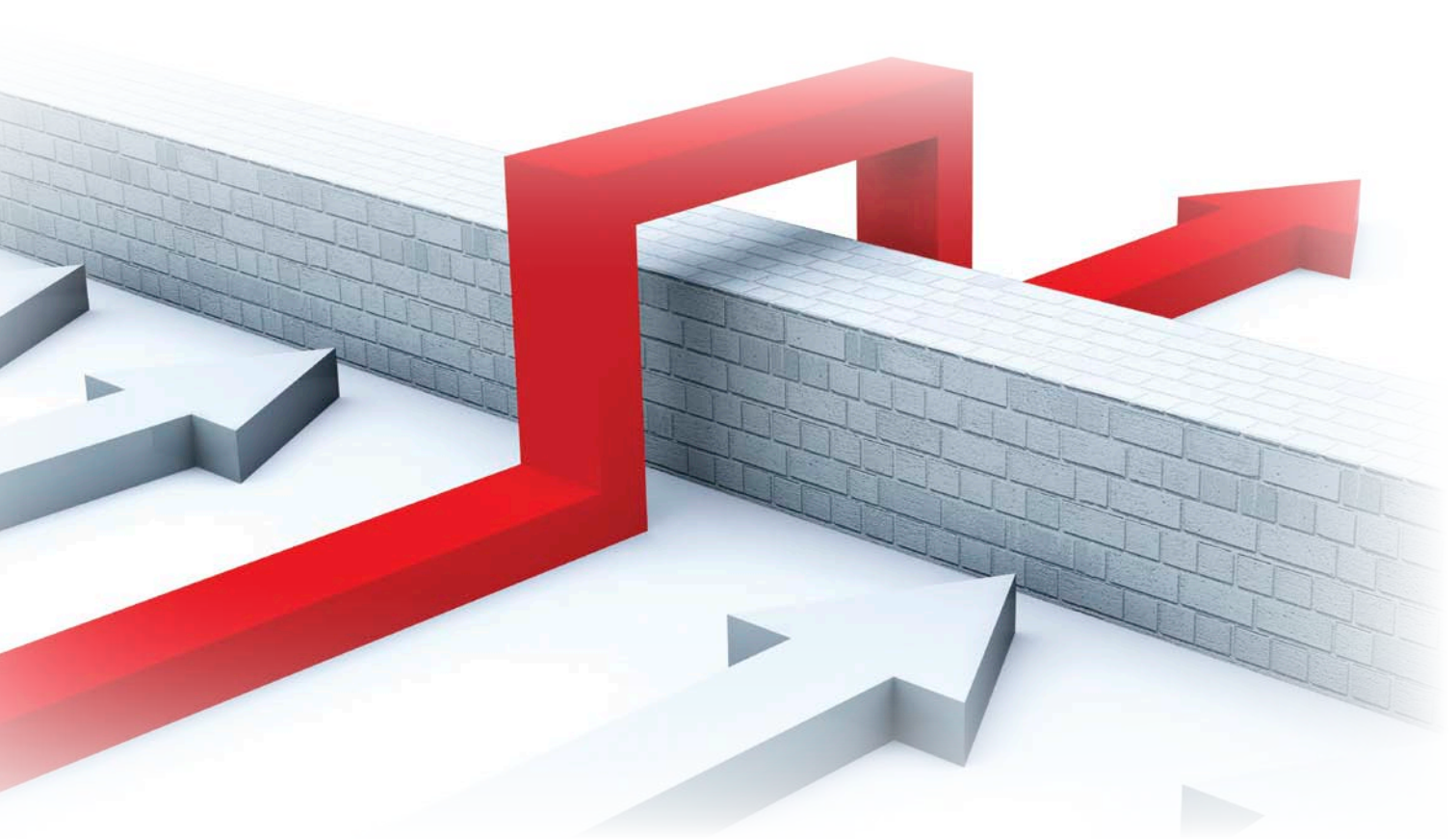

can be classified as either ameliorating or contingent (Manuele, 2008). Substitution, elimination and engineering controls are interventions that generally ameliorate the hazardous condition and are preferred over contingent controls whenever feasible. Amelioration falls under Stolovitch and Keeps's (2004) nonlearning intervention classification. Administrative controls, training and PPE are contingent interventions that fall under the learning intervention category. Since these interventions are contingent on compliant behavior, they are lower in the hierarchy and are usually less desirable for long-range optimal safety performance.

Distance Between the Causes & Injury Event

Safety interventions may focus on addressing proximal causes of injuries or conversely identify distal causation factors (situated away from the point of injury in time or location) for intervention. Proximal causes, such as the behavior that immediately preceded the injury, are typically symptoms of a deeper issue, whereas distal causes are often in the category of primary or root causes. Although distal causes are generally more important to address in interventions, they are often less apparent because they tend to be buried in the management system or reinforced by the organization's unwritten culture.

How effective is it to focus on proximal interventions versus distal interventions? Addressing proximal causes tends to be easier, but its effects are less permanent and less far reaching. In the author's opinion, focusing on distal causes of injuries is often more difficult, yet doing so usually leads to a more permanent fix with greater reach.

The author's experience also suggests that many organizations prefer a quick fix and intervene at the proximal-cause level, which is a more obvious but less effective route to improvement. Why might this be the case? It may be based on the way safety management has traditionally been conducted (e.g., a focus on unsafe acts). Or, perhaps addressing the distal causes would prove to be not only more difficult but also more expensive and time-consuming. Addressing the distal causes may appear more unsavory or be uncomfortable for management, as these issues are often systemic and embedded within the management system. With that background, let's examine soft-fix interventions, hard-fix interventions and strategies for making effective recommendations for safety interventions.

Soft-Fix Interventions: Contingent, Learning Solutions That Increase Safe Behavior

Komaki, Barwick and Scott (1978) provide a case study demonstrating an effective behavioral process intervention. The project involved pinpointing and reinforcing safe (or desirable) behavior at a food manufacturing plant. Plant management was expected to discuss the safety process with supervisors on (at least) a weekly basis. Supervisors were asked to help determine what behaviors should be on the checklist and to provide reinforcement when employees worked safely. The primary metric was percent safe behavior, with a beginning baseline of 67% safe and a goal of 90% safe. One difference between this study and typical behavior-based safety (BBS) approaches is that observations were conducted by students and psychologists involved in the project rather than by coworkers.

These results were reported after 1 year:

- Injury rates dropped more than 80%.
- Site safety performance improved from last place to first place in the company.
- The facility received a safety award from the parent company.
- After the study was completed, the facility maintained the process, and injuries continued to decline.

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Although this study occurred many years ago, lessons learned still apply today. The Komaki, et al. (1978), project engaged employees in the safety process in simple ways. Employees were asked their opinion when the pinpointed behaviors were established, and also when key performance targets or safety goals were determined. When employees are involved in the safety process they are more likely to buy in to safety efforts. Goals are more likely to be achieved when employees are committed to and excited about occupational safety.

Another strategy was to keep behavioral checklists short and simple (low complexity). The checklists were tailored to each area or unit. Behaviors listed were drawn from the inventory of 35 site behaviors identified as the most important for reducing injuries and enhancing safety performance. This simplicity and brevity enabled the organization to sustain the process after the project was completed.

In addition, feedback about the safety intervention's progress was given frequently (three or four times a week). Since feedback tells a team how it is doing in relation to an established goal (e.g., 90% safe behavior), the goals were emphasized graphically and verbally. This lesson suggests that current, frequent feedback is a key element of intervention effectiveness.

In the author's experience, many traditional safety efforts focus on negative lagging measures such as injuries, incidents and failures. Lagging measures typically provide little guidance to employees about their specific roles and responsibilities for safety. In the Komaki, et al. (1978), intervention, the focus was on the positive with clear and reinforced guidance provided to employees via pinpointed behaviors and specific safety responsibilities.

Additional distinctions/lessons learned from the Komaki, et al. (1978), case study include:

- Goals are effective in improving safety performance only if the goals are accepted by employees.
- All employees must have precise safety roles and responsibilities and be meaningfully involved in the safety process.
- Feedback accompanied by praise appears to be superior to feedback alone.

It should be noted that successes in this case study were due to the specific intervention strategies that were implemented in an effective manner, and not simply because it was a BBS-style initiative. It is expected that any organization could benefit from the systematic, effective use of employee engagement, simple targeted metrics and frequent, specific feedback on the safety process.

Safety training is another important intervention contingent on employee behavior. Unfortunately, training is sometimes viewed as a quick fix to many issues. Safety professionals should resist concluding that training is the answer to a safety concern unless an assessment indicates the need for training.

Based on an informal survey conducted by the author, some organizations do not conduct needs assessments before concluding that training is the solution. According to the hierarchy of controls, safety training should be one of the last considerations in solving performance problems, since its success is contingent on the resulting behavior. That said, if an obvious deficiency exists in employees' skills or job knowledge, then training is necessary.

It is useful to understand that training itself is not performance. As Stolovitch and Keeps (2004) explain, training is "structured activities focused on getting people to consistently reproduce behaviors without variation and with greater efficiency under various conditions" (p. 5). They define performance as "a function of both the behavior and accomplishment of a person or group of people" (p. 8).

Organizations that have treated training as a one-time event should consider viewing and treating training as an ongoing process. That process must encompass needs assessment, training delivery, learning, transfer of learning to the workplace, and sustaining the new skills and behaviors over time (Blair & Seo, 2007).

Research indicates that for training to be most effective, participants must be engaged in the content. Burke, Sarpy, Smith-Crowe, et al. (2006), conducted a meta-analysis of 95 studies covering more than 30 years of safety training in 15 countries. Their findings suggests that safety and health training is most effective when employees are highly engaged. Essentially, training that is highly engaging is conducted as a conversation or dialogue. Dialogue and reflective thinking, versus simple feedback, are a form of engagement that appears to yield greater knowledge acquisition and improved safety performance. Burke, et al.'s (2006), findings suggests that "the most engaging methods of safety training are, on average, approximately three times more effective than the least engaging methods in promoting knowledge and skill acquisition" (Burke, et al., as cited in Blair & Seo, 2007).

To summarize, soft-fix interventions can be effective if leaders understand how they work, then ensure that these fixes are meticulously and systematically implemented. Since soft fixes are dependent on behavior, it is always possible that the new approaches may be forgotten or ignored over time, or that the organization may simply drift away from the original intent of such fixes.

Hard-Fix Interventions: Fundamental, Ameliorating Solutions That Transform Systems & Reduce Error

As safety has evolved, practitioners have become more aware of the importance of focusing on context versus focusing on individuals. Bush (2012) notes that normalization of deviation is a common issue in organizations. Normalization of deviation means that an organization has been doing something a certain way (not the standard way) for so long that it has become the standard. Focusing on the context influencing deviant behavior simply explains the behavior—it does not justify it. In the search for solutions to human error, a just-the-facts approach can be harmful because it only explains what happened, not why it happened.

To address human errors that affect safety performance, it is important to understand why errors occur. Organizations often respond emotionally

and at a surface level to deviant behaviors. Dekker (2006) states, "Reactions to failure interfere with your understanding of failure; the more you react, the less you understand" (p. 22). He recommends instead: "Trade indignation for explanation; take your pick—be indignant or do something meaningful" (p. 47).

Manuele (2008) encourages safety professionals to become more involved in human error reduction, particularly errors that occur above the worker level. "Bring attention to human errors that derive from deficiencies in:

- organizational safety cultures;
- safety management systems;
- design and engineering decision making;
- error-provocative operations" (p. 68).

The reason for labeling these as *hard-fix interventions* is because they involve systems and generally take a greater effort to understand and implement. Since hard-fix solutions are more time-consuming and expensive, they can be more difficult for the safety professional to convince management to implement versus recommendations that stop at blaming the operator. However, a hard fix has a greater impact on safety performance that is more permanent and robust. Dekker (2006) suggests that efforts to understand human error should ultimately point to changes that will truly remove the error potential from a system, which places a high premium on meaningful recommendations.

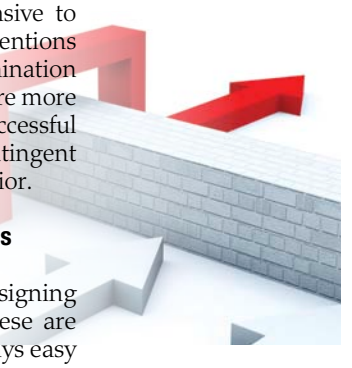
Dekker (2006) also suggests viewing recommendations as predictions or hypotheses, which he refers to as high-end or low-end recommendations. A low-end recommendation is similar to the concept of a soft fix and is a common starting place for interventions. Low-end recommendations include tightening procedures, retraining, reprimands, discipline and termination.

High-end recommendations target structural decisions regarding resources, technologies and pressures that people encounter in the workplace. The author believes the following statement is an accurate but challenging assessment about making recommendations to reduce human error:

> The ease of implementation and the effectiveness of an implemented recommendation generally work in opposite directions . . . the easier the recommendation can be sold and implemented, the less effective it will be; after the [low-end] implementation, the potential for the same trouble is left in place. The error is almost guaranteed to repeat itself in some shape or form. . . . Low-end recommendations really deal with symptoms, not with causes. After their implementation, the system as a whole has not become much wiser or better. (Dekker, 2006, p. 175)

This understanding about meaningful recommendations is essential for safety professionals seeking to add value to their organizations by reducing injuries. Dekker (2006) suggests that the ability to generate structural recommendations that aim high in the causal chain is a "reflection of the quality and depth of your understanding of human error" (p. 179).

To summarize, hard-fix interventions are typically more challenging, difficult and expensive to implement. However, many of these interventions involve a higher-level control, such as elimination and engineering. Therefore, such solutions are more likely to eliminate the problem because successful reduction in exposure to hazards is not contingent (or is much less contingent) on future behavior.



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Recommending Safety Interventions: Strategies That Predict a Positive Impact on Performance

Following are several strategies for designing effective safety interventions. Although these are relatively simple concepts, they are not always easy to execute.

Prevention Strategy: Recommend Early Intervention Through Problem Finding & Timely Implementation

Leading safety organizations are proactive and pursue early interventions. According to Roberto (2009), great leaders are not problem solvers, they are problem finders. He gives examples of early intervention methods, as well as specific strategies to enable one to become a better problem finder. He shares an intervention story about how several hospitals have developed rapid response teams (RRTs) to proactively attend to a patient immediately prior to an impending heart attack. This is an attempt at an early intervention versus reactively responding to a code blue. While heart attacks cannot be predicted with 100% accuracy, the impact of RRTs has been so dramatic that "the innovation has spread like wildfire."

These excerpts from the RRT story (Roberto, 2009) reflect the success:

> When the nurse pages an RRT, the team arrives at the patient's bedside within a few minutes and begins its diagnosis and possible intervention. . . . To help the nurses and other staff members spot problems in advance of a crisis, the hospitals created a list of the "triggers" that may foreshadow a cardiac arrest and posted them in all the units.
>
> The invention of RRTs yielded remarkable results in Australia. The innovation soon spread to the U.S. Nurses reported . . . that they felt much more comfortable calling for assistance, especially given that the RRTs were trained not to criticize or punish anyone for a "false alarm."
>
> A physician explained why RRTs proved successful. "The key to this process is time. The sooner you identify a problem, the more likely you are to avert a dangerous situation." A recent study published in the *Journal of the American Medical Association* found a 71% reduction in "code blue" incidences and an 18% reduction in mortality rate after implementation of an RRT in a pediatric hospital.

What is the takeaway of this story? Small problems often precede catastrophes. In fact, most large-scale failures result from a series of small errors and failures, rather than a single root cause. These small problems often cascade to create a catastrophe. In healthcare, code blue teams are in the business of

fighting fires. The RRT is all about detecting smoke (Roberto, 2009). These descriptions capture the essence of what it means to be proactive in safety.

Permanent Impact Strategy: Recommend Interventions With Widespread, Lasting Impact

Consider applying the concept of poka-yoke (solve safety problems for good). One example is designing connections so that they can be joined in one way only, thereby reducing risk. It is a fail-safe design. Manuele (2008) calls poka-yoke an important but often neglected concept with regard to employee and product safety.

Critics often suggest that BBS does not address system issues. However, a BBS process can be used to initiate more permanent fixes if an organization takes advantage of the full array of methods found in a well-planned and executed process. One simple tactic is to follow up on detailed comments that are recorded as part of the safety coaching and feedback process. To achieve this:

1) Encourage and expect employees to write detailed, high-quality comments so that the committee or safety department can identify specific concerns. These comments may stem from the safety coaching that includes a two-way dialogue in discovering barriers to working safely.

2) Follow up on the comments by seeking a permanent solution (hard fix) versus a behavioral solution (soft fix).

3) The purpose of the follow-up is to reduce exposures and enable/facilitate safe work. In the author's opinion, this is what organizations should strive to accomplish with BBS in the short term and establish a longer-term goal to produce behavior changes that develop the safety culture.

Analyzing the Case of Using the Wrong Tool

Consider a scenario played out in three different ways that illustrates how those three steps might work. These scenarios are based on examples of safety issues that may typically be hidden from management. This demonstrates how a simple distinction in the quality of comments can alter the effectiveness of an intervention, assuming the organization follows up on pertinent comments.

1) An employee observes a workgroup and notices one member using the wrong tool for the job. In the comments section of the observation checklist, s/he writes, "wrong tool used." This type of comment does not provide enough information to pursue a system solution.

2) Same situation, except this time the observer writes, "Used a cheater bar instead of the correct size wrench." Now the safety committee has a little more information than in the first example. Cheater bars are usually a short, hollow pipe that can be slipped over a wrench handle to provide an extension for leverage during maintenance projects. This is a risky behavior that results in relatively frequent injuries.

3) Same situation, except the observer (who has received a train-the-trainer intervention) writes, "Used a cheater bar because the tool crib was out of the correct size wrenches." Can the organization solve the issue with this information? Yes. The correct size wrenches can be ordered, someone can be put in charge of maintaining the supply and a system can be established to monitor inventory.

Summarizing these three scenarios: If an organization receives vague comments like "wrong tool used," then the deeper issue will not be solved. The third scenario demonstrates the most effective approach: The organization actively works to enable and facilitate safe behavior. This seemingly minor distinction regarding comment quality can be the difference between an effective intervention and an ineffective one.

Fixing the Problem vs. Fixing the Blame: Target the Working Interface to Reduce & Eliminate Hazards & Exposures

Krause and Hidley (2005) define the working interface as "the configuration of equipment, facilities, systems and behaviors that define the interaction of the worker with the technology. Hazards exist in this configuration" (p. 10). They also state, "High-functioning safety organizations have gone beyond the entanglements of blaming and recognize that getting safety right means designing and influencing systems that reduce and eliminate exposure" (p. 11).

The key takeaway is the importance of having an effective strategy for safety improvement. Without an overarching strategy for safety improvement, the design and execution of interventions will likely be haphazard. As Krause and Hidley (2005) write, "In the absence of a clearly articulated strategy, understood well and supported fully by the leadership team, the likelihood of successful execution is greatly reduced" (p. 164). They recommend that the strategic plan for safety improvement include five elements. The third element deals with "an intervention plan that addresses the gaps and names accountabilities" (p. 164).

A large part of safety leadership is defining the specific vision for safety performance, assessing the current state of safety, and closing the gap between the vision and the current state. Leaders must take responsibility for eliminating hazards where the worker and technology interact (i.e., the working interface). Leadership creates an organization's safety culture and it regulates the working interface. Safety professionals may not have the authority to make these decisions, but they can make the appropriate recommendations to help leadership uphold its responsibility to reduce and eliminate hazards. Safety professionals must gain management's ongoing support and participation to implement effective interventions.

Leadership Rounding: A Precursor to Making Effective Intervention Recommendations

The concept of leadership rounding, also known as leadership by walking around (Blair, 2013), can be a powerful way to influence safety culture. Its benefits include helping workers achieve their best; increasing trust levels between management and

the workforce; and identifying circumstances that provoke human errors.

Used in some segments of the healthcare industry, leadership rounds are reported to improve operations, connect with patients and reduce errors. Beyond these benefits, the practice can lead to informed and improved decision making. There is no substitute for leaders seeing with their own eyes, on a regular basis, the actual work context.

Leadership rounding must be conducted in a systematic manner with quick follow-up on issues raised and data collected. Each leader must:

- mindfully observe and monitor the actual work being performed;
- actively listen to workers (or patients);
- demonstrate care and concern for worker safety;
- offer support for safety-related issues;
- attempt to solve problems before they escalate;
- follow through as needed on the findings from the rounding.

With consistent rounding the leader now knows what s/he did not know before the walk arounds (Roberto, 2009). This provides a sound basis for making informed decisions. The leader has systematically and consistently observed the work, listened to employees or patients, and analyzed situations resulting in hazards or risky exposures. The solution might be a soft fix, or perhaps a work order is needed. Maybe a hard-fix intervention, such as an engineering solution, is needed to make the work environment safer.

Other Factors That Improve Intervention Effectiveness

The following actions can influence intervention effectiveness:

1) Establish a mechanism to monitor and reinforce the successful implementation of the intervention. Consider viewing intervention completion as a leading indicator of safety performance. Safety professionals should consider recommending that the organization implement a measure regarding the timely completion of safety interventions that have the potential to reduce serious injuries.

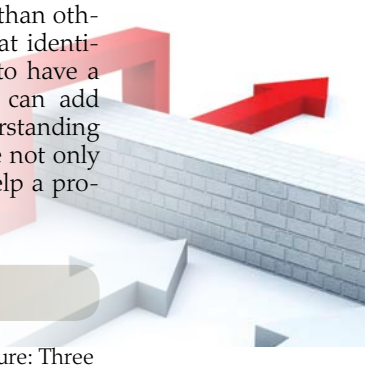
2) Measure return on investment to illustrate the intervention's value over time. It is generally best to view safety as a long-term process. Most hard-fix solutions cost money, but analysis may predict a good return on investment over a 2- to 3-year period.

3) Maintain a sense of urgency and focus on important intervention recommendations. Establishing deadlines for corrections is one way to achieve this. Another common method is to appoint and make someone accountable for the intervention.

4) Recognize opportunities. Use behavioral issues and human error problems to discover and fix larger systemic problems. Human errors and behavioral issues are symptoms of deeper root causes. These efforts may be complex and time-consuming, but most problems have no quick fix. Safety professionals increase their value by investigating beyond the obvious proximal causes and symptoms to address the more complex organizational problems. Leadership rounding is an effective method for accomplishing this.

Conclusion

Some interventions are more effective than others. Safety professionals who are adept at identifying interventions that are most likely to have a positive impact on safety performance can add value to their organizations. Thus, understanding what makes safety interventions effective not only improves the organization, it also can help a professional advance his/her career. **PS**



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