# Reducing Lost Workdays After Work-related Injuries

## *The Utilization of Athletic Trainers in a Health System Transitional Work Program*

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**Objective:** To determine if an internal employee health program (IEHP), including transitional work, with early access to physical medicine and rehabilitation provided by athletic trainers, will reduce missed workdays following work-related injury. **Methods:** A retrospective review of health system workers' compensation data were conducted for injuries sustained 23-month period preceding (PP) ($N = 713$) and following IEHP implementation ($N = 661$). **Results:** Sixty-two PP and 128 IEHP events resulted in lost workdays (LWDs), $P < 0.001$. For LWDs events, mean days lost decreased from $100.3 \pm 119.7$ PP to $44.6 \pm 69.0$ IEHP, $P = 0.001$, with 2.2 (95% confidence interval [CI]: 1.1–4.2) IEHP 3-week odds of returning to work. **Conclusions:** Internal employee health program reduced LWDs. Internal employee health program was associated with more than 10% increase in LWDs events, but LWDs event mean days lost decreased by more than 50%, with 3-week odds of returning to work more than 2.0.

Work-related injury resulting in lost work time is a large problem for both injured employees and their employers, with nearly 7 million job-related injuries and illnesses occurring annually in the United States, at a cost to businesses of $171 billion.[1] This burden of injury is particularly great among health care workers, who according to the United States Department of Labor, Bureau of Labor Statistics, sustained 7.7 injuries and illnesses for every 100 full-time workers in 2007, with 1.7 resulting in days away from work. During that time, ambulatory health care services workers sustained 3.0 injuries and illnesses for every 100 full-time workers, with 0.6 resulting in days away from work.[2] Injury rates among nurses have also been well-documented with nursing and personal care services having one of the highest nonfatal occupational injury incidence rates, 18.5 per 100 full-time workers.[3]

According to the Bureau of Labor Statistics, in 2007, among work-related injury events that resulted in days away from work, the leading types of nonfatal occupational injuries or illnesses were sprains, strains, and tears, which accounted for 38.4% of all events within private industry and 49.9% of events among education and health services workers.[4] Sixty-seven percent of recent disabling injuries in nursing were due to sprains and strains, most of them due to overexertion in lifting patients.[3] Nurses have one of the highest rates of back and other musculoskeletal injury among all occupations,[5] with up to 38% of nurses affected by back injuries.[3] Back injures are the most frequent type among nurses, with annual prevalence ranging from 30% to 60%; other frequent areas of injury are neck (31%–48%) and shoulder (43%–53%).[5] Nurses are not the only health care providers with documented risk of sustaining work-related musculoskeletal injury. In a study of 90 emergency medical service providers, 47.8% reported a back injury within the previous 6 months, with 39.1% of those sustained while performing emergency medical service duties.[6] Finally, in a study of physical therapists designed to investigate the prevalence and severity of work-related musculoskeletal disorders (WMSDs), the lifetime prevalence of WMSDs was reported to be 91%, and one in six reported having moved within or left the profession as a result of WMSDs.[7] Younger therapists reported a higher prevalence of WMSDs in most body areas.

Musculoskeletal injuries, along with injury prevention, are two of the concentrated areas of an athletic training education. For that reason, athletic trainers have been working in the industrial setting for over two decades.[8] In 2003, the National Athletic Trainers' Association conducted a survey of business administrators to assess the involvement of certified athletic trainers (ATCs) in the occupational work setting.[9] Roles of ATCs identified included wellness, physical conditioning, ergonomics, education/outreach training, rehabilitation and fitness, nutrition consultation, safety, medical case management, and work hardening. One key finding was that almost two-thirds reported that ATCs had helped to decrease restricted workdays and workers' compensation claims for musculoskeletal disorders by more than 25%.

In a study designed to evaluate the impact of workplace-based work hardening, 103 employees with rotator cuff disorders were randomly assigned to either traditional generic clinic-based work hardening or workplace-based work hardening, including principles of athletic rotator cuff pathology, biomechanics, and specific job activities.[10] After 4 weeks, 71.4% of the workplace-based work group had returned to work whereas only 37.0% of the clinic-based work group had returned to work ($P < 0.01$). In a study of 632 claimants with work-related musculoskeletal injuries, of the claimants who were offered a work accommodation order, those who accepted had better outcomes, and those who accepted the offer had even better outcomes than those who never receive an offer, suggesting that workplaces that include work accommodation in their "return to work" disability management program/policy can more successfully reduce the work absence duration of injured workers.[11] Finally, in 2005, Franche et al[12] conducted a review of the literature related to the effectiveness of workplace-based return-to-work (RTW) interventions and concluded that "There was strong evidence that work disability duration is significantly reduced by work accommodation offers and contact between health care provider and workplace; and moderate evidence that it is reduced by interventions that include early contact with worker by workplace, ergonomics worksite visits, and presence of a RTW coordinator."

The purpose of this study was to analyze existing workers' compensation program data to evaluate the effectiveness of an internal employee health program (IEHP) in decreasing lost work time among hospital and clinic employees. We hypothesized that the IEHP, which utilized ATCs to offer workplace-based rehabilitation, at no charge, in conjunction with the initiation of a transitional work program for injured employees, would decrease the number of lost workdays (LWDs) for those who sustained a work-related injury event that resulted in lost work time.

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## METHODS

A retrospective case series evaluation of all health system workers' compensation claims data were conducted for injuries sustained by hospital and clinic employees of St Mary's Duluth Clinic Health System (SMDC), Duluth, MN. Following approval by the health system's institutional review board, data were retrieved electronically for the 23-month period preceding (PP) implementation of the IEHP, January 1, 2004, through November 30, 2005, and the 23-month period following IEHP implementation, January 1, 2006, through November 30, 2007. Injury events sustained during the month of transition, December 2005, were excluded from analysis ($n = 25$), as were events associated with cancelled claims ($n = 219$, 111 PP and 108 IEHP), resulting in a study sample of 1374, 713 PP injury events, and 661 IEHP injury events.

### Internal Employee Health Program (IEHP)

In the state of Minnesota, athletic trainers are registered through the board of medicine, providing physical medicine, and rehabilitation under a physician approved protocol. The ultimate decision on whether an employee should be taken out of work or returned to work is made by the physician. The IEHP involved athletic trainers offering workplace-based rehabilitation, at no charge, along with the initiation of a transitional work program for injured employees. Employee injury care at SMDC followed a traditional pathway. Injured employee reported the incident to a supervisor, was scheduled to see a physician, and was treated with standard options of imaging, physical therapy, and medication. A new process was introduced in 2005. We specifically implemented multiple tools into a contiguous program that would allow increased access, increased medical attention, greater communication, and awareness of job function and RTW options, and a transitional work program. Of key importance to this new program was the introduction of athletic trainers in the evaluation and treatment of injured employees. In the state of Minnesota, athletic trainers are registered through the board of medicine, providing physical medicine and rehabilitation under a physician approved protocol. After the completion of a comprehensive "workers compensation collaborative," which involved multispecialty discussion of injured employee care, a set of standardized treatment protocols were established to allow our athletic trainers to work under the medical directorship of a staff physician. This group worked as a team, much like would happen with a professional sports team, to monitor, treat, and effectively return injured employees to work. This relationship between the medical director and athletic trainers allowed for same day access for work injuries, daily rehabilitation if necessary, and direct involvement at the worksite to help reintegrate the injured employee's safely into their work. In particular, this process helped avoid delayed medical treatment, more efficiently handle rehabilitation, and more confidently return patients to work, as the athletic trainers not only treated them but also when necessary would accompany them to their work to ensure that they were safe and comfortable with their return.

The trigger for RTW is, as is customary, the purview of the physician. However, this is generally decided in discussion and agreement between the physician and the patient utilizing medical and therapeutic tools available to keep the patient/employee working effectively and safely. Our new program did not incorporate physician practice as a new part of the program. Physician evaluation and decision-making has been a standard for the care of our employees that dates back decades at least. Unprecedented changes in outcomes, however, were observed with the additional therapeutic tools offered via the program described in this literature. Certainly, physician attitude and decision can affect the ultimate outcome, but the premise here is that the additional tools made available through this RTW program assisted the treating physicians, in this case, in the efforts to maintain a healthy and productive workforce, and was also, reasonably, a useful tool to help treat and "persuade" the patients that they were safe to return and maintain work.

### Participants

It was not the injured employee, but rather the injury event sustained by the employee that was the level at which data were collected and analyzed. Therefore, an individual employee could have been included in the analysis more than once for multiple injury events, with injury events that resulted in lost work time the primary focus of analysis. The number of work-related injury events experienced by an individual employee ranged from one to five, with the number of associated LWDs ranging from 0 to 367, and an individual employee sustaining zero to three events resulting in LWDs.

### Analysis

Period preceding work-related injury events were compared with IEHP events, with LWDs evaluated in two ways-–first, injury events were assessed for whether or not they resulted in any LWDs, for the population as a whole, then for male and female employees, separately, using the chi-square test of significance. Then, because the IEHP was designed to impact employees with injury events that would result in LWDs, the number of LWDs was evaluated for events that had resulted in LWDs, 62 PP and 128 IEHP. This analysis utilized three methods as follows: (1) independent samples *t* test analysis assessed the mean number of missed workdays; (2) unadjusted odds ratios (OR), with Woolf's 95% CI, evaluated the simple odds of returning to work within fixed intervals (by 1–8 weeks); and (3) stepwise logistic regression determined the adjusted odds of returning to work within the same fixed intervals, with time period (PP vs IEHP) entered into each model, then sex, age, and type of injury entered stepwise, when statistically significant.

## RESULTS

### Sample Characteristics

Comparing PP and IEHP work-related injury events, there was no significant difference in the sex of the employee or the time of year, whether viewed as a whole or restricted to only those events that resulted in LWDs (Table 1). Overall, the age of the employee at the time of the injury event rose by an average of 1.3 years ($t = -2.1$ $df = 1368$ $P = 0.04$). This difference in age may reflect the aging of SMDCs relatively stable employee population across the elapsed time of the study. However, the mean age for events that resulted in LWDs did not change significantly, so the same pattern was not mirrored consistently in this important subgroup of employee injury events.

The majority of reported employee work-related injury events resulted in sprains, strains, and other repetitive motion injuries, with a significantly different distribution of injury types for PP events and IEHP events among all injury events ($\chi^2 = 58.7$, $df = 5$, $P < 0.001$) and those events that resulted in LWDs ($\chi^2 = 15.2$, $df = 5$, $P < 0.01$).

### Any Lost Workdays

As shown in Table 1, work-related injury events sustained during the IEHP period were significantly more likely to result in LWDs ($\chi^2 = 32.8$, $df = 1$, $P < 0.001$). This substantial increase occurred among both male and female employees ($\chi^2 = 16.4$, $df = 1$, $P < 0.001$ and $\chi^2 = 17.9$, $df = 1$, $P < 0.001$, respectively).

### Lost Workdays

The mean number of LWDs decreased significantly (Fig. 1), $t = 3.4$, $df = 81.2$, $P = 0.001$. This decrease was significant for female employee events, $t = 3.1$, $df = 48.8$, $P < 0.01$, but not for those

 

**TABLE 1.** Sample Characteristics

| | LWD | | | |
|---|---|---|---|---|
| | All Injury Events | | Injury Events* | |
| | PP (*N = 713*) | IEHP (*N = 661*) | PP (*N = 62*) | IEHP (*N = 128*) |
| *Employee involved in injury event* | | | | |
| Sex: female, *N* (%) | 545 (76.5) | 504 (76.2) | 49 (79.0) | 90 (70.3) |
| Age (mean ± standard deviation)** | 42.2 ± 11.5 | 43.5 ± 11.6 | 44.1 ± 10.8 | 43.4 ± 12.0 |
| *Month of injury event, N* (%) | | | | |
| January–March | 198 (27.8) | 185 (28.6) | 16 (25.8) | 40 (31.3) |
| April–June | 185 (25.9) | 139 (21.5) | 10 (16.1) | 20 (15.6) |
| July–September | 178 (25.0) | 175 (27.1) | 20 (32.3) | 37 (28.9) |
| October–December*** | 152 (21.3) | 147 (22.8) | 16 (25.8) | 31 (24.2) |
| *Type of injury event, N* (%)*,**** | | | | |
| Bruise/contusion/cut/laceration/bite | 116 (16.3) | 111 (16.9) | 1 (1.6) | 6 (4.7) |
| Sprain/strain/repetitive motion | 462 (64.8) | 357 (54.4) | 44 (71.0) | 78 (61.4) |
| Burn/dermatitis | 53 (7.4) | 34 (5.2) | 1 (1.6) | 10 (7.9) |
| Dislocation/fracture/torn cartilage or joint | 12 (1.7) | 22 (3.4) | 2 (3.2) | 9 (7.1) |
| Swelling/inflammation/stiffness/pain | 24 (3.4) | 92 (14.0) | 5 (8.1) | 20 (15.7) |
| Other disease or injury | 46 (6.5) | 40 (6.1) | 9 (14.5) | 4 (3.1) |
| *Body part injured, N* (%)* | | | | |
| Head/neck/spine | 97 (13.7) | 73 (11.2) | 3 (4.9) | 6 (5.0) |
| Trunk | 224 (31.7) | 168 (25.8) | 25 (41.0) | 39 (32.5) |
| Upper extremity | 280 (39.7) | 243 (37.4) | 27 (44.3) | 40 (33.3) |
| Lower extremity | 82 (11.6) | 17.8 (17.8) | 5 (8.2) | 27 (22.5) |
| Multiple body parts | 23 (3.3) | 50 (7.7) | 1 (1.6) | 8 (6.7) |
| *Any LWDs? N* (%) | | | | |
| All employees* | 62 (8.7) | 128 (19.4) | | |
| Female employees* | 49 (9.0) | 90 (17.9) | | |
| Male employees* | 13 (7.8) | 38 (24.2) | | |

*All injury events: PP versus IEHP comparison, chi-square test of significant at $P < 0.05$.
**All injury events: PP versus IEHP comparison, $t$ test significant at $P < 0.05$.
***Contains only 1 year of December data.
****LWD injury events: PP versus IEHP comparison, chi-square test of significant at $P < 0.01$.
IEHP, internal employee health program; LWD, lost workday; PP, period preceding.

sustained by male employees. However, the statistical power for the subgroup comparison among males was low (power = 71%, two-tailed $\alpha = 0.05$). The unadjusted odds of returning to work (Table 2) increased gradually from 1 to 7 weeks (OR range: 1.7–3.4), and then tapered off, with significantly elevated odds of returning to work from 2 to 8 weeks (OR range: 1.99–3.19). This difference can be seen clearly in the Kaplan–Meier "survival" analysis for lost work weeks presented in Fig. 2, where those with open claims as of April 1, 2009, are identified as censored. After adjusting for sex, age, type of injury, and body part, when statistically significant (Table 3), a slightly different picture immerges. The adjusted odds of returning to work associated with the treatment period (PP vs IEHP) increases from week 1 to 6 (OR range: 1.8–2.6), with a gradual decrease thereafter, but the adjusted odds do not demonstrate the same linear incremental increase seen in the unadjusted values. This variation is primarily associated with significantly decreased odds of returning to work by weeks 3–8 for more serious types of injury events (OR range: 0.49–0.21). In addition, male employees demonstrated increased adjusted odds of returning to work in less than 1 week (OR = 2.3, 95% CI 1.07–5.06) and later, by 6 to 8 weeks (OR = 2.6, 2.3, and 2.4, respectively). Increased age was associated with consistently decreased odds of returning to work by 2 weeks.

## DISCUSSION

The ultimate decision on whether an employee should be taken out of work or returned to work was made by a physician, study outcomes were not directly dependent upon decisions or actions of the athletic trainers participating in the IEHP. Although the proportion of injury events resulting in LWDs increased by more than 10%, no demographic differences existed among events that resulted in LWDs during the PP and IEHP periods. There was a significant difference between the type of event that resulted in LWDs for PP and IEHP events, but the proportion of IEHP strain, strain, and repetitive motion events that resulted in LWDs (61.4%) was similar to the nursing rate of sprains and strains reported by Stetler et al[3] (67%), suggesting that IEHP events were similar to other reported disabling health care workplace injury events. Study results were also comparable to those of Cheng and Hung[10] with the proportion of employees who had returned to work significantly higher for IEHP events, which were offered workplace-based rehabilitation, than for PP events. By 4 weeks, 54.7% of IEHP events had returned to work, compared with 35.7% of PP events (OR = 2.2, 95% CI 1.2–4.1). By 6 weeks, the difference had increased to 68.0% of IEHP events and 40.3% of PP events (OR 3.1, 95% CI 1.7–5.9). After adjusting for the sex, age, type of event, and body part, when statistically significant, those differences remained.

 

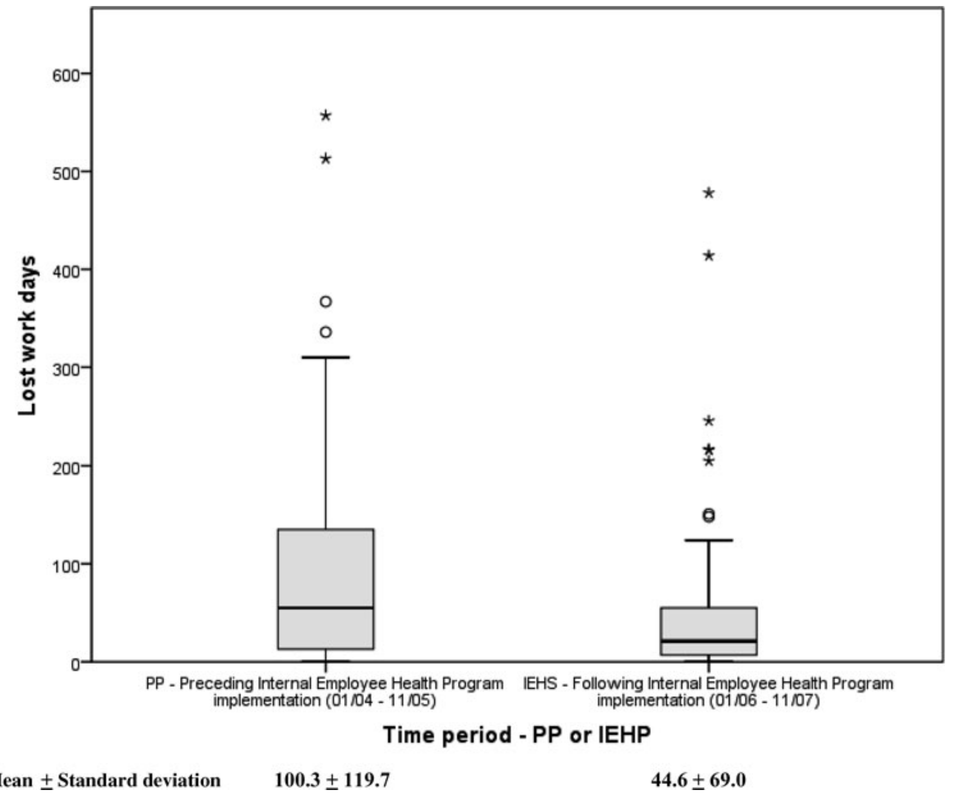


**FIGURE 1.** Five-number summary: lost workday injury events (62 PP and 128 IEHP). LWD events—lost days: PP versus IEHP comparison, *t* test significant at $P < 0.01$. IEHP indicates internal employee health program; LWD, lost workday; PP, period preceding.

**TABLE 2.** Unadjusted Odds of Returning to Work*

| Returned to Work (in less than ...) | PP ($N = 62$) | IEHP ($N = 128$) | Odds ratio | 95% CI |
|---|---|---|---|---|
| 1 week | 8 (12.9) | 28 (21.9) | 1.89 | 0.81–4.43 |
| 2 weeks | 17 (27.4) | 55 (43.0) | 1.99 | 1.03–3.85 |
| 3 weeks | 19 (30.6) | 63 (49.2) | 2.19 | 1.16–4.17 |
| 4 weeks | 22 (35.5) | 70 (54.7) | 2.19 | 1.17–4.10 |
| 5 weeks | 24 (38.7) | 78 (60.9) | 2.47 | 1.33–4.60 |
| 6 weeks | 25 (40.3) | 87 (68.0) | 3.14 | 1.68–5.89 |
| 7 weeks | 27 (43.5) | 91 (71.1) | 3.19 | 1.70–5.99 |
| 8 weeks | 31 (50.0) | 96 (75.0) | 3.00 | 1.58–5.68 |

*Injury events that resulted in LWD only.
CI, confidence interval; IEHP, internal employee health program; PP, period preceding.

## Limitations

Among the limitations associated with this study is the complex nature of employee motivation to RTW following a work-related injury event. Among associated influential factors are the following: the employee's relationship with coworkers, whether the employee enjoys his or her current position, and the employee's relationship with a supervisor. These factors are not addressed in this study. Another limitation of the study is the inability to draw meaningful conclusions about injury events sustained by male employees that resulted in at least one missed workday due to an insufficient subsample size (13 PP and 38 IEHP). A limitation with a retrospective review of past data is that the researchers do not have control of the quality of the data itself. Though data on race were not available from the workers' compensation claims database, it must be acknowledged that the population of the region from which SMDC draws its employees is predominantly white and resides in an urban setting, so this population may not be representative of health care workers as a whole.

# CONCLUSIONS

The goal of this study was to evaluate utilization of ATCs in an industrial/clinical setting. Evidence-based assessment of the effectiveness of utilizing ATCs to offer workplace rehabilitation in the industrial setting of health care facilities and other corporations is necessary to advance their role in this field.

Lost workdays due to work-related injury can be a financial burden for both the employer and the employee. Unnecessary time away from work also creates psychological issues and physical deconditioning. The IEHP implemented by the participating health care system, which utilized ATCs to offer workplace-based rehabilitation, at no charge, in conjunction with the initiation of a transitional work program for injured employees, reduced LWDs, with adjusted odds of returning to work following a work-related injury event more than doubling by 3 weeks. Further analysis is needed to assess the financial impact of this IEHP. Finally, a qualitative study of patient satisfaction may be beneficial in also demonstrating to administrators that employees feel this type of service is a valued asset.

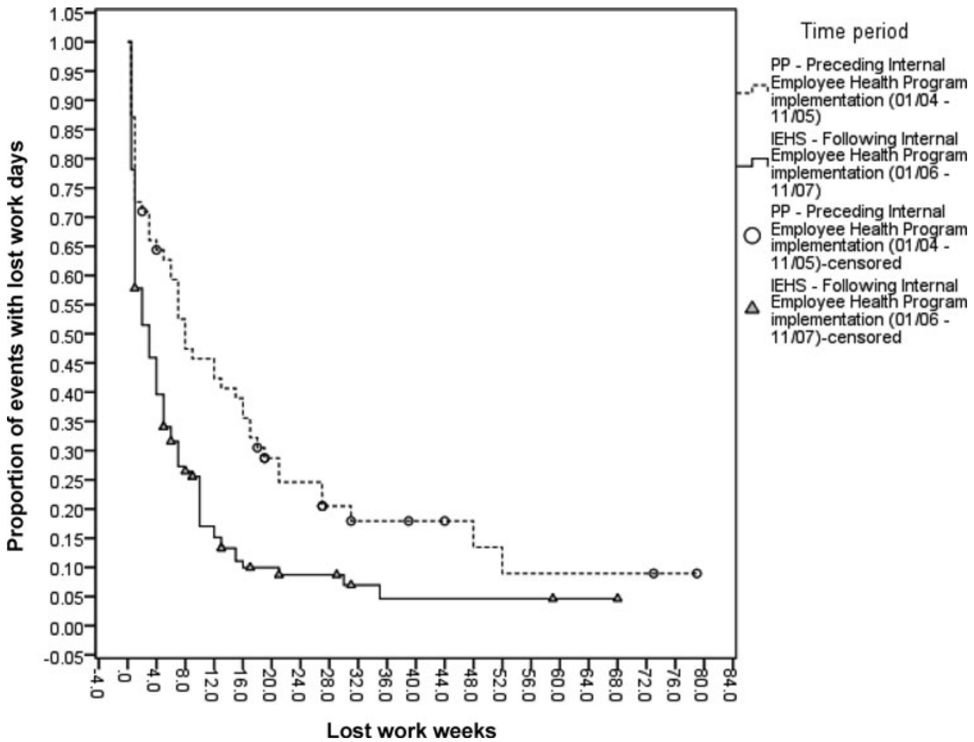


**FIGURE 2.** Events with lost work days: Kaplan–Meier analysis—number of lost workweeks.

**TABLE 3.** Stepwise Logistic Regression Analysis*—Adjusted Odds of Returning to Work

| Returned to Work (in less than . . . ) | Time** | Sex*** | Age**** | Injury type***** |
|---|---|---|---|---|
| 1 week | 1.79 (0.75–4.26) | 2.33 (1.07–5.06) | ns | ns |
| 2 weeks | 2.30 (1.16–4.58) | ns | 0.97 (0.94–0.99) | ns |
| 3 weeks | 2.19 (1.11–4.30) | ns | 0.97 (0.94–1.00) | 0.49 (0.22–1.08) |
| 4 weeks | 2.14 (1.10–4.16) | ns | 0.97 (0.94–1.00) | 0.34 (0.15–0.78) |
| 5 weeks | 2.19 (1.13–4.23) | ns | 0.97 (0.94–1.00) | 0.29 (0.12–0.70) |
| 6 weeks | 2.62 (1.34–5.11) | 2.63 (1.23–5.61) | ns | 0.25 (0.09–0.66) |
| 7 weeks | 2.49 (1.27–4.88) | 2.25 (1.05–4.80) | 0.97 (0.94–1.00) | 0.26 (0.10–0.69) |
| 8 weeks | 2.45 (1.25–4.81) | 2.37 (1.07–5.22) | ns | 0.21 (0.07–0.64) |

*Injury events that resulted in LWDs only (PP = 62 and IEHP = 128); body part(s) involved tested in each model, but not significant in any.
**Time: IEHP compared with PP; entered into the model; sex, age, and injury type allowed to enter, stepwise.
***Sex: male compared with female; allowed to enter stepwise, when statistically significant ($P < 0.05$).
****Age: in years; allowed to enter stepwise, when statistically significant ($P < 0.05$).
*****Injury type: strains, sprain, repetitive motion injuries, dislocations, fractures, torn cartilage or joints, other diseases, or injuries, compared with bruises, contusions, cuts, lacerations, bites, burns, dermatitis, swelling, inflammation, stiffness, or pain; allowed to enter stepwise, when statistically significant ($P < 0.05$).

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## REFERENCES

1. The Comprehensive Guide to Health Ergonomics. *Health Ergonomic Program Development: part III*. St Petersburg, FL: ErgoRehab, Inc; 2002.
2. United States Department of Labor, Bureau of Labor Statistics. *Workplace Injuries and Illnesses in 2007*. USDL 08-1498. http://www.bls.gov/news.release/pdf/osh.pdf. Accessed July 10, 2008.

 

3. Stetler C, Burns M, Sander-Buscemi K, Morsi D, Grunwald E. Use of evidence for prevention of work-related musculoskeletal injuries. *Orthop Nurs*. 2003;22(1):32–41.

4. United States Department of Labor, Bureau of Labor Statistics. *Nonfatal Occupational Injuries and Illnesses Requiring Days Away form Work, 2007*. USDL 08-1716. http://www.bls.gov/news.release/osh2.nr0.htm. Accessed July 10, 2008.

5. Trinkoff A, Brady B, Nielson K. Workplace prevention and musculoskeletal injuries in nurses. *J Nurs Adm*. 2003;33(3):153–158.

6. Crill M, Hostler D. Back strength and flexibility of EMS providers in practicing prehospital providers. *J Occup Rehabil*. 2005;15(2):105–111.

7. Cromie J, Robertson V, Best M. Work-related musculoskeletal disorders in physical therapists: prevalence, severity, risks, and responses. *Phys Ther*. 2000;80(4):336–351.

8. Zimmerman G. Industrial medicine and athletic training: cost effectiveness in the non-traditional setting. *J Athl Train*. 1993;28(2):131–136.

9. Halls C. *Executive Summary: Certified Athletic Trainers Deliver ROI in Occupational Work Settings—A Report From the Clinical/Industrial/Corporate Athletic Trainers' Committee*; 2003. http://www.nata.org/employers/hosp-clinic/deliver_ROI.htm. Accessed July 10, 2008.

10. Cheng AS, Hung LK. Randomized controlled trial of workplace-based rehabilitation for work-related rotator cuff disorder. *J Occup Rehabil*. 2007;17(3):487–503.

11. Franche RL, Severin CN, Hogg-Johnson S, Cote P, Vidmar M, Lee H. The impact of early workplace-based return-to-work strategies on work absence duration: a 6-month longitudinal study following an occupational musculoskeletal injury. *J Occup Environ Med*. 2007;49(9):960–974.

12. Franche R, Cullen K, Clarke J, Irvin E, Sinclair S, Frank J. The Institute for Work & Health (IWH) Workplace-Based RTW Intervention Literature Review Research Team. Workplace-based return-to-work interventions: a systemic review of the quantitative literature. *J Occup Rehabil*. 2005;15(4):607–631.