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A New Paradigm for Fatality Prevention

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Introduction

Despite significant reductions in general occupational injury rates over the past several years, in many organizations reductions in the levels of fatal and serious events have not followed at the same pace. This leads to several questions:

- Is the traditional safety triangle limited in its application? Has it outlived its usefulness, particularly in relation to serious and fatal injuries?
- Should we think differently about the prevention of fatal and serious injuries?
- What approach should we take to serious injury prevention?

This paper seeks to answer these questions by examining the reasons behind the apparent disparity in improvement between serious events and other injuries, introduces the concept of precursor events, and presents a new framework for leading an organization to be free of serious and fatal injury events.

Old Paradigm, Old Problem

H.W. Heinrich first described the relationship between types of injuries in 1931, and it has been emphasized in most standard safety texts ever since. It is expressed as the familiar safety triangle (Figure 1), which states that there is an inverse relationship between frequency and severity; the more severe the injury the less frequent it is.

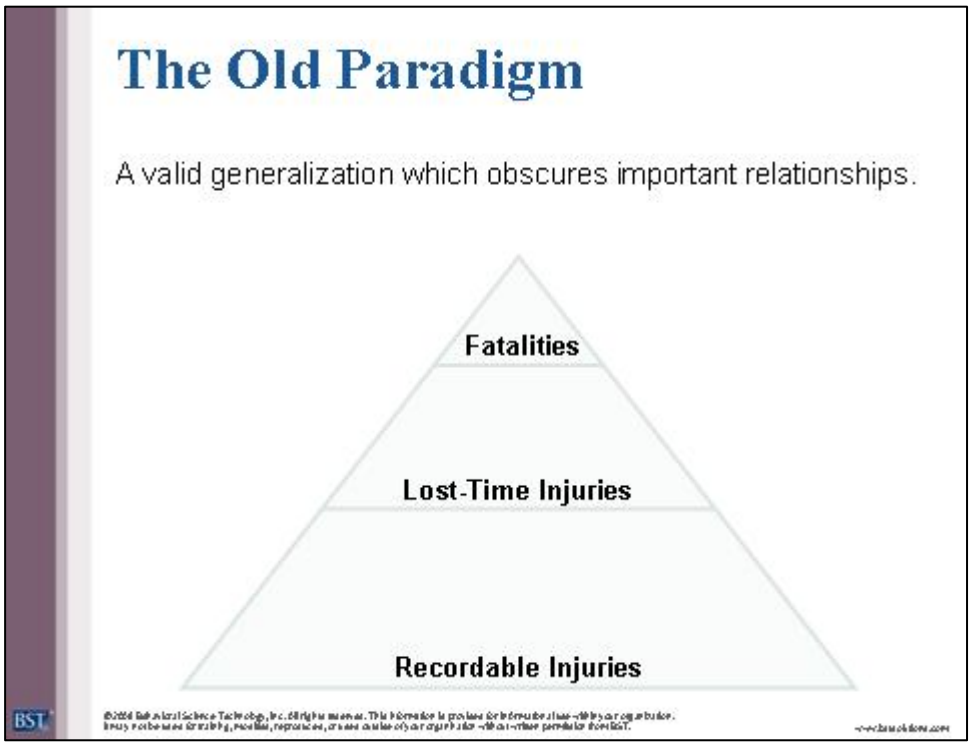

Figure 1. The Safety Triangle.

The safety triangle has been useful in many ways. It has provided an accurate description of kinds of incidents and their relationships to each other. This has highly significant value for a number of strategic reasons, importantly because it suggests that a single high severity event signals the likelihood of significant exposure in the workplace.

In other ways however, the safety triangle has proved problematic. It suggests both that all injuries of low severity have the same potential for serious injury and that injuries of differing severity have the same underlying causes. Heinrich also suggested that one injury reduction strategy would effect all kinds of injuries equally. The logical conclusion is that if you reduce minor injuries by 20% you can reasonably expect a 20% reduction in major injuries. Yet, years of experience have disproved this presumed ratio. Despite significant investment of time and resources, data show that nonfatal injury events have declined by 51% across industry since 1993, but fatal injuries have declined by only 24% (Figure 2).

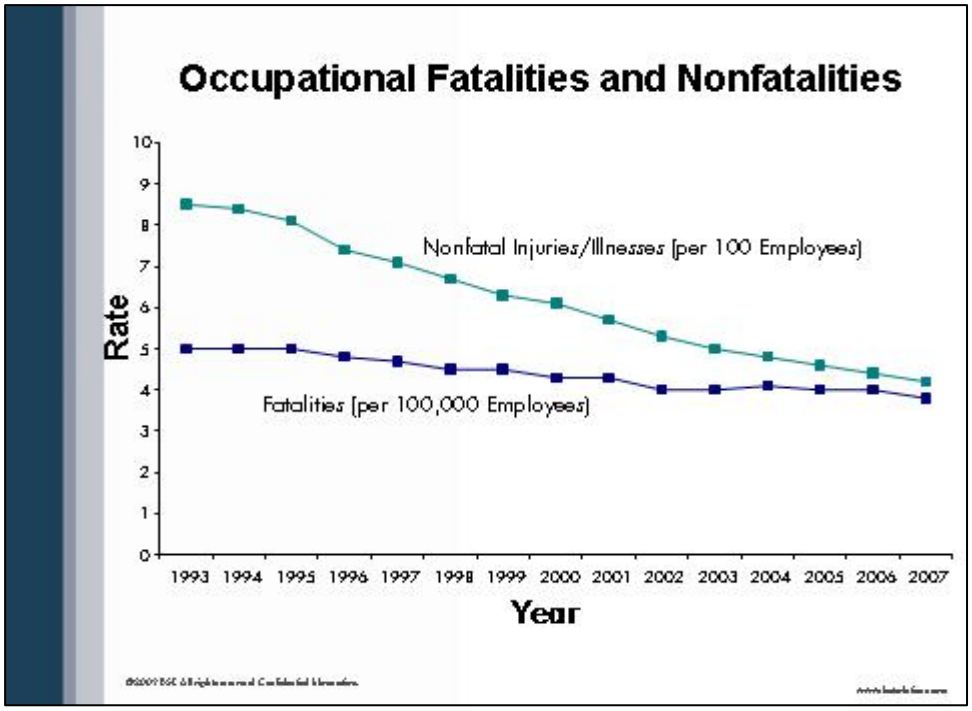

Figure 2. Fatality and Nonfatality rates from 1993 to 2007. (*Source*: U.S. Bureau of Labor Statistics)

It would be a serious mistake to disregard the fact that frequent low-severity events indicate the potential for high-severity events. An environment that frequently generates low-severity events harbors systems, cultural, and leadership issues that can (and eventually will) generate high-severity events as well. At the same time, not all exposures are equal in terms of the potential for high-severity events. Some exposures result in more serious incidents; some in less serious ones. The safety triangle in particular has led to several problems in effectively preventing serious injury and fatality (SIF) events:

- **A lack of focus on injuries and near misses that have the potential for SIF events**. Failing to distinguish the potential for serious injury across types of injuries leads many organizations to treat all less severe injuries and near misses equally, meaning that an exposure with a low severity potential gets the same attention as an exposure with a high severity potential.

- **An increased focus on trivial occurrences**. As organizations fail to realize improvement in severity, many take the inverse relationship a step further and apply a "more is more" approach. That is, they try to improve safety by focusing harder on all exposures, in some cases becoming preoccupied with trivial events.

- **The creative classification of injuries**. Thinking of injuries after the fact as the main area to focus on can lead organizations to categorize injuries creatively.

- **Loss of credibility**. Over attachment to the safety triangle paradigm, rather than assessing and responding to the exposure picture as it is, can widen the gulf between an organization's management and its employees. In the extreme, this situation can lead to cynicism as employees perceive that safety efforts do not match reality.

- **A general lack of understanding regarding the prevention of SIF events**. Most troubling of course is that relying on an oversimplistic view of injury causation limits the ability of an organization to distinguish those exposures that represent the greatest threat to employee life.

Excellence in safety is directly related to how effectively the organization controls exposure to hazards in the working interface, the configuration that defines the interaction of the worker with technology. But exposures come in a variety of ways; they can be a condition, decision, behavior, activity, cultural standard, process, or system (or lack thereof). Exposures also vary in the level of risk they pose. The safety triangle is unsatisfactory as the sole guide for SIF prevention because it has a tendency to limit our thinking and lull us into a sense of false security. For example, low injury rates can mask the presence of high-potential exposures. Developing an effective strategy for preventing SIF events requires a new framework that accounts for the variety in type and intensity of exposures in the workplace and that provides organizations the capacity to address them adequately.

Serious Events and the Role of Precursors

The relative infrequency of fatalities and other serious events can give them an appearance of being random, of being beyond any reasonable degree of anticipation and prevention. The lessons of prominent incidents, such as the Space Shuttle Columbia, Oxy's Piper Alpha, Esso Longford, BP Texas City, as well as lessons from single fatality events tell us otherwise. The vast majority of these events result from high energy potential exposures that are identifiable, measurable, and manageable. Our work studying these and other events in organizations around the world point to several significant conclusions:

- All minor injuries are not the same: a sub-set of low severity injuries are precursors to serious injuries and fatalities.
- Injuries of differing severity are associated with differing situations and types of activity.
- Reducing serious injuries requires a different strategy than reducing minor injuries.

These findings form the basis of a new paradigm in the prevention of SIF events and they begin with an understanding of precursor events.

Precursor events refer to the occurrence of an injury, accident, near miss, or exposure that has a high probability of resulting in serious injury if repeated. What categorizes a precursor event is not its immediate outcome, but its potential to produce a serious outcome. For example, sideswiping a desk and falling from a height might both result in a minor cut. But it is only the cut received from falling from height that would be considered a precursor; the potential for serious injury is very high if the event were repeated. Precursor event data from accidents, injuries, near misses, and exposures provide the essential focus point of SIF prevention efforts. As an example, the precursor events for a vehicle fatality might look like:

Exposure: Driver of the vehicle is under the influence of alcohol or drugs.

Near Miss: Driver swerves into the lane of oncoming traffic; no injury or accident.

Injury: Vehicle is side-swiped by oncoming traffic and driver has minor injury.

Accident: Head on collision with no injuries to driver.

Our experience and findings have shown that certain activities have a particular propensity to create precursor events. Examples of these activities might include:

- Mobile equipment (operation and interaction with pedestrians)
- Confined space entry
- Energized systems/equipment (jobs that require lock-out tag-out)
- Lifting operations
- Working at height
- Caustic liquor handling
- Manual handling

Similarly, several situations also possess a tendency to produce a high proportion of precursor events. There is some level of commonality across these situations with respect to suddenness or degree of shift from norms. Particular situations might be (as examples):

- Process instability
- Significant process upsets
- Unexpected maintenance
- Unexpected changes
- High energy potential jobs
- Emergency shutdown procedures

Accounting for the more complex causes and circumstances related to SIF events allows organizations to develop a more focused effort on their prevention. Figure 3 illustrates this new paradigm and shows the specific elements that lead to serious events.

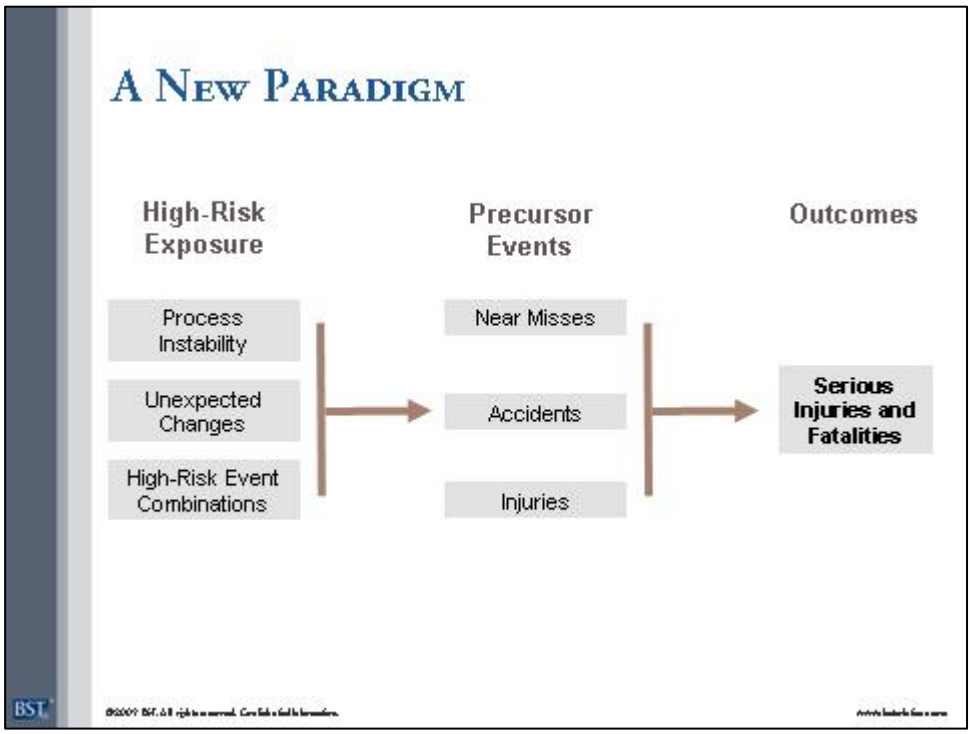

Figure 3. A New Paradigm for Understanding SIF

Applying the New Paradigm

A new paradigm for SIF prevention has significant implications for more than our view of accident causation. It requires that organizations develop a higher degree of dexterity in their injury prevention systems. The way in which exposure data is collected, assessed, and used must accommodate variances in severity potential. Specifically, organizations need to be able to detect high-potential exposures and develop a "systems view" of how these exposures are created. Fundamentally, an organization can begin to adapt this new paradigm to their safety efforts by:

- **Identifying all precursor events in the data.** Organizations need to begin by recognizing precursors past and present. Data from fatal and life-altering events, lost time and reduced work, medical treatments, near misses, and exposures provide clues that can lead to high severity events.

- **Conducting a "systems view" analysis.** Once precursors have been identified, it is essential to understand how they were created. Oftentimes incident investigations only capture the immediate causes, yet it is the "big picture" of system influences and drivers (often multiple), that tells you the likelihood of precursor recurrence.

- **Designing appropriate interventions.** Intervention takes place at the site, but the analysis and design of intervention is best done at the group or corporate level. This is because SIF events are small in number. Sites should tailor intervention activities to fit their existing systems.

Catching Up

The rate of serious injury and fatality events need not be stalled at its current level. Nor does its improvement need to stay significantly behind the improvement of other injury events. As with many organizational challenges, the solution to better performance is not to try the same thing harder, but to rethink the problem. Deepening our understanding of how SIF events occur, in particular recognizing that their causes are different and require different approaches, opens up new possibilities for organizations wishing to prevent them.

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