CHAPTER SEVENTEEN
PREVENTING FATALITIES AND LIFE-ALTERING INJURIES

Treating all exposures equally, while well intended, doesn’t make sense when roughly 80% of injuries represent low-severity potential.
—Thomas R. Krause

Serious injury and fatality (SIF) prevention has long been considered a matter of numbers. Reduce “smaller” events, the thinking goes, and you will also reduce more serious ones. This conventional wisdom has not served leaders well. Serious injury events continue to plague otherwise strong safety performers. Data show that while industry has made tremendous strides in reducing less serious injuries over the past 20 years, the rate of fatal injuries has remained relatively flat. Understanding the reasons behind this discrepancy—and knowing the principles for addressing them—is critical to your success as a safety leader.

THE RELATIONSHIP BETWEEN MINOR INJURIES AND FATALITIES
The Heinrich Triangle has been a fundamental concept in workplace personal safety for many decades. This model simply says that the frequency of injuries goes down as severity goes up—i.e., there are more medical treatment cases than lost-time cases, and more lost-time cases than fatalities. The Heinrich Triangle has been interpreted
by the safety community as telling us that if we reduce the number of less severe injuries, we will reduce the number of more severe injuries as well—shrink the bottom of the triangle and you shrink the top.

However, national data in the U.S. over the past 10 years shows medical treatment injuries steadily declining, but fatalities remaining essentially level (see Figure 17-1).

**Occupational Fatalities and Non fatalities**

![Graph](image)

**Figure 17-1.** Source: United States Department of Labor, Bureau of Labor Statistics, 2011.

These results are inconsistent with how the Heinrich Triangle has been interpreted and raises questions about its validity and the validity of prevention efforts.

Research undertaken in 2011 helped explain the apparent contradiction between experience and theory and provides important lessons for managers concerned with prevention of fatalities and serious injuries.
The research confirmed that:

- There is an inverse correlation between frequency and severity of injuries. Less severe injuries do occur more frequently than more severe injuries.
- Reducing the number of incidents at the bottom of the triangle does not necessarily reduce the number at the top in a proportional way.

The potential for a fatality or serious injury is highly variable across the types of less serious injuries that occur, reflecting the fact that serious injury or fatality (SIF) potential varies among different types of exposure. (For example, a back strain from lifting a load has little SIF potential, while a fall from an elevated work position has high SIF potential.) As a result, a particular safety initiative may be highly effective in reducing the number of injuries with low SIF potential, while having little or no impact on the exposures with high SIF potential.

We also know that specific types of work activities and safety controls are most closely associated with incidents that have SIF potential. For example, injuries involving equipment and pipe opening of hazardous chemicals, lock out/tag out, machine guarding and barricades, confined space entry, and use of hot work permits tend to have SIF potential, as do operation of mobile equipment, water craft, working under suspended loads, and working at elevations. Examining the exposures for a specific company or location can identify those with high SIF potential, allowing the design of interventions that focus on those exposures.

**SIFS ARE NOT FLUKE OCCURRENCES**

It is not uncommon for managers to react to fatalities or life-altering injuries by suggesting that the incident was a fluke and not indicative of a broader safety issue. This is flawed thinking.

The occurrence of a major event requires a specific and infrequent configuration of factors—a variety of conditions must occur
and the safety controls designed to protect against injury must fail. A series of things all must occur, and each of these things individually has a low probability. A machine must malfunction requiring maintenance, the lockout of energy is done incorrectly, the supervisor fails to catch the error, the machine cycles unexpectedly, and someone is in position to be injured. The chances that the first and only time a machine malfunctions that the lockout is done incorrectly, and no one notices, and the supervisor doesn’t catch the problem, and an individual is in position to be injured when the machine cycles is low. It is much more likely that breakdowns have occurred often, and lockout is not done rigorously, and lockout jobs are not carefully checked, so that eventually one of these events will cause a serious injury, but the underlying exposure has occurred many times before and gone unrecognized.

It is important to understand the fallacy of the “fluke occurrence” idea. If SIFs truly were fluke occurrences, then there would be little chance of preventing them. However because they are not, but rather the product of conditions and behaviors that have occurred previously, it is possible to detect exposures with SIF potential and mitigate the exposures.

CONSIDERATIONS FOR REDUCING SIFS

While many organizations are aware of non-SIFs that have high potential, few have the consistent visibility needed to address precursors in sustainable ways. Since medical case rate changes are not indicative of changes to SIF potential, in the absence of measuring incidents with SIF potential organizations have no way to assess whether they are making progress in reducing the exposures that contribute to SIFs.

In designing interventions to address SIFs, the following principles should be followed:

- Educate people at all levels on the difference between general injury prevention and SIF prevention.
• Track SIF potentials as a separate outcome metric, combining actual serious injuries and fatalities with less serious injuries that have SIF potential.
• Develop interventions to reduce SIFs that are not one-time activities, but part of an ongoing process. These interventions need to engage employees at all levels, use data analysis to understand sources of precursors, and provide sustainable mechanisms to identify and address precursors.
• Use targeted mechanisms to identify and address precursors. Most precursors can be identified through a system that combines effective observation with focused discussion/interviewing in the workplace. Implementation of this process should occur within a change management framework.
• Both the design of safety systems targeting SIFs (their integrity) and the quality of how they are implemented (conformance) should be addressed.

IMPLICATIONS
One cannot assume that just because overall injury rates are declining that the likelihood of a fatal or life-altering injury is also declining. These most serious injuries result from an identifiable subset of all exposures. Managers need to seek to understand these exposures, regularly review data on the frequency of incidents with serious outcome potential, and implement targeted exposure mitigation efforts aimed at these exposures.