AMERICAN JOURNAL OF INDUSTRIAL MEDICINE 36:532–540 (1999)

Chronic Symptoms in Construction Workers Treated for Musculoskeletal Injuries

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Background *Soft tissue musculoskeletal injuries make up a high proportion of all work-related injuries in construction. Data from Workers' Compensation claims indicate that strains and sprains are the leading compensable injury for construction workers. This study describes the consequences of soft tissue musculoskeletal injuries for construction workers, and assesses the persistence of symptoms after an injury and the impact of that injury on return to work.*

Methods *Through an Emergency Department surveillance system [Hunting et al., 1994a], we recorded 176 construction worker visits, from 5/01/93 through 2/28/95, for strains, sprains, joint injury or pain, tendinitis, dislocations, hernias, or other musculoskeletal injuries excluding fractures. Telephone interviews were conducted several months after workers had visited the emergency room for a musculoskeletal injury.*

Results *Seventy individuals were interviewed about the long-term impacts of 72 incidents that had resulted in work-related musculoskeletal injuries. For 46 (62%) of the 74 diagnoses, problems continued beyond two months. The likelihood of problems continuing more than two months varied considerably by body location of injury. Hispanic workers and older workers were more likely to have continuing symptoms. Eleven of the 45 construction workers with symptoms persisting longer than two months were not employed at the time of the interview. Only 11 of the 45 workers with ongoing symptoms told us that modifications had been made to their jobs to accommodate their symptoms. About one-quarter of these 45 subjects reported substantial effects on home or work life.*

Conclusions *Acute musculoskeletal injuries in construction workers frequently result in chronic symptoms, and those with chronic symptoms report substantial effects of the injury on their quality of life. Job accommodations were made in a minority of these injuries. These findings point to the need for heightened efforts for injury prevention in this industry.* Am. J. Ind. Med. 36:532–540, 1999. *© 1999 Wiley-Liss, Inc.*

KEY WORDS: construction workers; surveillance; muscle strain

INTRODUCTION

Construction is a dangerous industry, and is associated with high rates of both fatal and non-fatal injuries. Seventeen percent of all fatal on-the-job injuries occur in construction, which is about three times its 6% share of the total employment [Bureau of Labor Statistics (BLS), 1997a]. In 1996 there were 4.5 lost-time injuries per 100 full time equivalent (FTE) construction workers compared to a rate of 3.4/100 × FTE workers in all private industry; this rate

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Contract grant sponsor: Center to Protect Workers Rights, (CPWR) as part of a cooperative agreement between CPWR and NIOSH; Contract grant number: CCU306169. This research is solely the responsibility of the authors and does not necessarily represent the views of CPWR or NIOSH.

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Accepted 7 July 1999

exceeded all other sectors except transportation [BLS, 1997b]. The overall injury rate in construction was 9.9/100 FTE workers in 1996, second only to manufacturing [BLS, 1997b]. The BLS rate is based on a definition of full time work of 2,000 h per year. Lipscomb et al. [1997] using data on medical claims or lost time compensation claims among carpenters reported an annual rate of 43.7 per 200,000 work hours (that is, per 100 FTE workers).

Soft tissue musculoskeletal injuries make up a high proportion of all work-related injuries in construction; they were second in frequency only to lacerations among construction workers treated in a large emergency department [Hunting et al., 1994]. Data from Workers' Compensation claims indicate that strains and sprains are the leading compensable injuries for construction workers [OSHA, 1992]. In the study of carpenters noted above [Lipscomb et al., 1997], 45% of all compensation claims were for musculoskeletal injuries and disorders.

Soft tissue musculoskeletal injuries may cause a great deal of worker discomfort, and have other adverse consequences. Musculoskeletal disorders in general are responsible for a large burden of both temporary and permanent disability in the United States [Cunningham and Kelsey, 1984; CDC, 1998]. The total direct and indirect cost for low back pain, both work-related and non-work-related, was estimated at $27.9 billion in 1990 in the United States [Freymoyer and Cats-Baril, 1991]. Occupational back injuries are more expensive and involve more lost time, on average, than other work-related injuries [National Safety Council, 1993]. In one construction trade, sheet metal workers, 75% of those who retire on a disability pension, have a musculoskeletal disorder as the primary diagnosis [Welch et al., 1998].

The aim of this study was to determine the consequences of soft tissue musculoskeletal injuries on construction workers, assessing both the persistence of symptoms after an injury and the impact of that injury on return to work. We have collected data on all construction trades workers treated at the George Washington University Emergency Department (ED) for work-related injuries [Hunting et al., 1994; 1999]. As part of this surveillance system, we initiated a follow-up study to describe the long-term consequences of soft tissue musculoskeletal injury among construction workers. We describe the injury characteristics of the workers we interviewed, what proportion had a persistent problem, what characteristics were associated with persistence, and how the workers were affected by these persistent injuries.

The construction industry has some unique characteristics which could impact the outcome of an injury. Workers often have no long-term relationship with an employer, changing employers as specific projects are completed. Employers are small; of the 1.9 million construction contractors identified by the 1990 census, only 28% had *any* employees, and only 136,000 had more than 10 employees [Ringen et al., 1995] Small employers are much less likely to be able to accommodate a worker with an impairment, and without a relationship with that worker are less inclined to do so.

METHODS

Through an Emergency Department surveillance system [Hunting et al. 1994; 1999], we have collected information on construction worker injury and illness. ED logs were reviewed, and data were abstracted to document work-related visits of construction workers. Demographic data and as much detail on the medical condition and circumstances of the injury as is available in the medical record were collected. We recorded 176 construction worker visits for strains, sprains, joint injury or pain, tendinitis, dislocations, hernias, or other musculoskeletal injuries excluding fractures, from 5/01/93 through 2/28/95. Hereafter, this group of disorders is termed "musculoskeletal injury". (Fractures were excluded because we believed they would have a different course of recovery, and be less likely to result in impairment over the following year.) A "visit" represents one injury event. During the study period, seven workers visited the ER twice for different musculoskeletal injuries. Thus, 169 construction workers were eligible for interview, with 176 visits. These 176 musculoskeletal visits constituted 21% of the 838 work-related construction worker visits to the ED during this time period.

Telephone interviews were conducted several months after workers had visited the emergency room for a musculoskeletal injury. Information was obtained on circumstances of the injury, current symptoms, lost time, light duty, and ability to return to the previous job. This surveillance program included all workers in construction occupations, even those working for employers classified outside the Standard Industrial Classification (SIC) categories 15–17: Two types were identified: (1) those individuals employed in "traditional" construction settings (e.g., new building construction, renovation, road construction and repair) constituted the majority of the injured workers; and (2) individuals from the construction trades who do maintenance or other work for fixed site employers (e.g., a carpenter or electrician working for a university or government agency).

Interviews were targeted to occur six to eighteen months after the emergency room visit; this time frame was chosen to allow time for recovery if possible, and time for the social and economic impact of continued impairment to be apparent. Various methods were used to attempt to contact all of the study subjects. Home addresses and phone numbers of the subjects were obtained from ED records. If phone numbers were not available from hospital records, we contacted operator information in the subjects' local calling area. If no contact could be made by phone or if no phone

number was available, a letter was sent to a subject's home address to explain the purpose of the study and request a phone number where the person could be reached. If all attempts to reach an individual failed then the subject was declared lost to follow-up (LTFU). The Institutional Review Board of The George Washington University Medical Center approved the study. Informed consent was obtained from each subject over the telephone prior to initiation of the interview.

Epi Info was used to analyze the data. Statistical comparisons employed two-tailed *P*-values based on the chi-square test or, when any expected cell value was less than 5, on the Fisher exact test.

RESULTS

Interviews of 72 (41%) construction workers were completed. Seventy individuals were questioned about the long-term impact of 72 incidents which had resulted in work-related musculoskeletal injuries. (Two individuals experienced two unrelated injuries each.) Eighty-five percent of the interviews were conducted eight to sixteen

TABLE I. Demographic Characteristics of Participants and Non-Participants, Among Construction Workers in Washington, DC[a]

	Participants (72)		Non-Participants (104)		
	Number	%	Number	%	*P*-value[b]
Gender					.65
Male	71	99	101	97	
Female	1	1	3	3	
Ethnicity					<.01
Black	33	46	51	49	
White	32	44	25	24	
Hispanic	7	10	26	25	
Asian	0	–	1	1	
Unknown	0	–	1	1	
Age					.08
17–24	2	3	16	15	
25–34	29	40	41	39	
35–44	20	28	22	21	
45–54	17	24	18	17	
≥ 55	4	6	7	7	
Occupation					
Carpenter	20	28	18	17	
Laborer/construction worker, NOS	12	17	39	38	<.01
Ironworker	11	15	10	10	
Plumber/sprinkler fitter	11	14	4	4	
Supervisor/engineer	6	8	6	6	
Electrician	5	7	14	13	
Drywall/plasterer	2	3	2	2	
Stonemason	2	3	0	–	
Concrete finisher	1	1	3	3	
Heavy equipment operator	1	1	1	1	
Sheetmetal worker	1	1	0	–	
Painter	0	–	4	4	
Insulation worker	0	–	2	2	
Roofer	0	–	1	1	
Type of work setting					.06
Traditional construction	56	78	92	88	
Maintenance/other fixed site	16	22	12	12	

[a]Among participants, 72 unique injury events occurred among 70 different workers. Among non-participants, there were 104 unique injury events among 97 different workers. This table counts demographic characteristics associated with each injury event.

[b]*P*-value for ethnicity compares Black, White, and Hispanic only. *P*-value for occupation compares laborers and unspecified construction workers against all other trades.

months after the ED visit, with an average 12 months and a range of six to twenty-one months.

Twenty-four of the remaining 104 visits declined to participate (14%), and 80 were lost to follow-up (45%). The largest LTFU group (67 visits) includes those subjects for whom neither a good phone number was available nor was a response received from tracing letters sent. The remaining included eight subjects who had a good phone number available but were never reached despite numerous attempts, and five individuals who could not be reached due to language barriers, moving out of the area, or incarceration.

Table I compares the demographic information between participants and non-participants. The denominator is injury visits, so a few individuals are double-counted. Participation differed ($P = .08$) by age, with younger workers less likely to participate than older workers. There were significant differences in participation by ethnicity ($P < .01$). Fifty-six percent of the eligible whites participated, however, only 39% of blacks and 21% of Hispanics completed an interview. Language barrier, as mentioned above, may account for some of this discrepancy in participation rates; we did not translate the questionnaire into Spanish.

There were also variations in participation among occupations. Laborers and construction workers who did not specify a trade were much less likely to participate than other occupational groups ($P < .01$). With small numbers, we did not make statistical comparisons for other individual trades, although electricians also appeared less likely to participate. Differences in participation by occupation and ethnicity are interrelated, since the trades vary in their ethnic composition. However, it appears from our data (not shown) that being *both* a laborer and Hispanic contribute independently to non-participation.

Descriptive information on the 72 injuries with follow-up are described in Table II. Fifty-three percent of the injury circumstances are classified under the broad category ''overexertion'', and 26% of the musculoskeletal injuries resulted from falls, most commonly from ladders, but also slips on the same level and falls from scaffolds and stairs. Participation rates were somewhat lower ($P = .32$) for two types of circumstances: falls (34% participation), and struck by an object (33% participation).

The 72 injury events resulted in 74 musculoskeletal diagnoses. As shown in Table III, which summarizes the injuries by body location, the low back (28% of diagnoses) was the most frequent site of injury among the interviewed workers, followed by foot/ankle (20%), upper extremity (15%), shoulder (14%), and knee/leg/hip/groin (14%). The upper extremity category includes a mix of elbow, wrist, hand, and finger injuries. There were slight differences between participants and non-participants by body location of injury: persons with lower extremity injuries were somewhat more likely to participate than those with upper extremity or back/trunk injuries.

TABLE II. Circumstances of Injury for Follow-up Study Among Construction Workers in Washington, DC. Participants (N) = 72

Category of injury Type of injury	Number	Total	%
Overexertion		38	53
Lifting/carrying	16		
Pushing/pulling	5		
Stepping	3		
Using a drill	1		
Using a sledgehammer	1		
Stopping a fall	1		
Other/unspecified	11		
Falls		19	26
From ladder	6		
On same level	3		
From scaffolding	3		
On stairs/steps	2		
From height	2		
Not specified	3		
Struck by/against object/persons		7	10
Pipe	3		
Concrete	1		
Hammer	1		
Metal rail	1		
Unspecified	1		
Caught between objects		3	4
Steel and drill	1		
Manhole cover and street	1		
Lid of gangbox	1		
Other		5	7
Vehicle overturned	1		
Struck by crane	1		
Excessive heat	1		
Unspecified	2		

TABLE III. Summary of Injured Body Locations Among Participants (N = 74 diagnoses) Among Construction Workers in Washington, DC[a]

Injured body location	Number	%
Low Back	21	28
Foot/ankle	15	20
Upper extremity	11	15
Shoulder	10	14
Knee/leg/hip	10	14
Neck	7	9

[a]There were 72 injury events resulting in 74 diagnoses.

Only two measures of severity are readily available from our medical record surveillance data, the first being hospital admission. It was not surprising that for these musculoskeletal injuries only one participant and one non-participant were admitted. Recommendations made by ED physicians for light duty and days away from work were also available in many of the medical charts. We compared this information for participants and non-participants and found no important differences. Workers for whom doctors recommended more than one day away from work or more than one week of light duty were only slightly less likely to participate than other workers.

Workers were asked to describe any previous problems they had experienced with the injured part of their body. If he had no prior symptoms at the injured body part, and the event was identifiable and sudden, we classified the case as acute. A chronic injury had no sudden identifiable event or prior symptoms at the injured body part, while one that was both acute and chronic had a mixture of the two. Of the 74 injuries, 63 (85%) were clearly acute onset, while three were chronic, and four were both acute and chronic. For example, two of those classified as both acute and chronic had low back injuries which occurred while lifting. Both workers had experienced back pain off and on in the past, ''but never pain like this''. Four workers told of previous injuries from which they had recovered, but we were unable to determine if the previous injuries contributed to the current injuries.

Factors Related to Symptoms Which Continued Beyond Two Months

Interviewers determined retrospectively if study subjects were continuing to have pain, aching, or other problems related to their injury two months after their ED visit. This arbitrary ''initial recovery period'' of two months was chosen to identify those workers we most wanted to focus on—those whose problems persisted. Workers who recovered in two months or less were thanked for their participation, and were not asked further questions.

For 45 (62%) of the 72 subjects, problems continued beyond two months. The likelihood of problems continuing for more than two months varied considerably by body location of injury, as shown in Table IV. Workers with knee/leg/hip/groin injuries were most likely to have symptoms beyond two months, followed by workers with shoulder, low back, and neck injuries. Recovery from foot/ankle and upper extremity injuries was, on average, the most rapid. Injury circumstances accounted for only small differences in recovery time, with injuries from overexertion and from slips, trips, and falls somewhat more likely to entail recovery lasting more than two months.

We also looked at whether demographic characteristics were associated with continuing problems. Six (86%) of the seven Hispanic workers interviewed reported having symptoms that extended beyond two months; thus Hispanics were over-represented in this group. There were no pronounced differences by age or occupation between subjects with and without continuing symptoms, although the number of interviewed workers in some occupations was too small to really examine this factor. Likewise, work setting (traditional vs. fixed site) was not predictive of rapid recovery.

TABLE IV. Presence of Symptoms Beyond Two Months, by Injured Body Location ($N = 74$ diagnoses)[a]

Injured body location	Number and (%) with symptoms beyond 2 months	Total
Knee/leg/hip/groin	9 (90%)	10
Shoulder	8 (80%)	10
Low back	14 (67%)	21
Neck	4 (57%)	7
Foot/ankle	7 (47%)	15
Upper extremity	4 (36%)	11
Total	46 (62%)	74

[a]There were 72 injury events resulting in 74 diagnoses. The sequelae of each diagnosis was separately ascertained.

Recommendations made by emergency room physicians for time off work and light duty were significantly associated with recovery time. These data are presented in Table V. Of those patients for whom the physician recommended no time off, 58% still had symptoms after two months, while 80% of those for whom the physician recommended more than one day off had symptoms after two months. Recommendations regarding light duty were

TABLE V. Associations Between Presence of Symptoms Beyond Two Months and ED Recommendations for Time Off Work and Light Duty Among Construction Workers in Washington, DC ($N = 74$ diagnoses)

ED recommendation	Number and (%) with symptoms beyond 2 months	Total
Time off work ($P = .006$)[b]		
Missing from chart[a]	0 (0%)	19
0 days	18 (58%)	31
1 day	6 (67%)	9
>1 day	12 (80%)	15
Light duty ($P = .001$)[b]		
Missing from chart[a]	2 (10%)	21
0 days	5 (56%)	9
1–2 days	5 (56%)	9
>2 days	24 (69%)	35

[a]Many medical charts did not note the number of days off work or days on light duty recommended; in most of these cases this probably meant that no time off or light duty was necessary.

[b]P values are for chi-square association between time recommended (by the categories shown above) and persistece of symptoms beyond two months. Missing recommendations were combined with zero days for statistical testing.

also predictive, though not as strongly, of whether symptoms were reported after two months. (Many medical charts did not note the specific number of days off work or days on light duty recommended; it is likely that in most of these cases no time off or light duty was recommended).

In 85% of the workers with symptoms beyond two months, symptoms persisted at the time of the interview, an average of 12 months after the ER visit (Table VI). Seventeen of these 45 individuals had essentially constant symptoms, and another five had daily but not constant symptoms.

For the 45 individuals with long-term symptoms, the last part of the interview focused on return to work. We asked separately about time lost during and after the initial two-month recovery period. Thirty-one of long term cases (69%) missed days immediately after the injury. Initial time lost ranged from just one day to ten weeks, with a median of 11 days and an average of 19 days. Thirteen individuals reported having to take time off after the initial recovery period. Six cases involved two to seven lost days, while seven cases involved one month or more lost *after* the first two months. The longest of these (five cases) had lost six to twelve months with all losses taken together, and were not working at the time of the interview.

Eleven of the 45 construction workers with symptoms lasting longer than two months were not employed at the time of the interview. In addition to the above-mentioned five cases who suffered long-term disability caused by their injuries, two other construction workers could not perform their regular trade because of their injuries and were not working, and four study subjects were unemployed because of lack of work. The seven individuals who were out of work because of their injuries had substantially more severe symptoms than did the other injuried workers with symptoms persisting beyond two months.

The study subjects were asked to recall treatments recommended by medical providers, whether they were able to get the treatment, and, if not, why not. Medication, light duty, physical therapy, and exercise were the most commonly recommended treatments. Most study subjects were able to receive the recommended treatments, with the exception of light duty. Eight (38%) of 21 individuals who recalled recommendation for light duty were not able to get light duty from their employers. The most frequent reason—cited by three ironworkers, two carpenters, and one laborer—was that light duty was not available for their jobs.

We asked injured workers whether any modifications had been made to their jobs after the initial recovery period. Eleven of the 45 workers with ongoing symptoms told us that modifications had been made to their jobs to accommodate their ongoing difficulties. Some of these had been temporary light duty assignments (for example, no heavy lifting, no climbing), reflecting appropriate accommodation for the worker's injury. A few workers with sporadic symptoms had worked out arrangements with their employers for changing job assignments on days when they are not able to do their normal job, and for the remainder no accommodation was made. Only three workers out of the 45 had not recovered in two months reported working in different trades, and they reported that these job changes were unrelated to their injuries.

For the workers with persistent symptoms, we asked a set of questions about the extent to which each worker's current symptoms had (1) interfered with his personal or household activities; (2) caused him to change work assignments; (3) caused a decrease in his work productivity; or (4) caused him to change the way he did his work tasks (see Table VII). For all four of these activity areas, about one-quarter of this subgroup of study subjects reported

TABLE VI. Symptom Characteristics Among Cases with Symptoms Persisting More than Two Months After Emergency Department Visit Among Construction Workers in Washington, DC ($N = 45$)

Symptom characteristics	Number (%)
Has the problem gotten better, worse, etc. than at the time of the ER visit?	
a lot better	15 (33)
a little better	15 (33)
about the same	7 (16)
a little worse	3 (7)
a lot worse	5 (11)
How long did problems last after ER visit?	
2–4 months	2 (4)
4–6 months	2 (4)
6–9 months	3 (7)
>9 months or still ongoing	38 (84)
When you are/were having the problem...	
How often do/did symptoms occur?	
every 2–3 months	4 (9)
once a month	13 (29)
once a week	7 (16)
almost always/daily	21 (47)
How long do/did the symptoms last?	
<1hr	10 (22)
1 hour to 1 day	24 (53)
>1 day to 1 week	5 (11)
>1 week to 1 month	1 (2)
>1 month to 3 months	0 –
>3 months	5 (11)
How would you rate the discomfort?	
mild	12 (27)
moderate	16 (36)
moderate/severe[a]	5 (11)
severe	10 (22)
worst ever in life	2 (4)

[a]Moderate/severe was not a given choice for this question but was coded when the interviewer judged that the study subject would not decide between moderate and severe.

TABLE VII. Cases With Symptoms Lasting Longer than Two Months: Adverse Impact of Musculoskeletal Symptoms[a] on Personal and Work-Related Activities, Among Construction Workers in Washington, DC ($N = 45$)

To what extent have your symptoms...	Not at all	Minor or moderate extent	Major or substantial
Interfered with your personal or household activities?	39%	37%	24%
Caused you to change work assignments?	61%	15%	24%
Caused a decrease in your work productivity?	44%	28%	28%
Caused a change in the way you do your tasks?	28%	48%	24%

[a]Impact of symptoms *after* the initial recovery period (first two months).

major or substantial effects. In the category of minor or moderate impacts of ongoing symptoms, work assignments were the least affected (15%) and the ways the workers did their tasks were the most affected (48%).

DISCUSSION

This case series describes the long-term consequences of construction worker musculoskeletal injuries which required emergency room treatment. Most (85%) of the injuries which were documented by interview information appeared to be acute in onset. For a large proportion (62%) of these injuries, recovery took more than two months, and most of the individuals in this extended recovery subgroup were *still* having symptoms several months after the ED visit. Altogether, 11 of the 45 construction workers with symptoms longer than two months were not employed at the time of the interview.

The patterns of participation gave us valuable information about the representativeness of the cases we interviewed, and about the usefulness of the ED surveillance database as a source of potential study subjects. For the most part, participation did not vary a great deal when controlling for various demographic and injury factors. For Hispanics and laborers, however, the lower participation rates were remarkable. In addition, past analysis of the surveillance database cases has shown greater injury severity (higher proportion of admitted cases) among Hispanics and among laborers. Important information will be missed on these severe injuries if follow-up is poor within these two groups.

The estimated total annual cost to employers of injured construction workers in the US ranges from $10 to 40 billion [Meridian Research, 1994]; at $20 billion, the cost per construction worker would be $3,500 per year. One cost indicator, Workers' Compensation premiums for three trades—carpenters, masons, and structural iron workers—averaged 28.6% of payroll nationally in mid-1994 [Powers, 1994]. In addition to worker's compensation, there are liability insurance premiums and other indirect costs, including reduced work crew efficiency, clean-up (from a cave-in or collapse, for instance), or overtime necessitated by an injury; these indirect costs can exceed the worker's compensation claim for an injury by several multiples [Hinze, 1991; Levitt and Samelson, 1993]. Yet some of the economic or social impact of these injuries may not be possibly measured by compensation statistics or lost work days. For example, Bresnitz et al. [1994] reported that a substantial number of applicants for Social Security disability had impairment caused or aggravated by a work injury or work exposure. Some of these workers probably had never received any benefits from Workers' Compensation, for they had medical conditions that often are not accepted even if filed; others had work injuries that led to permanent disability, and for which benefits under Workers' Compensation were probably paid.

Although we know the compensation costs of these injuries, we know less about their long-term impact on the workers. We do know that many workers who have work-related injuries or illnesses often cannot return to their jobs without modification, or cannot return at all. For example, Katz et al. [1998] reported that almost half of the patients with carpal tunnel syndrome requiring surgery were not able to return to their pre-injury jobs. Work-related back pain is associated with prolonged time off work in construction. In Washington State, which has a state-wide mandatory compensation program, roofing was one of the industries having the highest claim rate in the state for back and upper extremity disorders [Silverstein and Kalat, 1998; CPWR, 1998].

Gillen et al. [1997] reported that 7% of the construction workers who sustained a fall at work had a permanently disabling injury, and 11% of the workers left construction work either because they had a permanent impairment or decided not to return to construction after their fall. Our findings are very similar, even though we are looking at all types of soft-tissue musculoskeletal injuries and excluded fractures.

Accommodation is much more difficult in the construction industry because most employers are small businesses, the relationships between employer and employ-

ees frequently are short-term, and the work is cyclical and intermittent. Employers are small; of the 1.9 million construction contractors identified by the 1990 census, only 28% had any employees, and only 136,000 had more than 10 employees [Ringen et al., 1995]. Small employers are much less likely to be able to accommodate a worker with impairment, and without a long-term relationship to that worker the employer would also be less inclined to do so.

This research has its strengths and its weaknesses. The data set and the follow-up interviews are a unique resource for research in construction, and provide a way to see the hidden social burden of musculoskeletal injuries in this industry. Since most construction workers have no regular place of employment or employer, a project such as this allows research that cannot be done in a more traditional fashion, such as cross-sectional study of a workplace. Our participation rates are clearly a weakness, potentially limiting the generalizability of the results. Table I presents data on the non-participants, and we know that the participants are not fully representative of all the construction workers in our surveillance database. Yet the data presented can stand on their own even with that limitation. Our conclusions about symptoms and functional status are based on self-report. Baron et al. [1996] assessed the validity and reliability of self-reported musculoskeletal symptoms. They reported adequate validity and reliability; for example, a hand symptom questionnaire had a specificity ranging from 64% to 95% compared to physical examination findings, and the more severe symptoms were more frequently associated with abnormal physical findings.

Behind all the tables of data, there are workers with injuries. We recorded the stories, the faces behind the facts. These stories told us many things the facts do not; several major themes emerged from the workers' stories. Construction workers believe that getting hurt and working with pain are both part of the job. Injured workers prefer to work, even with restrictions, if they are able to do so, and workers will find ways to perform tasks differently when they are in pain. We heard from them that the effects of serious work related injuries reach far beyond physical symptoms.

Construction workers told us that modified work does not exist in many cases. Even when a contractor had a ''light duty program'', it frequently did not meet the needs of the injured worker. Modified duty, which has been successful in other industries, is a challenge for the construction industry; more creativity is needed to develop good programs. Part of this creative thinking can come from the workers themselves. Modified duty programs will need to be trade-specific and probably site-specific, and allow for different types and degrees of work restrictions.

From these stories we have also learned that the effects of chronic injuries are complex and go beyond the physical boundaries of the worker. There are long-term financial, emotional and a myriad of other effects on workers and their families. Injury prevention programs, coupled with construction specific return to work programs, can go a long way to reduce the disability and financial consequences of acute musculoskeletal injury.

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