

Final Report

"An Intervention to Reduce Disability in Injured Workers"  
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## **List of Abbreviations**

CTS = carpal tunnel syndrome

WMSD = work-related musculoskeletal disorders

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## **Abstract**

Objectives: To evaluate the effectiveness of an ergonomic intervention in reducing days lost from work among persons with work-related musculoskeletal disorders.

Methods: Workers from health care, airline ground crew, and a university were eligible for enrollment if they had an accepted claim for an acute or chronic musculoskeletal disorder that resulted in five or more days away from usual work (lost days or restricted duty). After recruitment, workers were randomized to usual care, or to an intervention consisting of ergonomic evaluation of the subject's work with tailored recommendations for changes to be made by the worker and the employer. The intervention also included a case coordinator, who communicated medical and ergonomic issues to the employer, employee, and treating physician. Time loss data were obtained from OSHA 200 logs; analysis was by intention-to-treat, with follow up for one year from time of injury.

Results: Work loss data were available for 278 workers (145 control, 133 intervention). Onset of symptoms was acute in 86% of cases; sites included the low back (46%), the lower extremities (18%), and the upper extremities or neck (36%). Workers in the intervention group experienced fewer days of lost time with the initial injury (mean 10.4 vs. 18.0 days,  $p = .07$ ). The total number of days lost and restricted from the initial injury was similar (mean 32.2 vs. 31.1). The proportion of workers with recurrent injury in the year following the index injury was 18% in both groups. At six months following injury, there were few differences in functional status or satisfaction with work or medical care between the two groups. Many workers reported continuing disability following return to full duty work. Measures of health-related quality of life improved over six months, but bodily pain and physical functioning scores remained lower than expected based on national averages.

Conclusions: An intervention consisting of an ergonomic evaluation and work change recommendations for the worker and employer reduced days lost from work at the time of initial injury and over the next year. Total days lost and restricted were not reduced. Recommendations for job changes were not universally implemented, which may have limited the effectiveness of the intervention. Following return to work, many workers experienced re-injury or reported persistent limitations in function six months following injury. National statistics may under-represent the full burden of disability following work injury.

## **Significant Findings**

An intervention consisting of an ergonomic evaluation and work change recommendations for the worker and employer reduced days lost from work at the time of initial injury. Workers who received this ergonomics and case management intervention had a shorter duration of lost time than workers receiving usual care. At six months following injury, there were few differences in functional status or satisfaction with work or medical care between the two groups. Many workers reported continuing disability following return to full duty work. National statistics may under-represent the full burden of disability following work injury.

## **Usefulness of Findings**

Wider application of ergonomic interventions may reduce the burden of disability and time loss following work-related musculoskeletal injuries. A more complete picture of the costs and disability resulting from musculoskeletal injuries may be obtained by use of data beyond time loss and workers' compensation statistics.

## Scientific report

### Background

Our study addressed the prognosis and treatment of work-related musculoskeletal disorders (WMSD), a major cause of costs and disability in working populations. WMSD affect an estimated 19 million persons per year in the United States and account for the majority of workers' compensation costs. We tested the effectiveness of an early integrated case management and ergonomics intervention to reduce work loss and costs resulting from WMSD in a randomized clinical trial enrolling 310 injured workers from three worker groups: hospital workers, airline ground crew, and university employees. Our intervention was novel in two important ways: it was instituted very early in the course of time loss injuries (at five days of lost time or restricted work duties), and it consistently made use of ergonomic workplace evaluations and job modifications.

### Specific Aims

**Specific Aim 1: Evaluate the effectiveness of an early integrated case management and ergonomic intervention in reducing time loss and other work absence among subjects with work-related musculoskeletal disorders.**

Hypothesis 1: Injured workers randomized to the intervention group will return to usual work sooner than workers randomized to the control group. The proportion of workers with prolonged work absence will be smaller in the intervention group than in the control group. Following initial return to work, workers in the intervention group will have fewer days of lost time and work absence in the six months following injury.

**Specific Aim 2: Evaluate the effectiveness of an early integrated case management and ergonomic intervention in reducing workers' compensation costs among subjects with work-related musculoskeletal disorders.**

Hypothesis 2: Total direct workers' compensation costs (medical costs, payments for temporary and permanent disability, and administrative costs) will be lower in the intervention group than in the control group. The intervention will be cost-effective, with cost savings exceeding the costs of the intervention.

**Specific Aim 3: Examine associations between self-reported functional status, job satisfaction, and other variables with the duration of disability and total case costs among persons evaluated early in the course of a work-related musculoskeletal disorder.**

Hypothesis 3: Self-reported functional status, job satisfaction, and other variables measured in the first week of injury will be predictive of functional and financial outcomes. Baseline data collected in the study will allow the

identification of patients at increased risk of prolonged disability or high costs of care.

**Specific Aim 4: Evaluate whether satisfaction with the workers' compensation care process is altered by the early case management and ergonomics intervention among patients, employers, and physicians.**

Hypothesis 4: Satisfaction with the care process, including satisfaction with medical treatment and administrative procedures, will differ between patients in the intervention and control groups. Satisfaction of employees' supervisors and treating physicians will also differ between employees in the intervention and control groups. We hypothesize that satisfaction with the care process will improve for all these groups when patients, physicians, and employers are receiving the additional services offered by the intervention group. However, decreased satisfaction in any or all these groups may result if the intervention is seen as intrusive or burdensome.

**Procedures and Methodology**

Workers were recruited from three large employers: a large health care system, airline ground crew, and a university. Study eligibility required subjects to have an accepted workers' compensation claim for an acute or chronic musculoskeletal disorder resulting in five or more days of total or partial disability (five or more workdays of restricted duty or time loss recorded in medical treatment records). Patients were identified through a computerized patient registration system at occupational health clinics serving the worker populations in our study. Following identification through the clinic registration system, prospective subjects were contacted by telephone to ensure that they met eligibility criteria concerning time away from usual work.

Administrative data were obtained from OSHA 200 logs and workers' compensation data from the three employers, and through a limited review of medical records. To evaluate completeness of reporting of lost and restricted workdays on the OSHA 200 log, we compared OSHA 200 log data on total days lost and restricted from work was compared with data from medical records that showed the date when the treating physician released a patient back to full duty work by removing work restrictions. The OSHA 200 log counts only lost or restricted days of scheduled work, while the measures of lost and restricted workdays derived from medical records utilized calendar days. Weekend days and national holidays were removed from the physician-determined lost or restricted workdays to allow for more direct comparison with OSHA 200 log data. In addition to these administrative data, all subjects completed a baseline telephone interview that included questions on work and functional status, symptoms and symptom severity, as well as job satisfaction. Six months later subjects completed a follow-up interview that covered similar domains to the baseline interview. The interview was adapted from a validated questionnaire used in the Washington State Managed Care in Workers' Compensation study. (Kyes et. al. 1997)

In addition to questions from the Washington State study, the questionnaire included standardized scales used for the assessment of functional status and health related quality of life. These scales included the SF-12 and additional questions to complete three subscales from the full SF-36 (Physical Role Function, Bodily Pain, and Mental Health). (Ware et. al. 1998, Ware and Sherbourne 1992) The SF-36 is a widely used generic health related quality of life measure that measures eight subscales; the SF-12 is a shortened version of this instrument that measures two scales, Physical Health and Mental Health. The SF-12 was used in place of the full SF-36 to reduce the length of the interview; the three additional subscales of the SF-36 were included as it was thought that these measures would be most pertinent to injury-related effects in the subjects.

The SF-36 is relatively insensitive to changes in health-related quality of life in patients with upper extremity disorders. Thus, a short version of the DASH (Disabilities of the Arm, Shoulder, and Hand), an instrument designed to measure functional status of the upper extremity, was included. (Hudak et. al. 1996) The full 30 question DASH has a high internal consistency and a high level of reliability; the 11 question version used in this study was developed based on the items with the highest item total correlation in each of the domains covered by the DASH, and has been previously used in studies of occupational musculoskeletal disorders. (Beaton et. al. 2000)

## **Results**

Data collection and subject recruitment proved more difficult than anticipated, primarily due to labor-management disputes, bankruptcy, and subsequent takeover at one of our main study sites, Trans-World Airlines. Final subject recruitment was 310 out of a proposed 350 subjects. 32 subjects dropped out of the study, leaving 278 subjects for the final analyses. Since the takeover of TWA and its administrative functions by another airline, we have had slower than anticipated access to OSHA 200 logs and workers' compensation data. We have very recently obtained final study data and are currently analyzing data from the full study cohort. Except as noted, data are shown below for the first 205 subjects recruited into the study; final analysis is pending.

The specific musculoskeletal disorders diagnosed at the time of enrollment are shown in Table I. Because some subjects had more than one diagnosis, the number of diagnoses (310) exceeds the number of subjects (205). For purposes of analysis, injuries were divided into three broad regional anatomic areas by the site of primary symptoms, though many subjects had symptoms in more than one anatomic area. Forty five percent of subjects reported their primary symptoms in the low back, 18% in the lower extremity, and 37% in the upper extremity, thoracic or cervical regions. Eighty-nine per cent of the injuries were acute, with the onset of symptoms within one week of seeking medical attention. Eleven per cent of the injuries were chronic, with the onset of symptoms more than one week prior to seeking medical attention.

The average time from initial medical attention to completion of the baseline interview was eight days. The mean time from injury to follow-up interview was 180 days. Of the 205 subjects, 132 were employed by the healthcare system, 62 by the airline, and 11 by the university. A wide range of job types and job tenures were represented. The average age of subjects was 42, with a range from 20 to 70. One hundred and thirty six (66%) of the subjects were female and 69 (34%) were male.

As shown in Table II, 1% of subjects were working full duty at the time of the baseline interview. Twenty-four percent of subjects were off work and 75% were working in a restricted duty capacity. At six months, 88% of workers had returned to work, with 83% working full duty and 5% working restricted duty. Seventy-seven percent of subjects reported they were working at the same job as they had been at the time of injury. Fifty eight percent of the 47 workers who changed jobs reported that they did so at least in part because of their injury.

Time lost from work was measured by the OSHA 200 log and by physician assessment in the medical record. As shown in Table III, the number of days lost and restricted recorded on the OSHA logs from the three companies showed a slight but statistically different decrease in mean lost days compared with those obtained from physicians' determinations recorded in the medical charts (28.0 vs. 29.4 days).

Re-injury was a common cause of further time loss in this group. A re-injury was defined as an OSHA log recorded injury occurring to a different body part than the original injury, or injury to the same body part occurring more than 30 days after return to full duty following the original injury. Choice of the 30-day period, while arbitrary, was intended to distinguish persons who failed initial return-to-work efforts from those who apparently returned successfully before requiring medical attention and change in work duties. Inclusion of different body parts was intended to capture re-injuries that may represent similar conditions, but are coded differently. Thirty-two (16%) of 205 subjects had a re-injury recorded on the OSHA 200 log during an average follow-up time of 11.5 months, with a maximum follow-up time of one year. Five subjects had multiple re-injuries.

As shown in Table III, underreporting of days lost and restricted by re-injuries was more striking than the underreporting of the primary injury when comparing OSHA log data to physician-determined days. Mean OSHA log recorded days of lost or restricted time was 18.3 days, while the means of adjusted and unadjusted physician determined days were 25.9 and 37.7 days, respectively. These differences were statistically significant. While 16% of workers had a re-injury recorded on the OSHA log, 30% reported in the six-month interview that they had additional lost or restricted days related to the injury following their initial return to work. The average duration of this self-reported time loss was 26 days, comparable to the adjusted physician recorded days.

Despite high rates of return-to-work, there was still significant disability reported among workers at six-month follow-up. At the baseline interview, 40% of workers answered yes to the question, "Do you consider yourself physically disabled

because of the injury?" Although there was a statistically significant decrease in the number who considered themselves to be disabled by six-month follow-up, 24% of workers (including 20% of those working at full duty) still considered themselves to be disabled because of their injury. At follow-up, 35% of workers said that their ability to work was worse or much worse than before the injury; 32% percent of workers reported lower income at six months than at the time of the injury.

Between baseline and six-month follow-up, there was overall improvement in SF-36 subscale scores as shown in Table IV. Improvement in all categories was statistically significant. The SF-36 subscales are scored from zero to one hundred with higher scores representing less disability. Mean scores (w/ standard deviation) for the general US population are 84 (+/- 23) for physical functioning, 75 (+/- 24) for bodily pain and 74 (+/- 18) for mental health (Ware, 1992). As shown in Table IV, scores among the injured worker cohort at six months were substantially lower than those reported for the U.S. general population for the physical functioning and bodily pain subscales, but essentially the same for mental health.

SF-12 physical health and mental health summary scores are also shown in Table IV. Both of these scales are transformed using coefficients and a constant derived from the general US population such that the mean of both scales in the general population is 50, with a standard deviation of 10. As with the SF-36 subscale scores, higher scores represent better health. There was statistically significant improvement in the mean scores on the physical health scale and the mental health scale. The follow-up mean for the physical health scale was nearly one standard deviation below the mean for the general US population.

Table V shows the SF-36 subscale scores stratified by work status at follow-up. Those who were back to full duty at six months had the greatest improvement in bodily pain and physical functioning scores. These differences were statistically significant across all three groups. Interestingly, workers who were in restricted duty roles at six months had lower physical functioning and bodily pain scores than those who were off work, while those who were off work at six months had the lowest mental health scores at follow-up. Differences in follow-up scores on all three subscales were statistically significant across the three groups.

SF-36 scores were also stratified by injury type as shown in Table VI. In contrast to comparisons by work status, where baseline scores were similar but diverged at six months, comparisons by injury type showed differences at baseline, which converged at six months. Of the three injury types, those with primarily upper extremity injury had the highest baseline and follow-up scores on the physical functioning scale. This is likely due in large part to the questions used to assess physical functioning in the SF-36, which are more sensitive to functional impairment in the back and lower extremities. Those with back injury had the lowest scores on the bodily pain scale at baseline, and had the largest amount of improvement on that scale at six months. Differences in baseline scores on all three scales were statistically significant across the three groups. Changes in physical functioning score from baseline to follow-up were also significantly different across all three groups. Baseline and follow-up scores on all three SF-

36 subscales tested were lower for those with chronic injuries than for those with acute injuries. Improvements in all subscale scores were similar in both groups.

Answers to individual questions from the SF-36 also indicated persistent decrements in functional status six months following injury. At baseline, 97% of subjects reported that they were limited in work or other regular daily activities as a result of physical health. At six months, 42% still reported such limitation. Forty percent of subjects at six months reportedly accomplished less than they would like to because of physical health and 28% because of emotional problems. Seventeen percent of subjects at six months reported that they were unable to do work as carefully as usual as a result of emotional problems, an improvement from 31% seen at baseline, but still a substantial proportion of workers. These differences between baseline and six-month interview were all statistically significant.

There was improvement over the six months in the amount of pain reported by workers and in the degree to which pain interfered with normal work. At baseline 44% of workers reported severe or very severe pain over the last week. No one reported having had no pain over the last week. At six-month follow-up 16% reported severe or very severe pain, while 13% reported having had no pain over the last month. At baseline, 61% reported that pain interfered with their work quite a bit or extremely; at six months 21% of workers still reported that pain interfered with normal work quite a bit or extremely.

Finally, the general health status question of the SF-12 showed a decline in self-perceived health status. As shown in Table VII, 60% of employees reported that their general health status was very good or excellent at the time of the initial injury, while 14% reported general health as fair or poor. Six months following injury, only 44% reported that their general health was very good or excellent, while 27% reported it to be fair or poor. This decline in general health status was statistically significant.

The eleven-question mini-DASH is scored on a scale from 0 to 100 with a lower score representing less disability. Baseline mean DASH score among the 76 subjects with a primary upper extremity injury was 52, while follow-up mean DASH score among these same subjects was 27 ( $p < .001$ ).

Comparison of time loss between subjects in the intervention group and the usual care group showed a shorter duration of initial time loss among the intervention group. Mean duration of initial time loss was 18.0 days among the control group versus 10.4 days among the intervention group (difference = 7.5 days, 95% confidence interval of difference = -0.8 – 15.9, two-sided  $p$  value of difference = 0.07). There was no difference between the total lost and restricted days between the two groups (mean lost + restricted days = 31.1 days in the control group and 32.2 days in the intervention group). As shown in Table VIII, mean duration of time loss at initial injury differed widely by employer, though the intervention group had a lower mean duration of time loss for each of the three employers. Large standard deviations for the duration of lost time were seen.

## **Discussion**

This study provides data on 205 workers with five or more days of lost or restricted workdays resulting from a musculoskeletal injury treated under workers' compensation. Workers were interviewed an average of 8 days following their injury and again at approximately six months post injury, and were followed with administrative data for 1 year. Findings revealed that the traditional outcome measures of return to work and time lost from work did not capture important information about the burden of injury that was shown by self-reported measures of disability and functional limitations. Many workers who returned to full duty work reported continuing disability six months following the injury. This residual disability is likely to be important due to its effects on quality-of-life and work productivity. Re-injury rate was another important outcome that would be missed by reliance on return to work as the main outcome measure. Together, the current data suggest that a complete picture of disability caused by work injuries can only be provided by the use of multiple measures.

The results demonstrated limitations in the measurement of time loss via OSHA 200 logs, the traditional outcome measure that forms the basis for the most widely used national data on work injuries. OSHA 200 logs underreported time loss from work injuries when compared to data obtained from medical records. However, the magnitude of the difference was small, and the correlation between the physician reports and OSHA log was high, at least for initial work absences. Time loss from subsequent injuries was underreported on the OSHA 200 log to a greater extent than initial injuries. Several reasons may be postulated for such discrepancies. Physicians may be overly cautious when prescribing the duration of work restrictions, and workers may appropriately decide to return to full duty work before being released by the physician. Restrictions prescribed by the physician may not prevent the performance of essential job functions. An alternate explanation is the effect of workers' compensation and regulatory policies on employer reporting behavior. There may often be disincentives to employees and employers for reporting an injury or lost days due to injury (Mustard and Hertzman, 1991).

Study findings also demonstrated a substantial rate of re-injury and subsequent time loss among workers who had incurred an episode of disability. Workers reported a higher incidence of re-injury (30% over six months) than reported in the OSHA logs (18% over one year). This is consistent with the observation of other researchers that musculoskeletal injuries may lead to recurrent disabling symptoms and may necessitate multiple attempts at return to work (Baldwin et al., 1996). Estimates of time loss attributable to an injury should focus on total work disability over a longer time period, rather than including only time loss before initial return to work. There is a possible over-estimation bias due to inclusion of events affecting other body parts, that may have not been actual re-injuries, but instead independent new events. Other injuries may have been the result of cumulative effects, and thus additional absence spells may reflect re-exacerbations that are part of the natural history of the disorder, rather than a re-injury per se.

These findings support other studies suggesting that national estimates of the burden of illness attributed to work injuries may be underestimated, and that the true extent of disability may be greater than currently reported, even when confined to the traditional measure of lost or restricted days from work. In addition, measures of time loss that consider only work days neglect the intervening holidays and weekend, when the pain and functional limitations from the injuries presumably affect workers' quality of life and social functioning. The changed reporting rules for work injuries in the new OSHA 300 log have eliminated this latter problem. After January 1, 2002, the OSHA 300 log reports the total duration of work disability in calendar days, not just the number of scheduled workdays missed. (Occupational Safety and Health Administration, 2001)

The importance of considering pain and functional status measures in assessing musculoskeletal disease outcomes is shown by the high prevalence of symptoms and reported disability in our cohort. By traditional measures of work status and return-to-work, most of the subjects here had successful outcomes following treatment for their injuries. However, residual pain and disability cannot be assumed to be absent even with successful outcomes in work-related measures. Despite 83% of the cohort working full duty at six month follow-up, there was significant pain and functional limitation reported among these workers, with 24% reporting that they considered themselves to be still disabled by their injuries. Workers who were back at work in restricted duty roles at six months had lower physical functioning and bodily pain scores on the SF-36 than those who were off work. Perhaps by their presence at work, they are more keenly aware of how their function is deficient compared to co-workers without injuries. The mean follow-up SF-12 physical functioning score for the entire cohort was nearly one standard deviation below the mean for the average US population. These data support previous studies that have concluded that while work status is related to pain and functional status, it is not a substitute measure (Dionne et al, 1999). As Baldwin et al. (1996) have shown in their study of 1850 Canadian workers, return to work after injury is a complicated process that involves not only health status, but also labor market conditions and demographic factors such as age, sex, marital status and education.

The impact of continuing pain and functional limitation on productivity and job performance following return to work is only now being studied and understood. A study of worker's compensation cases in Washington State during 1986 estimated years of productivity lost for various types of injuries. (Fulton-Kehoe et al., 2000) This study found examples of injuries that were associated with a significant number of years of productivity lost, despite a small amount of time lost from work. This study supports the idea that the full costs of work injuries are not captured in measures that count only the direct workers' compensation payments for medical care and lost time. In this study, many workers reported decreased productivity and poor job performance six months following an injury. Thirty five percent of workers said that their ability to work was worse or much worse than before their injury, while 30% said their ability to concentrate was less since their injury. Clearly, return to work does not always mean return to work in a fully productive capacity. If productivity losses can be measured or estimated,

the true costs of work injuries are likely to be much higher than commonly estimated.

This study had several potential limitations that may restrict the generalizability of the findings. Forty-nine percent of potentially eligible subjects could not be contacted or refused to participate in the initial screening to ascertain eligibility. Of those who did participate, 34% did not meet eligibility criteria, primarily because they had less than 5 days of time loss or restricted duty. Study participants may have differed from those who refused to participate, and from those who had shorter durations of time away from work, and thus may not be fully representative of the entire population of injured workers. Many of the measures relied on self-report of functional status. Participants may have exaggerated the extent of their symptoms due to concerns about ongoing compensation claims, and in fact some subjects refused to participate or withdrew from the study on the advice of their attorneys. However, the majority of workers did not have an active claim at the time of the follow-up interview, and subjects were informed that their responses were confidential, thus limiting this source of bias. This study presents pooled descriptive data from the first 205 subjects in a larger study. Important differences in disability and impairment may exist within different subgroups of this sample; these were not explored in this study. Future analyses of the full study cohort will evaluate effects of different predictors of impairment and disability including age, gender, job tenure, physical job demands, type and chronicity of injury, job satisfaction, income, and employer. Finally, physician reports of lost time may also be inaccurate, and other sources of information (such as payroll and attendance records) might provide a more accurate measure of actual attendance.

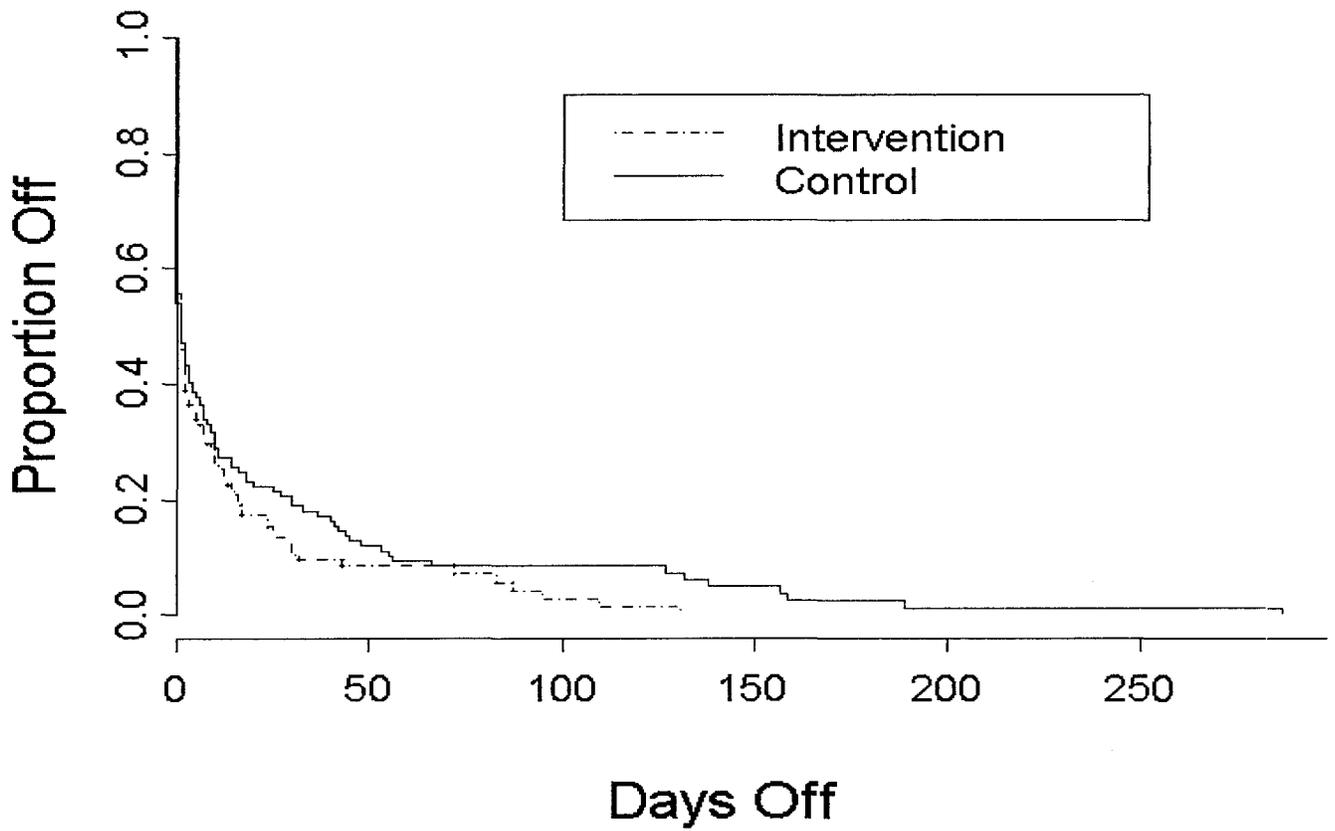
Comparisons between the control group and the intervention group in the randomized trial showed a shorter duration of initial time loss in the intervention group. However, no differences were seen in total duration of disability, re-injury rate, functional status, work status, or measures of employee satisfaction with care. Cost-effectiveness remains to be analyzed in this study, pending final data on workers' compensation costs.

## **Conclusions**

Multiple measures of outcomes from multiple data sources should be used when examining outcomes of workplace injuries. In addition to underreporting of actual days of work disability, OSHA 200 logs and workers' compensation records do not assess residual pain and functional limitations that persist following return to work. Methods to estimate productivity losses resulting from residual disability are needed to provide a more accurate picture of the true costs of work injury. The more complete picture of work disability seen in our study and others underscores the importance of prevention of workplace injuries. Work-related injuries are associated with higher costs than previously estimated, both in terms of long-term productivity loss and in terms of loss of quality of life and functional ability. Prolonged disability and high rates of re-injury also suggest the importance of workplace assessment and intervention after injury, as well as the

need for continued support after return to work. Interventions aimed at reducing workplace physical exposures may be effective in reducing the duration of time loss among workers who have had time loss or work restrictions due to a musculoskeletal disorder.

Figure 1. Survival plot of duration of time loss (Proportion Off Work) comparing Intervention to Control groups. ( $p = 0.16$ , log rank test)



**Table I: Patient diagnoses**

Patient diagnoses	# of cases
Low back	
Strain/sprain/spasm/pain	90
Radiculopathy / disc	16
Other	1
Lower extremity	
Lower abdominal/inguinal strain	3
Hip	7
Thigh/leg	6
Knee	32
Foot/ankle (contusion/ tendinitis/ strain/ sprain)	15
Upper extremity/Upper Trunk	
Shoulder (contusion / sprain / strain/tendinitis)	34
Arm (contusion/sprain/strain)	7
Elbow (contusion / sprain / strain/epicondylitis)	7
Wrist / hand	
Contusion	6
Sprain/strain/tendinitis	21
Carpal tunnel syndrome	4
“Repetitive trauma”	4
Cervical (contusion /sprain/strain)	25
Thoracic spine/chest (contusion /sprain/strain)	32
<b>Total*</b>	<b>310</b>

\* Multiple injuries were recorded for some subjects

**Table II: Work status at baseline and six-month follow-up**

	Work Status		
	Off work (%)	Restricted duty (%)	Full Duty (%)
Baseline	24	75	1
Follow up	12	5	83

**Table III: Comparison of time away from usual work reported by OSHA 200 log and medical records**

	Total days off and restricted duty days		
	Medical record*	Medical record**	OSHA 200 log
Initial injury	42.8 (.000)	29.4 (.006)	28.0
Reinjury (n = 32)	37.7 (.000)	25.9 (.024)	18.3

\* includes weekends and holidays

\*\* adjusted to exclude weekends and holidays

( ) = p values for t test in comparison to OSHA 200 log

**Table IV: SF-36 subscale scores and SF-12 summary scores at baseline and six-month follow-up**

SF 36 Scores	Baseline Mean (SD)	Follow-up Mean (SD)	P value*	US Population Mean
SF-36 subscale				
Physical functioning	42 (25)	71 (26)	.000	84
Bodily pain	30 (17)	55 (26)	.000	75
Mental health	69 (20)	76 (19)	.000	74
SF-12 summary scale				
Physical health	30 (7)	42 (11)	.000	50
Mental health	49 (11)	51 (11)	.033	50

\* Comparison of Baseline v. follow-up, significance tested using paired t-test

**Table V: Mean SF-36 subscale scores by work status at six-month follow-up**

	Work Status			P value*
	Off work	Restricted duty	Full duty	
<b>Physical Functioning</b>				
Baseline	38 (25)	44 (23)	42 (25)	0.749
Follow up	56 (25)	48 (24)	75 (24)	0.000
<b>Mental health</b>				
Baseline	67 (19)	61 (26)	70 (20)	0.361
Follow up	66 (24)	70 (20)	77 (17)	0.014
<b>Bodily pain</b>				
Baseline	28 (17)	23 (16)	31 (17)	0.232
Follow up	38 (27)	27 (22)	59 (24)	0.000

\* Significance tested using analysis of variance (ANOVA)

**Table VI: Mean SF-36 subscale scores by injury site at six-month follow-up**

	Injury Site			P value*
	Low back n=91	Lower extremity n=37	Upper extremity n=76	
Physical				
Functioning				
Baseline	33	28	59	0.000
Follow up	68	69	76	0.129
Mental health				
Baseline	68	63	73	0.049
Follow up	74	77	77	0.663
Bodily pain				
Baseline	26	35	33	0.002
Follow up	53	59	54	0.502

\* Significance tested using analysis of variance (ANOVA)

**Table VII: General health status at baseline and six-month follow-up**

	Health Status				
	Excellent	Very Good	Good	Fair	Poor
	(%)	(%)	(%)	(%)	(%)
Baseline	20	40	26	11	3
Follow up	16	28	29	23	4

**Table VIII: Mean lost days by employer**

<u>Employer</u>	<u>Control group</u>	<u>Intervention group</u>
Health care (n=158)	10.4	5.1
Airline (n=100)	31.0	22.4
University (n=20)	17.0	0.3

### **Publications and presentations:**

Journal of Occupational Rehabilitation, Vol. 12, No.3, September 2002  
Is Disability Underreported Following Work Injury?  
Bradley Evanoff, Sakena Abedin, Deborah Grayson, Ann Marie Dale, Laurie Wolf, Paula Bohr

Implementing an ergonomic evaluation program as part of a treatment protocol for musculoskeletal injuries: Does the job change after the consultant leaves?  
Grayson D, Dale A, Bohr P, Evanoff B  
AAOHN Conference May 2002, Chicago IL

Ergonomic Evaluation as Part of a Work-related Musculoskeletal Disorder Treatment Protocol Reduces Exposure 6 Months Following Injury  
Grayson D, Dale A, Wolf L, Bohr P, Evanoff B  
ACOEM Conference, May 2001, San Francisco, CA.

Effects of an ergonomic intervention on return-to-work following a musculoskeletal disorder  
B Evanoff, D Grayson, A Dale, L Wolf, P Bohr  
16<sup>th</sup> Congress on Epidemiology in Occupational Health Conference, September 2002

Disability is persistent and under-reported following work injury  
Sakena Abedin, Deborah Grayson, Ann Marie Dale, Laurie Wolf, Paula Bohr, Brad Evanoff  
APHA November 2002, Philadelphia, PA

Disability persists six months after occupational injury  
B Evanoff, D Grayson, L Wolf, P Bohr  
Academic Medicine and Managed Care Forum, November 2000

Utilizing Ergonomic Assessment in Early Intervention of Work-related Musculoskeletal Injuries  
Dale A, Grayson D, Wolf L, Bohr P, Evanoff, B  
The American Occupational Therapy Association, June 2003, Washington, DC

### **Anticipated future publications:**

Effects of an ergonomic intervention on return-to-work following a musculoskeletal disorder (presentation of main results of study on time loss and disability outcomes)

Ergonomic Evaluation as Part of a Work-related Musculoskeletal Disorder Treatment Protocol Reduces Exposure 6 Months Following Injury (effects of ergonomic changes on job exposures)

Validity and reliability of a work observational method to measure physical exposures (reliability and validity of work exposure measures used in the study)