



Workers' compensation loss prevention representative contact and risk of lost-time injury in construction policyholders

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ABSTRACT

Introduction: Insurance loss prevention (LP) representatives have access and contact with businesses and employees to provide targeted safety and health resources. Construction firms, especially those smaller in size, are a high-risk population. This research evaluated the association between LP rep contact and risk for lost-time injuries in construction policyholders. **Methods:** Workers' compensation data were utilized to track LP rep contact with policyholders and incidence of lost-time injury over time. Survival analysis with repeated events modeling calculated hazard ratios (HR) and 95% confidence intervals (CI). **Results:** Compared no LP contact, one contact was associated with a 27% reduction of risk (HR = 0.73, CI = 0.65–0.82), two with a 41% (HR = 0.59, CI = 0.51–0.68), and three or more contacts with a 28% reduction of risk (HR = 0.72, CI = 0.65–0.81). **Conclusions:** LP reps appear to be a valuable partner in efforts to reduce injury burden. Their presence or contact with policyholders is consistent with reduction in overall incidence of lost-time injuries. **Practical applications:** Reduction in lost-time injuries, resulting in reduced workers' compensation costs for policyholders and insurance companies, builds a business-case for safety and injury prevention. LP reps are often a low or no-cost benefit for insurance policyholders and may be an important injury prevention resource for small firms and/or those with lack of safety resources and staff.

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1. Introduction

Workers in the construction industry experience a high rate of fatalities and injuries (National Institute of Occupational Safety and Health (NIOSH), 2009). The injuries tend to be severity-driven (Courtney, Matz, & Webster, 2002; Dement, 1999) and result in higher instances of disability, lost-work time, increased workers' compensation claim costs (Stover, Wickizer, Zimmerman, Fulton-Kehoe, & Franklin, 2007), and disproportionate financial impact on workers (Waehrer, Dong, Miller, Haile, & Men, 2007). Small construction firms of fewer than 10 employees comprise one-fourth of the construction industry; yet, they experience one half of the fatal injuries (National Institute of Occupational Safety and Health (NIOSH), 2009). It has been reported that smaller companies (under 100 employees) are at increased risk of injury, including lost-work time (Bernacki, Yuspeh, & Tao, 2007; Lowery et al., 1998; Stover et al., 2007). Smaller and non-union companies also

report less health and safety (regulatory) attention on their jobsites (Gillen, Baltz, Gassel, Kirsch, & Vaccaro, 2002), and data on work, hours, and injury occurrence may be more limited (Lipscomb, Dement, & Behlman, 2003), making categorization of risk difficult. Further, smaller companies may lack the knowledge, staff, or resources for safety programs and injury prevention measures that larger companies can provide.

Providers of safety and health assistance are important injury prevention partners, especially for small contractors. Meaningful and impactful collaborative efforts have been the focus of the researchers studying the construction industry (Boatman, Chaplan, Teran, & Welch, 2015; Chang, Nixon, & Baker, 2015; Macario, Hannon, Baker, Branche, & Trahan, 2015; Welch, Russell, Weinstock, & Betit, 2015). Workers' compensation insurance carriers, in particular, have been recognized as powerful agents to partner with the construction industry, disseminate injury prevention information, and motivate change through making business cases for safety (Boatman et al., 2015; National Institute for Occupational Safety and Health, 2014; Welch et al., 2015). Moreover, insurance carrier loss prevention representatives (LP reps) have essential access into businesses and their worker populations, and thus, a unique ability to influence and direct injury prevention interventions (National Institute for Occupational Safety and Health, 2014).

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Research has indicated that LP reps can help reduce the rates of injury and lower the cost of existing claims once they occur (Bernacki & Tsai, 2003; Davis, Badii, & Yassi, 2004; Green-McKenzie, Parkerson, & Bernacki, 1998; Nave & Veltri, 2004; Schofield, Alexander, Gerberich, & Ryan, 2015). Occupational Safety and Health Administration (OSHA) enforcement/consultation contact with construction employers has also produced measurable reduction in workers' compensation claims (Baggs, Silverstein, & Foley, 2003; Foley, Fan, Rauser, & Silverstein, 2012; Haviland, Burns, Gray, Ruder, & Mendeloff, 2010; Levine, Toffel, & Johnson, 2012; McQuiston, Zakocs, & Loomis, 1998).

The objective of this study was to evaluate the association between insurance LP rep contact with construction firms and risk for lost-time injuries in small and medium-sized construction firms.

2. Materials and methods

2.1. Population data

Workers' compensation claims were used to examine injuries to employees of 1360 construction policyholders who obtained workers' compensation insurance from a self-insured workers' compensation fund. The fund insures small- and medium-sized construction and construction-related businesses within the state of Minnesota and is the largest writer of construction workers' compensation in Minnesota. The study included all policyholders insured by the workers' compensation fund and all employee injury claims during a 2192 day time-period from January 1st, 2004 until December 31st, 2009. Most companies were policyholders for the entire length of the study. A small percentage entered or exited during the study time period (Schofield, Alexander, Gerberich, & Ryan, 2013; Schofield et al., 2015).

Time at-risk for the population was based upon hours at-risk for each company and class code estimated from monthly payroll. Class codes are an indicator of expected job risk and are determined by the Minnesota Workers' Compensation Insurance Association (MWCIA), the independent rating bureau for Minnesota. Policyholder data were classified by union-status and premium size. Premium size is largely based on payroll volume and employee job-risk classification (class codes), and the premium size correlates with number of policyholder employees. Workers' compensation claim experience may also affect premium size. A history of higher than average workers' compensation claim costs may inflate premium; lower than average costs may decrease premium. Companies with larger premium sizes may receive more attention from loss prevention representatives. Policyholders were stratified into three premium bands: \$0–15,000; \$15,001–75,000; and \$ > 75,001 (Schofield et al., 2013, 2015).

2.2. Injury claim data and outcomes

Claims data captured all injuries submitted by all policyholders to the workers' compensation insurance fund (WCIF). Claims data include the date of injury, injury characteristics, and costs, and are classified as medical-only or lost-time, depending on claim severity and days of lost work-time. Minnesota workers' compensation classifies an injury as lost-time when injury severity results in more than three consecutive calendar days of lost work time and includes payment of medical and wage loss (indemnity) costs plus reserves for future expected costs (Schofield et al., 2013, 2015). In addition to impact on the injured employee, lost-time injuries have a greater impact on policyholder insurance costs, as the full total of paid and reserved costs will be factored into premium calculations.

2.3. Loss control prevention contact

The WCIF included an LP department staffed with safety and health professionals. All services were provided at no-cost to policyholders. The LP reps were focused on partnering with policyholders to assist

them and their employees with hazard identification and mitigation, injury prevention, and awareness. When an LP rep made contact with a policyholder and/or their employees, if often involved personalized injury prevention services based on the policyholders' needs and goals. Record of the contact and date were documented for all LP activities. Contacts were broken into the following categories: claim investigation, on-site evaluation or updates combined with a jobsite visit, company evaluation or update, jobsite visit, personalized services, providing materials or resources electronically or via mail, recommendation follow-up, and training/education/awareness. Contacts could involve multiple activities in one visit, and were characterized by the main purpose of the contact. Prevention and reduction of employee injuries, particularly more severe lost-time injuries, was the main goal of LP. Furthermore, preventing lost-time injuries is in the best financial interest of both the insurance fund and the policyholder. A total of 4549 documented contact or activities with policyholders occurred during the study time period.

2.4. Modeling repeated events and time-varying covariates

To examine the effect of LP rep contact on the rate of employee lost-time injury claims, each day of the study was individually numbered. Policyholders entered into the study on Day 1, January 1st, 2004 or upon the first date of insurance with the fund. Policyholders exited the study in one of two ways: by leaving the insurance fund or upon end of the study time period. Proportional hazards regression was used to model and measure the time prior to a lost-time event and LP contact during this time interval for each policyholder. Each lost-time injury event was considered independent of prior lost-time injuries. A policyholder could experience multiple lost-time injury events during the six year study time period; therefore, a repeated events model and counting process format was selected. Each record was compiled as (day₁, day₂, I_{event},...), where day₁ represented the day at which the interval started, day₂ the day at which the interval ended, and I_{event} was an indicator showing the end-status of the interval (lost-time injury event, no event, or exit from the study). When a lost-time event occurred, a new time interval would begin the next day.

The exposure variable of interest, LP contact, was included in the model as a time-varying covariate. LP contacts categorized into four levels: 0 contacts; 1 contact; 2 contacts; and 3 or more contacts. Level of LP contact varied from policyholder to policyholder and could change over time, and duration to lost-time injury event varied from company to company. These were measured to maintain the proportional hazards assumption and determine the influence that LP contact had on a lost-time injury event (Ake & Carpenter, 2003; Allison, 2010; Andersen & Gill, 1982; Cox, 1972; Gharibvand, Jeske, & Liao, 2008).

3. Analysis

Data for injury claims and hours at-risk per 100 full-time-equivalents (FTEs) enabled estimation of rates for overall, lost-time, and medical-only injuries. Injury claims were further stratified by trade and union status. Categories of LP rep contact type were created and broken down by size and union status for a descriptive analysis.

Cox proportional hazards regression measured the effect of LP contact on risk of lost-time injury by estimating hazard ratios (HR) and 95% confidence intervals (CI) as a function of injury rate. Each claim was considered to be independent of prior claims. Generalized estimating equations with an auto-regressive correlation structure were used to account for correlated observations within companies over time (Liang & Zeger, 1986). For a multivariate model that included static covariates of union status, company premium size, and hours worked, adjusted hazard ratios were calculated. All analyses were done using proc PHREG procedure (Ake & Carpenter, 2003; Allison, 2010) in SAS (SAS Institute, Inc, 2011).

4. Results

Policyholders experienced an average adjusted total claim rate of 10.54 per 100 FTE, with a medical-only rate of 8.28 per 100 FTE and a lost-time rate of 2.47 per 100 FTE. Approximately 23% of all claims were lost-time injuries. Claim rates varied among trade categories, union status, and premium size. Union companies and companies of larger premium size had higher injury rates (Schofield et al., 2013, 2015).

Services personalized to the policyholder accounted for the most frequent type of LP rep contact. This was followed closely by safety evaluations/updates, and then training and education. Providing materials and resources electronically/remotely and claims investigations were the least frequent contact type (Table 1). Policyholders with the smallest premium size, \$0–15,000, comprised 44% of the population and received approximately 29% of LP rep contacts; policyholders with a premium size of \$15,001–75,000 comprised 45% of the population with 46% of LP rep contacts; the largest policyholders, with premium of \$ > 75,001 made up 13% of the population and received 25% of LP rep contact (Table 2). Union contractor policyholders comprised approximately 22% of the study population and received 33% of total LP rep contacts as compared to non-union contractors who comprised 78% of the population and received 67% of LP rep contacts (Table 3).

Cox proportional hazards was used for the unadjusted and adjusted model analysis. The crude model revealed significantly lower rates of lost-time injury for those companies with LP contact. The adjusted model also illustrated significant reduction in risk of lost-time injury for policyholders that experienced LP contact, with greatest reduction in risk identified for two contacts. Compared no LP contact, one contact was associated with a 27% reduction of risk, two contacts with a 41% reduction of risk, and three or more contacts with a 28% reduction of risk. Companies with greater premium and union status were associated with greater risks of lost-time injuries (Table 4).

5. Discussion

Rates of injury vary by trade and are increased for union contractors and those with a premium size over \$75,000. The risk of lost-time injury was reduced for employees when loss prevention representatives had contact with a policyholder, and this varied by number of LP contacts as well as with company size and union status. These findings extend what is known about risk factors for small and medium-sized construction firms. Furthermore, they provide important new and quantitative information about opportunities to partner with workers' compensation insurance providers to reduce injury burden in the construction sector.

Results indicated companies with the smallest premium size were least likely to experience lost-time injury. This conflicts with other reports that suggest smaller companies are at increased risk of injury (Bernacki et al., 2007; Lowery et al., 1998; Stover et al., 2007). However, it is important to consider that all the companies in this study population would be categorized as small companies in much of published literature. Our study utilized premium size as a surrogate for company

Table 1
LP rep contact type.

Contact type	Contacts, N	Contacts, %
Claim investigation	53	1%
Company eval./update & jobsite visit	370	8%
Company evaluation/update	1166	26%
Jobsite visit	578	13%
Personalized services	1283	28%
Provide materials/resources (electronic)	111	2%
Recommendation follow-up	212	5%
Training/education/awareness	776	17%
Grand total	4549	100%

Table 2
LP rep contact type and frequency by policyholder premium size.

Premium size and contact type	Contacts, N	Contacts, %
\$>75,001	1146	25.2%
Claim investigation	18	0.4%
Company eval./update & jobsite visit	54	1.2%
Company evaluation/update	183	4.0%
Jobsite visit	228	5.0%
Personalized services	385	8.5%
Provide materials/resources (electronic)	33	0.7%
Recommendation follow-up	41	0.9%
Training/education/awareness	204	4.5%
\$15,001–75,000	2102	46.2%
Claim investigation	28	0.6%
Company eval./update & jobsite visit	150	3.3%
Company evaluation/update	525	11.5%
Jobsite visit	277	6.1%
Personalized services	596	13.1%
Provide materials/resources (electronic)	52	1.1%
Recommendation follow-up	88	1.9%
Training/education/awareness	386	8.5%
\$0–15,000	1301	28.6%
Claim investigation	7	0.2%
Company eval./update & jobsite visit	166	3.6%
Company evaluation/update	458	10.1%
Jobsite visit	73	1.6%
Personalized services	302	6.6%
Provide materials/resources (electronic)	26	0.6%
Recommendation follow-up	83	1.8%
Training/education/awareness	186	4.1%
Grand total	4549	100%

size. Premium size is partly indicative of workers' compensation claim experience and costs. Thus, higher risk policyholders may also have larger premium size. Alternately, reports have offered an explanation of reduced injury rates in small companies as being attributed to greater underreporting of injuries in smaller companies versus larger companies (Glazner et al., 1998; Oleinick, Gluck, & Guire, 1995). Descriptive analysis indicated that policyholders with the smallest premium size tend to receive a proportionately smaller amount of LP rep contact than policyholders with a larger premium size. This could be driven by risk, as indicated in the results, by willingness and time to work with LP reps, and/or by business emphasis on certain categories of accounts.

The excess risk for union contractors may be attributable to differing work and organizational environments in union and non-union policyholders. Union environments may have better surveillance, capture, and categorization injuries. There may be increased and more consistent injury reporting at unionized companies where employees may perceive more job security, peer support, and/or less fear of retaliation

Table 3
LP rep contact type and frequency by policyholder union status.

Union status and contact type	Contacts, N	Contacts, %
Union policyholder	1498	32.9%
Claim investigation	19	0.4%
Company eval./update & jobsite visit	104	2.3%
Company evaluation/update	336	7.4%
Jobsite visit	265	5.8%
Personalized services	445	9.8%
Provide materials/resources (electronic)	17	0.4%
Recommendation follow-up	53	1.2%
Training/education/awareness	259	5.7%
Non-union policyholder	3051	67.1%
Claim investigation	34	0.7%
Company eval./update & jobsite visit	266	5.8%
Company evaluation/update	830	18.2%
Jobsite visit	313	6.9%
Personalized services	838	18.4%
Provide materials/resources (electronic)	94	2.1%
Recommendation follow-up	159	3.5%
Training/education/awareness	517	11.4%
Grand total	4549	100%

Table 4
Loss prevention representative contact with policyholder and risk of lost-time injury.

Variable	Crude HR	95% CI	Adjusted ^a HR	95% CI
LC contact				
3+ contacts	0.70	0.62–0.79	0.73	0.65–0.82
2 contacts	0.42	0.37–0.49	0.59	0.51–0.68
1 contact	0.50	0.45–0.56	0.72	0.65–0.81
0 contacts (referent)	1.00	.	1.00	.
Premium size				
>\$75,000	.	.	13.74	11.71–16.11
\$15,000–\$75,000	.	.	3.89	3.33–4.54
<\$15,000 (referent)	.	.	1.00	.
Union status				
Union	.	.	1.16	1.06–1.27
Non-union (referent)	.	.	1.00	.

^a Adjusted for premium size and union status.

for reporting injuries. Notably, unionized companies in this study were, on average, larger in size compared to the non-union companies. In this study LP rep contact practices tend to appear to coincide with assertions that union companies receive proportionately larger amounts of attention than non-union companies. Discrepancies in injury reporting in smaller companies was described previously.

LP contact type provided insight into the types of interactions that LP reps were having with policyholders. Personalized services occurred the most frequently (28%), but lacked detail to specifically examine further. Most contact was in-person; only a small percentage of LP activities were done strictly electronically or remotely (2%). The majority of contact occurred on-premises of the policyholder or on their own jobsites, which could play a role in creating policyholder partnership and effectiveness of LP contact. Additionally, it allows the LP rep to visualize the actual work environment. In-person contact is a factor that could influence reduction of injury risk and should be explored further, especially with trends to move safety and resources online. Simple grouping of LP rep contact into broad categories may be imprecise; multiple activities could occur during the contacts, all contacts may not be reported, or the nature of the contact could be mis-categorized or ambiguous.

Analysis revealed that contact with LP reps significantly reduced risk of lost-time claims, confirming similar findings of several reports on insurance partnership and intervention with policyholders (Bernacki & Tsai, 2003; Davis et al., 2004; Green-McKenzie et al., 1998; Nave & Veltri, 2004; Schofield et al., 2015). Results indicate that significant reduction of risk begins at just one contact, and increases notably with two contacts; having three or more contacts identified an effect comparable to the level of one contact. A possible explanation for the drop after two contacts could be that higher risk policyholders require more contact from LP reps and, thus, do not have continued gains in lost-time injury reduction with increasing LP contact. Findings from this study also agreed with reports of contact/attention from other outside resources or regulatory agencies relevant to reduction of injury risk for construction or heavy industrial companies (Baggs et al., 2003; Foley et al., 2012; Gray & Mendeloff, 2005; Haviland et al., 2010; Levine et al., 2012; McQuiston et al., 1998). In contrast, previous reports, indicating rates of injury and days of disability in firms targeted for regulatory inspection or consultation, did not differ from firms without increased attention (Hogg-Johnson et al., 2012).

Results from this study differed from all the aforementioned reports in terms of the magnitude of risk reduction from LP contact. The magnitude of risk reduction was greater than most prior study results focusing on OSHA visits; yet it was more conservative than the 73% reduction reported in lost-time claims over a 10-year period, based on a workers' compensation team approach (Bernacki & Tsai, 2003; Green-McKenzie et al., 1998). Insurance LP rep contact may elicit a stronger response than regulatory bodies such as OSHA due to an actual or perceived partnership between LP reps and policyholders versus a sole enforcement approach. Multiple LP visits over time may create familiarity, which enhances the partnership approach. Alternately, policyholders may

believe workers' compensation carriers yield a more visible and higher probability incentive, through insurance premiums and coverages, for complying and working with LP reps.

Study methods did not utilize LP rep contact type for the multivariate analysis. More research into efficacy and strategic targeting of LP contacts could increase efficiency or magnitude of risk reduction. Additionally, utilizing a longer study time period may reveal more changes over time. Underreporting of injury claims is a consideration (Fan, Bonauto, Foley, & Silverstein, 2006; Glazner et al., 1998; Oleinick et al., 1995), especially if one group is differentially underreporting. This study investigated only lost-time claims that may be less likely to be underreported due to their severity and lost-work time (Shannon & Lowe, 2002).

The study had several unique strengths, including using industry partnership and workers' compensation data for injury surveillance and research (National Institute for Occupational Safety and Health, 2014). The data used were a comprehensive look at a population at-risk of small and medium-sized contractors. Data were available to characterize policyholder lost-time injury experience over time and measure and track changes based on LP rep contact. Cox regression is a novel approach to the study of injury in a cohort analysis with time-dependent covariates.

6. Conclusion and practical applications

Workers' compensation resources and LP reps appear to be a valuable partner to reduce injury burden of severe, lost-time injuries for small and medium-sized construction policyholders, a high-risk population. Additionally, these services can be deployed proactively to reduce claims, often at little or no cost to policyholders. The reduction in workers' compensation costs for both the policyholders and the insurers make providing resources mutually beneficial and builds a business-case for safety and injury prevention.

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Conflicts

Authors have no conflicts to declare.

Submission declaration

This work is a derived from a subpart of a larger study on risk factors for injuries in small-and-medium-sized construction companies. Descriptive data on the general construction worker population, as well as manuscripts utilizing distinct methodologies to examine distinct hypothesis have been published previously. This work differs in objective, hypothesis, and analysis from other works. Information from previous works has been referenced and cited within the manuscript text. Referenced works are listed below:

Schofield KE, Alexander BH, Gerberich SG, Ryan AD. Management commitment to safety and risk of workplace injury: a workers' compensation insurance perspective. *Journal of safety, health and environmental research*. 2015; 11 (1): 185–193.

Schofield KE, Alexander BH, Gerberich SG, Ryan AD. Injury rates, severity, and drug testing programs in small construction companies. *Journal of safety research*. 2013; 44: 97–104.

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