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Injury Surveillance in Construction: What Is an "Injury", Anyway?

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Background *Over the last decade, there has been a decline in injuries with days away from work in construction, associated with an increase in injuries with restricted work activity only.*

Methods *We abstracted demographics, diagnosis, cause-of-injury, and hospital discharge information for 481 workers from one large construction project treated in an urban Emergency Department (ED). The project safety team provided data on all injuries from this site, including first aid cases.*

Results *This site had fewer injuries with days away from work than expected from national rates. Two hundred and fifty-six injuries were reported on the OSHA log, and of those 93 entailed days away from work; 1,515 injuries were considered first aid/medical only. We used a sample of the data to estimate that the site classified as "recordable" 128 of the 481 ED-treated injuries from this site (27%).*

Conclusions *The pattern of injury varies depending on the subset of injuries examined. Lost time injuries, as reported in BLS data, record fewer lacerations and eye injuries, and more strains and sprains. No one surveillance system presents the full spectrum of occupational injury. Tracking all injuries allow early recognition of injury risks, and therefore can lead to more effective prevention.* Am. J. Ind. Med. 44:191–196, 2003.

KEY WORDS: construction industry; lost workdays; OSHA recordable injury; occupational health

INTRODUCTION

Construction work is dangerous, with high rates of both fatal and non-fatal injuries. Nineteen percent of all fatal on-the-job injuries occur in construction; about three times its 6% share of the total employment [US Department of Labor and Bureau of Labor Statistics, 2002b]. In 2000, there were 4 lost workday cases per 100 full time equivalent construction workers compared to a rate of 3/100 full time equivalent workers in all private industry; the rate in construction exceeded all other sectors [US Department of Labor and Bureau of Labor Statistics, 2002a]. The overall recordable injury rate in construction was 8.2/100 full time equivalent workers in 2000, second only to manufacturing. Figure 1 compares recordable injury rates in construction to those in all private industry, and displays the decline in injury rates over an 8-year period.

Injury rates in all industries, and injury rates in construction in particular, have been declining. Within this overall decline, there has been a decline in injuries with days away from work, and at the same time an increase in injuries with restricted work activity only. The rate for cases

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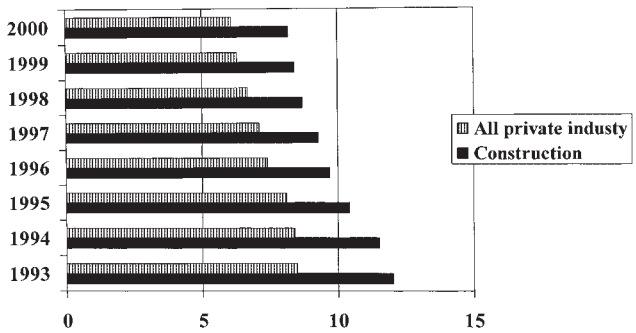

FIGURE 1. Rates of total recordable injury cases per 100 full time workers; BLS data, 2002.

with restricted work activity increased from 0.7 to 1.2 per 100 full time workers between 1990 and 2000, while the days away from work case rate declined from 3.3 to 1.8 per 100 full time workers in the same period.

There are many different ways in which injury data are collected, and the source of data can affect interpretation of injury patterns. OSHA has a specific definition of a recordable injury; OSHA logs are then the basis for the BLS annual survey. State statistics on work-related injury are usually based on reports from workers' compensation claims; a compensible injury is defined in a different way in each state, and many state workers' compensation databases only contain lost work time injuries. Injury statistics obtained from medical sources, such as hospital discharge data or emergency visits, are not directly comparable to either BLS data or workers' compensation data; medical providers do not use the OSHA definition of medical treatment, nor do they include lost work time in a definition of an injury. We have collected injury statistics for one large construction project from three different sources: the site first aid records, the site's OSHA-recordable injuries, and emergency room visits for injured workers. We will use this to illustrate how viewing injury in construction through these different filters can affect our assessment of the problem and our directions for reduction of injury.

METHODS

Each week from October 1990 through December 1998, a member of the research team reviewed all of the hospital registration forms at the George Washington University (GWU) Emergency Department (ED) in Washington, DC. For those patients whose job title, employer, or insurance carrier suggested construction work, demographic, diagnosis, cause-of-injury, and hospital discharge information were abstracted. The study's methods have been previously described [Hunting et al., 1999]. The study protocol was reviewed and approved by the IRB at GWU School of Medicine [Hunting et al., 1994].

During these 8 years of data collection, 3,395 injured construction workers were identified. They worked on a range of construction sites in downtown Washington DC, and included a large number of each of the 16 trade groups. Each injury case was assigned by cause-of-injury (E-code) to one of ten general categories (e.g., "struck by object," "falls") and one of 93 internally defined descriptive categories (e.g., "involving a beam," "from a ladder"). The diagnoses were classified by body location (18 categories, e.g., "low back") and injury type (21 categories, e.g. "laceration," "strain/sprain/pain"). The data were analyzed using SAS Version 6.12 [SAS Institute, Inc., 1996].

While this surveillance system was in place, the GWU ED contracted with a large construction project to provide immediate hospital care for injuries. Workers from this project have been identified within the dataset, and we present analysis of this group of workers. Over the period 5/1/92 to 6/30/97, 481 workers from this project were treated in the ED. The building required 6.6 million person hours to construct. There were 60 different employers involved in the project and 32 different occupations. All site workers were union members. The site had a specific contractor in charge of safety, had a wrap-around workers' compensation insurance program, and had a first-aid trailer on the site for treatment of minor injuries. The site risk management team provided us with a summary report through 6/30/97 that included all injuries: first aid; number and rates for recordable injuries; and injuries with days away from work.

At the site, injuries were classified using the BLS system, while we used E-codes. These two classification systems are not directly comparable. For example, there is an E-code specifically for an injury by a cutting or piercing object, while in the BLS system these injuries are generally included in the "struck-against" group, and usually described as contact with a sharp object. In order to compare patterns of injury for the workers treated in the ED to patterns of injury for all site workers from the first aid logs, we made the following assumptions:

E-code for cutting or piercing object = BLS for contact with a sharp object.
Eye injury as a diagnosis in ICD9 = eye injury as body part in BLS.

OSHA defines a recordable injury as one that requires more than first aid for medical treatment, one that results in loss of consciousness, or one that results in restricted work activity. Restricted work activity occurs if the employee: (1) cannot work a full shift or (2) cannot perform all of his or her normal job duties, defined as any duty he or she would be expected to do throughout the calendar year [OSHA, 2002a]. The distinction between first aid and medical treatment is made. A strain or sprain that does not result in restricted work activity, that is treated with over-the-counter

medication and does not require more than one repeat visit for an assessment is considered first aid. A corneal abrasion that is treated with irrigation and does not require removal of a foreign body can be considered first aid only, if it is not treated with ongoing prescription medication. Treatment in an ED or another medical facility, even if a doctor examines the worker, may not need to be reported on the OSHA 200 log.

A detailed review of 3 months of site log records compared to ED records for the same 3 months showed that all workers we identified in our ED data as having worked on this site were listed on the site's first aid logs. Three percent of the workers listed on the site's first aid logs had been treated in the emergency room but missed by our ED-data abstraction efforts. We also found from this review that not all injured workers from this site with OSHA-recordable injuries were seen at the GWU ED. Washington DC workers' compensation regulations allow workers free choice of medical provider. For the 3 months reviewed, 50% of the recordable injuries were treated at other sites, and 50% were treated in our ED.

RESULTS

The site recorded 1,771 injuries total, including those treated only in the first aid trailer or otherwise classified as first aid only. Two hundred and fifty-six injuries were reported on the OSHA log, and of those 93 entailed days away from work; 1,515 injuries were considered first aid/medical only.

Table I shows injury rates for each year over the course of the project. The rate for injuries with days away from work for the entire project, 1991–1997, was 2.8/100 full time workers. The rate for all recordable injuries was 7.7/100 full time workers. The rate nationally for construction is also included in the table for comparison; this site consistently had a lower rate for injuries with days away from work.

Four hundred and eighty-one workers from this site were treated at the GWU ED. These workers comprised 14% of all 3,395 construction workers treated at the GWU ED during the 8 years of this project. Injured workers from this construction site were similar in age to all construction workers treated in the ED. Workers from this site were more likely to be white (64% vs. 48% overall) and less likely to be Hispanic (3% vs. 19% overall). Proportionally more laborers (37% vs. 29%), more ironworkers (14% vs. 5%), and fewer electricians (7% vs. 14%) were seen from this site than in our overall dataset.

We compared the distribution of diagnoses for workers from this project treated in the ED to the diagnoses among all ED-treated construction workers. Figure 2 shows that, as a proportion of all injuries treated, this site had fewer workers treated for lacerations and eye injuries in the ED than did all construction workers, and proportionally more visits for strains, sprains, and pain. Figure 3 displays a similar comparison for injury circumstances. The proportion injured by a fall, or struck by or struck against, was similar for the workers from this large construction site compared to all construction workers in our ED dataset. Workers from this site were proportionally more likely to have an overexertion injury, and less likely to sustain a cut, in parallel to the higher proportion of strains and sprains and relative deficit of lacerations shown in Figure 2. Since the distribution of trades from this site differed from the distribution among all construction workers seen in the ED, and since injury patterns vary by trade [Hunting et al., 1999] we made some trade specific comparisons. Figures 4 and 5 shows comparisons for electricians and sheet metal workers and plumbers combined. (These two trades were combined because on this site they both worked for the same contractor and had overlapping job duties.) The same overall pattern was seen in these trade-specific comparisons, with proportionally fewer lacerations and proportionally more strains and sprains among the ED-treated workers from the site.

Figure 6 compares the body part injured between all 1,771 cases (including first aid) from the site injury log and the 481 who were treated at the GWU ED. Here we see that

TABLE I. Injury Rates for Site Project 1992—1997, Based on a Cumulative Total of 256 Recorded Injuries, of Which 93 Involved Days Away From Work

Year	Rate of cases with days away from work for project site	Rate of recordable injuries for project site	National rate for cases in construction with days away from work	National rate of recordable injuries in construction
1992	6.5	9.8	5.2	12.9
1993	3.4	7.9	4.8	12.0
1994	3.2	8.9	4.8	11.5
1995	2.6	5.4	4.1	10.4
1996	2.0	8.1	3.7	9.7
1997	1.6	8.3	3.6	9.3
Cumulative	2.8	7.7		

All rates are per 100 full time workers.

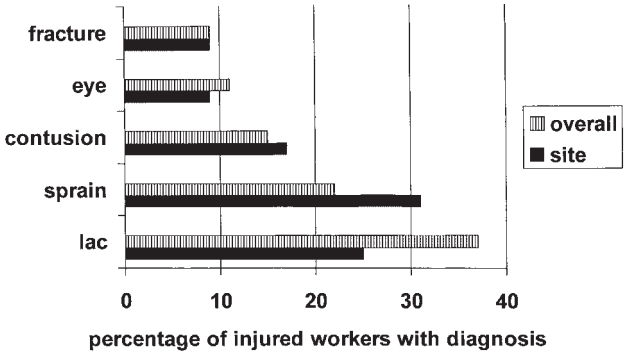

FIGURE 2. Most common diagnoses for 481 site workers vs. all 3,395 construction workers seen in Emergency Department (ED).

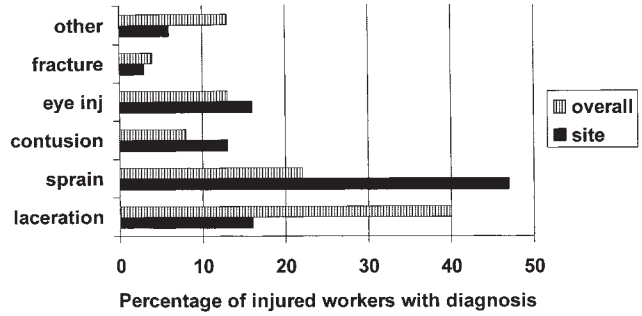

FIGURE 4. Most common injuries for 32 site electricians vs. all 394 electricians seen in ED.

workers requiring treatment in the ED have proportionally fewer eye injuries and hand injuries, and proportionally more back injuries.

The review of the first aid logs show that not all injured workers from this site with OSHA-recordable injuries were seen at the GWU ED. Extrapolating the pattern seen in the 3 month comparison to the entire project time frame, 128 of the 256 recordable injuries would have been seen in the GWU ED. Four hundred and eighty-one workers from this site were treated in the ED, and we estimate that 128 of these, or 27%, were recorded on the OSHA log. (This estimate should be viewed as approximate because of the small number of injuries in the 3-month comparison period.)

In April 1993 we began abstracting information from the ED charts on the doctor's recommendation for time off work or restricted duty (Table II). ED-physicians recommended days away from work for 19 individuals, while restricted duty without days away from work was recommended for 215 cases. The site log reported 76 cases with days away from work in the same time period of April 1993 through June 1997. There were 154 additional recordable cases over this time. (The recordable cases without days away from work could include both medical only and restricted work activity, but we cannot separate those based on the data we have.) If the physicians' recommendations had been implemented, there should have been a minimum of 215 recordable cases without days away from work; this number would be greater if recordable cases without days away from work were seen at other medical facilities.

DISCUSSION

We had a unique opportunity to look at the injury experience from one large construction project through different "filters." In contrast to fatal injuries, there is no single surveillance system capable of capturing a substantial proportion of non-fatal injuries [CDC, 1988]. In a prior analysis of ED data, we found that the data set had about three times the proportion of lacerations and half the proportion of strains and sprains when compared to data from the BLS annual survey [Hunting et al., 1999]. We also found that the ED data had twice as many upper extremity injuries and fewer back injuries than data based derived from lost time injuries. Fingar et al. [1992] found similar differences when comparing injuries treated in an ED to lost time workers' compensation data.

The presence of a first aid trailer to provide immediate care will change the pattern of injuries seen at the next higher level of medical care. As one example, there were 247 eye injuries on the site, representing 14% of all injuries on the

FIGURE 3. Most common injury circumstances for 481 site workers vs. all 3,395 construction workers seen in ED.

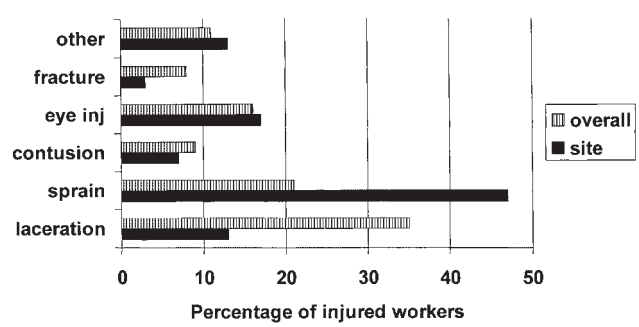

FIGURE 5. Most common injuries for 37 site sheet metal/plumbers vs. all 250 sheet metal/plumbers seen in ED.

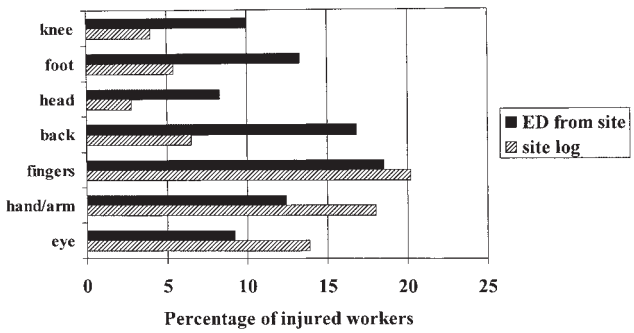

FIGURE 6. Most common body part injured for 1,771 injuries from site log vs. 481 injured workers from site seen in ED.

site log. Forty-five eye injuries were treated in the ED; this is 9% of all 481 injuries treated in the ED from this site. It is likely that if first aid were not available at the work site, some of the other 200 eye injuries would have been evaluated in the ED.

Glazner et al. [1998] in a study of injury during the construction of the Denver International Airport (DIA), found that injury rates, as determined by reports to a single workers' compensation plan and an on-site medical clinic, were higher than those based on BLS data for the same site. The difference was most marked for injuries that did not entail lost work time, when lost work time was defined as more than three scheduled work shifts. These authors reported an overall injury rate of 32.7/100 full time equivalent workers for the construction SIC codes 15–17, using all workers compensation cases as the numerator and hours worked as the denominator. The comparable rate from BLS data for all recordable injuries for these SIC codes during the same period ranged from 11.8 to 13. The rate for lost work time cases was 6.3/100 full time equivalent workers on the DIA, and 4.9–6.1 from BLS data. The rates are not strictly comparable, for a case in Glazner's records was defined by a payment from workers' compensation; some of those cases are not recordable using the OSHA definition, as discussed above. The definition used by Glazner for lost time cases requires more time off work than would the use of the BLS definition. Even if the rates are not strictly comparable, Glazner's data do illustrate the same issue as the data presented here—what is an occupational injury, and are the data sources using the same definitions? In this analysis, we find the pattern of injury varies depending on the subset of injuries examined.

There is an advantage to knowing the entire spectrum of injuries on a construction site. Lowery et al. [2000] reported that contractors whose employees had minor injuries during the construction of the DIA were more likely to report a major injury; those with more than one injury that did not entail lost work time were four times as likely to have a lost work time injury. An active injury prevention program can be successful by focussing on minor injuries as opportunities for early intervention; recording these injuries is essential to this process.

We report a difference between the emergency room doctors' recommendations for time off work or restricted duty and the number of reported lost time/restricted duty cases from the site's OSHA 200 log. This project had an active safety management program including a return-to-work policy. The site safety management team requested that workers be released to work with restrictions rather than being given time off work, so that the worker could be accommodated and kept on the job. The ED doctors recommended time off work for 67 workers, within the number of 76 lost time cases reported on the log in the same time period.

It is unlikely that most of the injured workers seen in the ED and released to work with restrictions were able to return to full duty. The treating doctors in the emergency room recommended modified duty for 215 cases, but the site reported it had to modify duty for a maximum of 154 in the same time period. At the time of this construction project, OSHA said that restricted work activity occurs if the employee: (1) cannot work a full shift or (2) cannot perform all of his or her normal job duties, defined as any duty he or she would be expected to do throughout the calendar year [Occupational Safety and Health Administration and US Department of Labor, 2002]. Restricted work activity limited to the day of injury makes the case recordable. The data here suggest that cases with restricted work activity were not being recorded on the OSHA log. Construction workers perform a variety of tasks in any job, and their mix of tasks varies day to day. The range of tasks performed in a year

TABLE II. Duty Status Recommended by the Treating Physician for Site Workers Treated in George Washington University (GWU) Emergency Department (ED) for 299 Injured Workers*

Days away from work	0	1	2	3	4	5	7	10
No RWA[a]	45	3	7	3	0	3	2	1
Any RWA	215	25	9	4	7	2	1	0
Total	260	28	16	7	7	5	3	1

*Lost time or restricted duty recommendations were missing on 182 cases from this site, and for this analysis we have omitted these cases.

[a]RWA = restricted work activity. If a case had days away from work RWA is restricted work activity after returning to work.

would be quite large. Assigning a worker to a limited set of those tasks for a limited period of time qualifies as a recordable injury, even if the worker is fully productive. Without a clear definition and enforcement of this aspect of the recordkeeping standard, injury rates could vary from site to site or from one year to another without representing an improvement in site safety.

The new OSHA recordkeeping standard clarifies some ambiguities in the prior standard, and reduces the number of injuries that need to be recorded as having restricted duty. Employers are now required to record cases as restricted work cases when the injured or ill employee only works partial days or is restricted from performing their ''routine job functions,'' defined as work activities the employee regularly performs at least once weekly. This narrows the definition of restricted work. BLS data in future years will not be directly comparable to prior years.

Does the decline in national construction injury rates tell us that construction is getting safer? The fatality rate in construction has not declined, and the largest reduction in injuries is for those that do not entail days away from work. Certainly changes in reporting practices could affect injury rates, even without a violation of the OSHA recordkeeping requirements. There are many incentives to employers to reduce injury rates, ranging from decreasing the likelihood of an OSHA inspection [OSHA, 2002b], to saving money on workers' compensation through a better experience modification rating. This specific site had fewer recordable injuries and fewer injuries with days away from work, than what would be expected from national rates for the construction industry. Glazner et al. [1998] concluded that on the construction of the DIA, the injuries that did not entail time away from work were under-reported to the BLS. The same pattern appears here, and suggests under-reporting of this group of injuries as well.

Local on-site programs such as this one are becoming more common, and the success of such programs in lowering lost time injury rates will encourage more use. First aid treatment and early return to work programs do not prevent injuries, and may not change the severity or long-term outcome. Even if these programs are responsible for a drop in the reporting of OSHA recordable injuries and lost time injuries, we must still push forward for primary injury prevention programs. Systems that encourage tracking of all injuries allow early recognition of patterns of injury, and more effective prevention.

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