

TRACKING THE CAUSES OF FIRST AID INJURIES

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ABSTRACT

It is common in the U.S. to gauge or monitor safety performance by tracking information related to the incidents in which the injury is sufficiently serious to warrant treatment by a physician. More serious injuries, such as lost workday cases, are commonly monitored, but their frequency is considerably less, making them a less desirable measure for tracking causation. Firms that embrace the zero incidents philosophy regularly report considerable successes in achieving good safety performances. As the number of the injuries decline, there is less injury information by which to develop strategies to make further improvements in safety. The number of minor or first aid injuries, those that are treated on the jobsite with no further treatment being required, occur with considerable frequency on construction sites. One research study showed that 30 first aid injuries were incurred for every injury warranting treatment by a physician. With the higher frequency of first aid injuries, considerable information can be gleaned by assessing the causes of these injuries. The analysis of first aid injuries has shown that accident causation can be more readily identified and preventative programs can be more effectively implemented. Results of the analysis of several thousand first aid injuries has shown that valuable information can be obtained by focusing on these minor injuries. The general understanding is that when sufficient minor injuries occur, that eventually a serious injury will occur. Thus, careful attention should be given to the causes of first aid injuries.

Keywords: Accident causation, First aid, Monitoring incidents

INTRODUCTION

In the United States safety performance of construction projects or construction firms is commonly measured in terms of the number of Occupational Safety and Health Administration (OSHA) recordable injuries sustained per 200,000 hours of worker exposure. OSHA recordable injuries are essentially those which require treatment by a physician. Since the OSHA recordable injury rate is used to evaluate project performance or company performance, the information is widely used to establish general industry-wide information about these injuries. Despite this, little information is gleaned about any specific aspects of OSHA recordable injuries. More attention is generally given to fatality statistics to describe the nature of fatality accidents, along with their causation. For example, an often-cited study concerned the causation of fatalities that occurred during the inclusive years of 1985 to 1989 (U.S. Department of Labor 1990). That study found that 33% of the construction worker fatalities were due to falls, 22% were due to struck-by accidents, 18% were due to caught in/between accidents, 17% were due to electrical shock and 10% were due to other causes (drowning, asphyxiation, poisoning, lightning, explosions, etc.). Such statistics have been used to provide guidance to OSHA in the promulgation of new safety regulations. For example, OSHA emphasized fall safety in several regulatory changes that it made during the 1990s. Thus, the statistics that have been generated have been used to implement changes to improve the safety performance of the construction industry. Since the fatality rates have steadily declined during the past few decades, there is reason to believe that OSHA has been effective in improving the safety performance of the construction industry.

While there has been some success in examining fatality statistics, there are many other accidents that warrant attention. A common analogy that is made is that the more serious accidents (those resulting in fatalities or lost workday injury cases) can be likened to an iceberg, which consists of visible ice above the water surface which conceals the bulk of the mass of ice below the water

surface. By focusing on fatalities, a tremendous amount of information is not considered that pertains to the less serious injuries. It is commonly accepted by progressive safety professionals that the focus of attention should be on the causation of minor accidents and close calls. These incidents occur much more frequently than fatalities and serious injuries. It is generally accepted that if a project sustains a large number of minor injuries that a serious injury can be anticipated. The difference between a minor injury and a serious injury is often only a matter of millimetres. As a result, a sustained effort to prevent the occurrence of minor injuries will also prevent the more serious injuries.

Focusing on the analysis of the less serious injuries should provide valuable information by which future injuries can be dramatically reduced. Since this information is not widely publicised, it is felt that such a study might validate the usefulness of such an effort. The intent is to examine information pertaining to the occurrence of first aid injuries and to identify any trends or patterns of injury occurrence that might be illuminated for the construction industry.

LITERATURE REVIEW

One of the early safety professionals in the United States was H.W. Heinrich (1941), an employee of Traveler's Insurance Company who publicized his views on accident causation. He concluded that for every 300 minor injuries there were 29 serious injuries and 1 fatality. In a more recent safety study conducted in cooperation with the Construction Industry Institute it was found that there were approximately 300 first aid injuries (no treatment by a physician being required), for every 10 OSHA recordable injuries, and one lost workday injury (Huang 2003, and Huang and Hinze 2006). While the types of injuries are not that same as in Heinrich's model, the principle of the iceberg is still apparent in both models.

One recent study examined the nature of injury of (first aid) cases that did not warrant attention by a physician. There were injuries sustained on projects where treatment was provided by a clinic. These injuries could be characterized as consisting of primarily first aid cases, but a small portion would also be considered to be OSHA recordable injuries. The data analysis consisted of a broad examination of construction worker injuries, but there was no detailed analysis of the information. For example, the analysis concluded that eye injuries constituted slightly more than 10% of all construction worker injuries (Hinze, et al. 2006).

Numerous studies have been conducted on the analysis of fatality statistics in construction. Since this is not the focus of this paper, these will not be summarized here. Suffice it to say that much research has been conducted with fatality data, but very little data analysis has been conducted with first aid data. The primary reason for this is probably because most companies do not track any information related to first aid injuries. That is, most companies do not document the occurrence of first aid injuries. This lends valued support for the need for further analysis of the numerous, though less serious, first aid injuries.

RESEARCH METHODOLOGY

The objective of this research was to analyze first aid data to identify any patterns or trends that might be apparent. Data were sought from several large construction firms. It was determined that first aid data are not documented by most firms. Presumably, if a worker has a minor injury, that worker simply goes to the nearest first aid kit, quickly treats the injury and returns to work without any record being made of the injury. This seems to be a typical scenario. This is different on many large projects where a nurse's station or emergency medical technician (EMT) station is maintained on the project site. The healthcare professional treats the injured workers who come to the first aid or medic station. The healthcare professional will also make an assessment of the seriousness of the injury. If the injury is deemed serious, the worker will be quickly dispatched to receive medical treatment. Once the injury of a worker has been addressed, the healthcare professional will make a record of the injury. The information is typically documented in an electronic spreadsheet. Three different firms were contacted that provided first aid information from some of their projects. There was considerable similarity between the different records that were received. The first aid injury records contained the following information:

- Time of injury occurrence
- Date of the injury
- Craft of the worker
- Nature of the injury
- Cause of the injury
- Part of the body that was injured

There were 2965 first aid injuries included in the data provided by the three firms. The firms were identified as Firm A, Firm B and Firm C. Firm A was a specialty contractor performing primarily concrete work and the data represented injuries sustained on a number of commercial building projects. Firm B was a large industrial contractor, with the data representing injuries sustained on a series of industrial projects, including shutdown or turnaround projects. Firm C provided data that was accumulated on a single large power plant project. The data were analyzed with the Statistical Package for the Social Sciences (SPSS), version 16.

RESULTS

The analysis of the data was carried out in a straight forward manner. The primary analysis was to examine the frequency distributions of the 2965 first aid injuries for the various factors that were common to the databases. The date of occurrence of the first aid injuries was one of the factors that was defined for each of the cases. The month of the injury occurrence was of interest in this research, this was not examined in this study as some of the project data did not span a full year. From the date of occurrence, the day of the week of injury occurrence was determined. The overall data showed that the frequency of injury occurrence was fairly consistent between Tuesday, Wednesday and Thursday. The occurrence of injuries on Monday was slightly less and the occurrence of injuries on Fridays was considerably less. The lower level of injury occurrence on Monday cannot be readily explained, but the low incidence on Fridays is probably attributed to the practice of industrial and power plant projects not working regular hours on Fridays. When examining the data in terms of the particular firms, it should be noted that Firm A showed no discernable differences for the workdays of the week other than a slight increase in injury occurrence on Thursdays. Firm B statistics were different in that there were significant numbers of injuries on Saturdays and Sundays. These injuries may be associated with shutdown and turnaround projects which typically work around the clock for seven days a week. The occurrence by day of the week showed a slight decline for Firm C from Monday through Thursday with a significant drop on Friday (see Figure 1).

The time of day was examined in two stages. The first was to examine the distribution of injuries by the four six-hour periods in the day, beginning with the six hours between midnight and 6:00 AM. The results show that the greatest number of injuries were concentrated in the period from 6:00 AM to noon, followed by the period from noon to 6:00 PM. When specific companies were considered, it was noted that Firm A had very few injuries between 6:00 PM and 6:00 AM, probably because little concrete work was done during the night time hours. Firm B accrued a significant number of injuries between midnight and 6:00 AM, while Firm C recorded more night time injuries between 6:00 PM and midnight (see Figure 2).

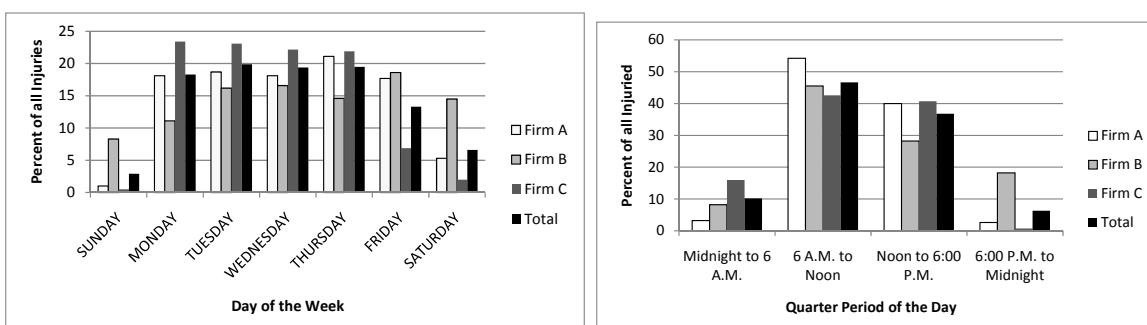


Figure 1. Injury Occurrence by Day of Week Figure 2 Injury Occurrence by Quarter of the Day

The daytime hours from 7:00 AM to 5:00 PM were examined for the proportion of injuries incurred per hour. The overall data shows a fairly even distribution throughout the day with lower frequencies noted during the noon hour and between 4:00 and 5:00 PM. Firm B showed particularly high injury occurrence between 7:00 and 8:00 AM (see Figure 3).

The data included information on the nature of the injuries. The most common (over 50%) type of injuries were sprains, contusions and lacerations. The category of “other” accounted for over a fourth of the injuries, individually representing less common types of injuries such as insect bites, headaches, etc. The data from the different companies was quite similar, although Firm C showed more abrasions, Firm B recorded more burns, and Firm A recorded more fractures. It should be noted that the fractures would clearly be injuries beyond first aid (see Figure 4). The first aid logs tend to record all injuries, not just first aid injuries. This practice of recording all injuries in the first aid log is apparently common as each of the companies that contributed data for analysis indicated that injuries beyond first aid were commonly included in the logs.

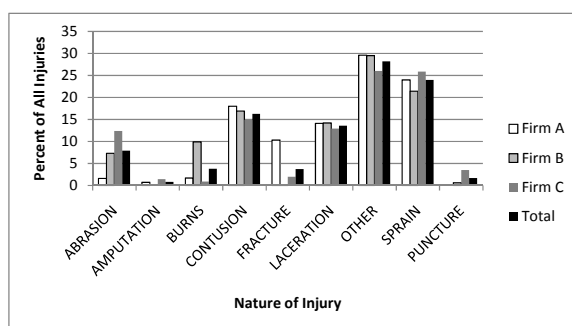
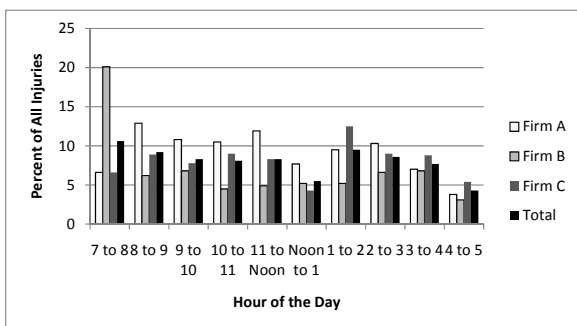


Figure 3. Injury Occurrence by Hour of Day Figure 4 Nature of Injury

The causes of the first aid injuries were examined. The results showed that approximately 30% of all injuries were caused by tools. This was followed by being struck by objects and by slips, trips and falls. There was a high incidence of repetitive motion injuries, but these were primarily those incurred by the employees of Firm C. Fewer injuries were noted to be caused by body mechanics, chemicals, inadequate protection, pointed objects, equipment and caught in/between incidents. The distribution of the causes of injuries did not vary appreciably between the different companies. The only exceptions appeared to be that Firm A had more injuries associated with body mechanics, struck by objects and slips, trips and falls (see Figure 5).

The part of the body involved in the injuries was examined. These data were not readily retrieved from the data provided by Firm B, so only the data from Firm A and Firm C were examined. The most commonly injured body parts were the arms, hands, back and legs. The employees of Firm A, the concrete workers, sustained significantly more feet and face injuries and significantly fewer arm injuries. It should be noted that in the construction industry eye injuries account for about 10 to 11 % of all injuries. Firm A and Firm C have a policy of wearing safety eyewear at all times and this appears to be reflected in the lower number of eye injuries. Similarly, both companies have policies where workers are always to have gloves with them and to make judicious decisions about their use. In the construction industry hand injuries typically account for about 22 to 25% of all injuries. The policies of Firm A and Firm C regarding hand protection appear to be successful as hand injuries accounted for about 16% of the injuries in these firms (see Figure 6).

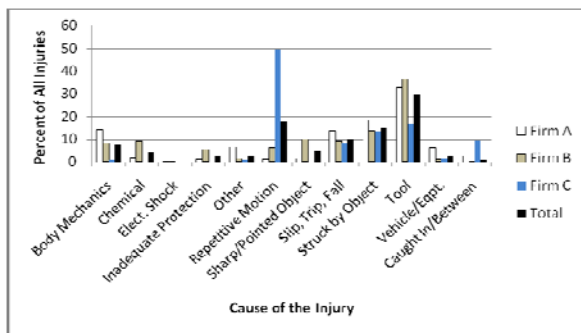


Figure 5. Causes of First Aid Injuries

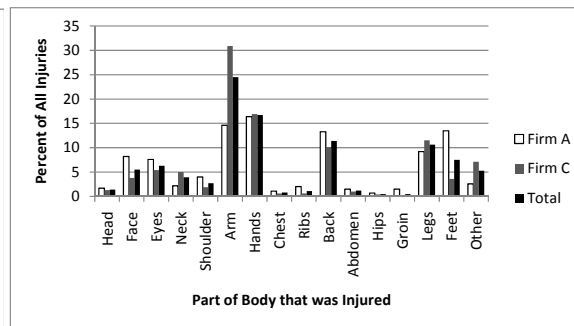


Figure 6. Part of Body Injured

Additional analysis of the data considered the specific trades of cement workers, carpenters, and non-manual workers, the trades that were most numerous in the database. In the database, there were 467 cement workers, 321 carpenters and 848 non-manual employees. Most cement workers were employed by Firm A, while the carpenters and non-manual employees represented Firms B and Firm C to a greater extent. The analysis of injury occurrence by day of the week showed that cement workers had fewer injuries on Wednesday and Friday. The carpenters had a slightly lower injury frequency on Thursday and even lower on Friday. The injury frequency of carpenters was higher than the other trades on Sunday and non-manual injuries were lower on Friday.

The data were examined in terms of the four quarter periods of the day. The carpenters had fewer injuries during the two daytime periods and decidedly more injuries between midnight and 6:00 AM and between 6:00 PM and midnight. There was essentially no difference in the timing of the injuries of the cement workers and the non-manual workers.

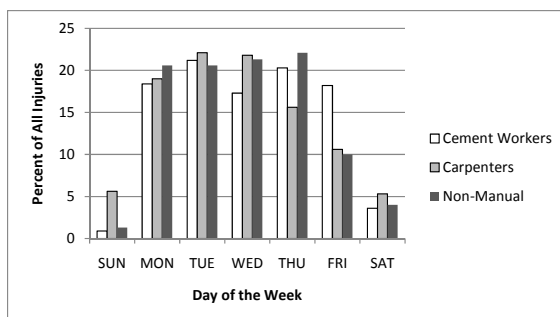


Figure 7. Trade Injuries by Day of Week

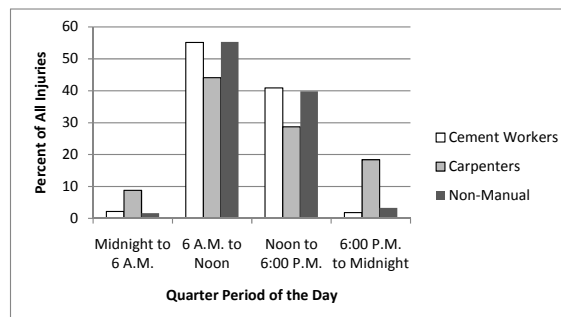


Figure 8. Trade Injuries by Time Period

When worker trade was considered in terms of the nature of injury, it was apparent that carpenters had a greater proportion of sprains and cement workers had a greater proportion of fractures. The cement workers sustained a very small proportion of abrasion injuries and burn injuries. The non-manual workers sustained a small proportion of burn injuries. Other injuries were relatively comparable among the different trades (see Figure 9).

The causes of injuries showed that all trades were comparable when the cause of injury was tools or struck by objects. Carpenters had a smaller proportion of body mechanics injuries but a relatively higher proportion of repetitive motion injuries. Non-manual workers sustained a higher proportion of injuries due to sharp or pointed objects and fewer injuries attributed to slips, trips and falls (see Figure 10).

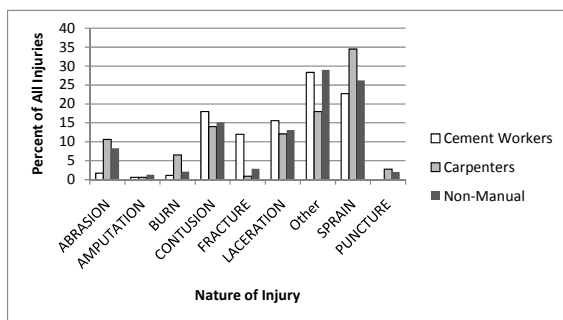


Figure 9. Trade and Nature of Injury

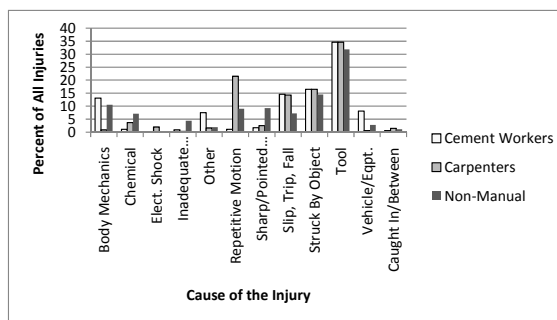


Figure 10. Trade and Cause of Injury

The trade of the workers were examined in terms of the part of the body that was injured. The arms, hands and back were the part of the body most commonly injured. Carpenters had a disproportionately high number of arm injuries, but they had few back injuries. Cement workers had relatively few arm injuries but more injuries to the face, eyes, back, legs and feet (see Figure 11).

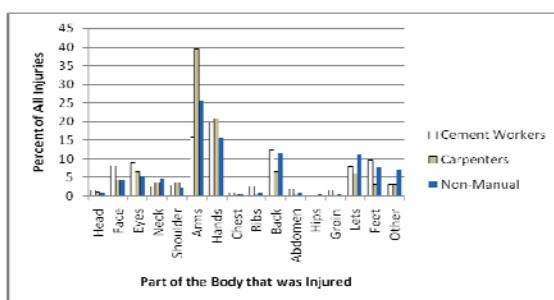


Figure 11. Trade and Body Part Injured

CONCLUSIONS

This research examined first aid injuries that were documented by three different construction companies. A general conclusion that can be drawn from the data is that the distribution of injuries may follow a general pattern but distinct differences were noted between the companies on certain aspects of the injuries. That is, injuries are not random occurrences and their occurrences are not consistent between different companies. As a result, it is concluded that a company would be more successful in developing an effective accident prevention program if it examined the various facets of the injuries of its own employees than those of the construction industry.

Through an examination of the worker trades it can also be concluded that different trades have different types of injuries. This is probably due to the fact that different trades are exposed to different hazards. Different crafts work with different tools, handle different types of building materials, etc. To devise adequate safety programs for a particular trade, it is imperative that an analysis be made of the injuries sustained by that trade. The analysis needs to be trade specific and company specific.

Considerable variability was noted in the injury statistics of the three participating firms. Had additional firms provided data, it is reasonable to assume that the data histories would be unique to each firm. Thus, little would be gleaned if first aid injury statistics were analyzed on an industry-wide basis.

For the firms that provided this information, it can be concluded that safety performance is favourably impacted by the policies of requiring workers to wear eye protection at all times and to always have gloves with them and to use them whenever they are needed. The incidence of eye

and hand injuries was clearly below the national average and it is concluded that the company policies directly contributed to reducing these types of injuries.

RECOMMENDATIONS

While a particular construction company would not benefit directly from examining the statistics that were presented, companies should realize that their own injury statistics would provide a wealth of information by which a safety program could be enhanced. First aid statistics are not generally documented on construction sites. Companies are well-advised to consider devising a means of capturing this type of information. Currently, this is most easily accomplished when a healthcare professional is assigned to a project site. Other means might be explored by which first aid injury information might be retrieved on smaller projects where nurse's stations are not utilized.

Additional research should be conducted on the various aspects of first aid injuries. With a sample of three companies, it is difficult to determine if these are truly representative of the construction industry or not. Such added study of first aid injuries should consist of larger numbers of first aid injuries obtained from a larger number of firms. Just as first aid injuries occur more frequently, so too do close call incidents. An effort should also be expended in obtaining information on the incidence of close calls. These would broaden the data base and provide additional information by which to better understand the causes and other factors associated with the large numbers of minor incidents in the construction industry.

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