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Early Retirement Due to Occupational Injury: Who Is at Risk?

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Background *As the workforce is rapidly ageing, research on the consequences of occupational injuries in older workers is becoming more important. One adverse outcome unique to older workers, early retirement, has significant negative social and economic consequences for workers and employers. Although linked to poor worker health, the roles of workplace factors and occupational injury have not been well-defined.*

Method *Changes in retirement plans attributed to an occupational injury were studied in a population-based sample of 1,449 New Hampshire workers aged ≤55, using a mailed survey. Questions addressed pre-and post-injury health, job satisfaction, work capacity, nature and severity of injury, medical care, employer response, work status, pain, and financial problems.*

Result *Eleven percent planned to retire earlier due to their work injury, and their outcomes were significantly worse. In a multivariate model, pre-injury dissatisfaction with the job and with medical care, and poor physical and mental health status were related to intent to retire early.*

Conclusion *These factors may represent opportunities for early identification and intervention with individuals at high risk for poor post-injury outcomes. Longitudinal studies are needed to confirm the importance of these preliminary findings.* Am. J. Ind. Med. 47:285–295, 2005. © *2005 Wiley-Liss, Inc.*

KEY WORDS: age factors; occupational diseases; injury; treatment outcomes; retirement; workers' compensation

INTRODUCTION

Consequences of work-related injuries are an important area of research, as occupational injuries affect about 1 out of every 15 workers each year [Bureau of Labor Statistics, 2003]. A variety of adverse impacts can occur due to occupational injury, including both short-term as well as long-term consequences. Even in workers whose injury has not resulted in prolonged disability, residual problems of pain, loss of function, and injury-related concerns about future employability and recurrence may persist [Keogh et al., 2000; Pransky et al., 2002; Rudolph et al., 2002].

For older workers, residual consequences of a work injury may be especially severe. Several investigations have documented more severe injuries, higher fatality rates, longer length of disability, and more residual health problems compared with younger workers [Agnew and Suruda, 1993; Personick and Windau, 1995; Mayer et al., 2001]. One adverse outcome unique to older workers is health-related early retirement. Several studies have demonstrated that blue-collar workers are at higher risk of early retirement after developing a significant health problem [Sammartino, 1987; Ruhm, 1989]. Furthermore, early retirees who leave the workforce due to health problems are much more likely to

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become impoverished than those who retire in good health. This adverse outcome is a significant concern, as the workforce is rapidly ageing. The US Bureau of Labor Statistics has projected that, between 1995 and 2005, the number of workers ≥55 will increase at an annual rate of 2.5%, while the number of workers ≥25–54 will increase only 1.1% per year [Costello, 1997]. However, fewer job options are available for older workers who have diminished work capacity [Glass et al., 1995].

Several factors may influence post-injury outcomes. Older employees with comorbid conditions are at risk for a more prolonged healing process [Benjamin and Pransky, 2001]. Some older workers may also have less reserve work capacity to draw on when an injury occurs [de Zwart et al., 1995] making it more difficult for them to return to their jobs during the healing process. Several studies have observed a relationship between poor job performance and high physical demands in older workers [Garg, 1991; Tuomi et al., 1997a]. Support in the workplace, from both employers and other employees, has been found to be important in maintaining workers with health impairments on the job [Daly and Bound, 1996] and has also been found to be important in duration of work absence after a job-related injury [Pransky et al., 2000].

The retirement theory literature, while extensive, provides limited direct evidence for the factors that influence a decision to leave the workforce [Shaw et al., 1996]. Health, or the individual's perception of their health, has been cited in numerous studies as a major factor in retirement, and changes in attitudes towards health have been found to co-occur with a decision to retire [Fries and Crapo, 1981]. Health may play an especially strong role in the decision to retire early; recent data from the Health and Retirement Study found that those who retired between ages 51 and 59 were significantly less likely to report being in very good to excellent health than the general population of the same age [National Academy on an Aging Society, 2000]. Another factor related to the retirement decision is the work environment; those with high levels of job satisfaction and a rewarding job with good supervision and management may retire later than those whose jobs are stressful and physically demanding [Ekerdt and DeViney, 1993]. Relief from a poor work environment may be a strong motivational force in the decision to retire [Shaw et al., 1996]. Financial considerations are also important, but it appears that health considerations may be a more primary motivational force, as those who retire due to ill health are often less financially prepared to leave the workforce than those who remain [Ycas, 1987].

However, none of these investigations have focused on work injuries or other acute trauma events. Work-related injuries in older persons provide a unique opportunity to look at the influence of a single health event on retirement outcomes. Advantages over studies of chronic health conditions include the ability to accurately identify onset in most cases, and the certainty that a workplace response occurred, as the condition was reported as work-related.

This investigation was intended to develop new information on the frequency and characteristics of workers whose occupational injury changed their plans regarding early retirement. Prior studies on involuntary early retirement suggested that poor health, lack of support in the workplace and inability to meet job demands, and low social support would be significant factors associated with early retirement. Studies on outcomes after work-related injuries support a sequential and multifactorial theory, where pre-injury factors, the injury itself, and post-injury responses and intermediate outcomes affect the ultimate outcomes of return to work, job retention, and job satisfaction [Feuerstein, 1991] we additionally theorized that these factors would affect plans for retirement. Thus, the working hypothesis was that plans to retire earlier after a work injury would be associated with several pre- and post-injury factors, as well as certain post-injury outcomes (Table I), included as they were significantly associated with adverse work outcomes or early retirement in prior studies.

METHODS

This study was performed as part of a research project comparing long-term outcomes of occupational injuries in a matched cohort of workers <55 years of age and ≥55. Potential participants included all workers over age 55 with a first report of occupational injury filed with the New Hampshire Department of Labor between November 2000 through March 2002. Only those with injuries reported no more than 8 weeks prior to study participation and without another reported injury within the past year were eligible. Participants were administered a mailed, self-report survey; nonrespondents received a second questionnaire or were contacted by telephone within 7–10 days from the initial mailing. As an incentive, the letter accompanying the survey informed participants that receipt of a completed survey would automatically enter the respondent in a lottery for one of five $100 prizes. To minimize recall bias, each case was eligible for only 40 days from the initial selection and mailing.

Survey Development

The survey consisted of 125 items, organized into four main constructs based upon the working hypothesis: pre-injury factors, peri-injury factors, post-injury factors, and outcomes that could influence retirement decisions (Table I).

Pre-injury factors included demographics, health (comorbid conditions, previous extended work absences due to health, previous work injuries), job and work tenure, and job satisfaction. An eight-item version of the Work Limitations Questionnaire was included as a measure of specific

TABLE I. Survey Constructs, Factors, Items, and Prior Validation

Survey constructs and factors	Number of items	Previously validated
Pre-injury factors		
Demographics (age, gender, education, income, marriage)	4	A
Pre-injury health (comorbidity, prior injury, sickness absence)	7	A
Occupational category and level of physical activity	2	A, B
Employer characteristics (size, industry)	2	A
Job and work tenure, prior retirement	3	A
Job satisfaction	1	A
Work limitations due to health	8	C
Peri-injury factors		
Injury type (body part involved)	1	A
Injury severity	1	
Immediate employer response	6	A
Employer communication and associated satisfaction	2	
Post-injury factors		
Type of medical care received	5	A
Provider response to occupational health issues	4	
Satisfaction with care and provider recommendations	2	A
Need to use personal leave for medical care	1	
Work accommodations after return to work	5	
Problems on returning to work	4	
Outcomes		
Length of time out of work	1	A
Residual injury-related physical/medical problems	3	A
Work limitations due to health	8	C
SF-12 mental health function subscale	6	D
SF-12 physical health function subscale	6	D
Quality of work life	5	A
Financial impact of injury	4	A
Future work concerns	4	A
Current work status	3	A
Pain exacerbated by work	1	

A: Validation information in Pransky et al. [2000].
B: Validation information in Peterson et al. [2001].
C: Validation information in Lerner et al. [1999].
D: Validation information in Luo et al. [2003].

work-related functional limitations [Lerner et al., 1999]. Respondents' occupation and industry were divided into major US Bureau of Census categories [US Census Bureau, 2002]. A measure of job physical demands was derived from the occupation and industry data collected, using the job physical demands scale from the US Department of Labor's Occupational Information Network (O Net) system [Peterson et al., 2001].

Peri-injury factors (close temporal relation to the injury event) included body part involved, self-rated severity [Zwerling et al., 1996] whether the immediate employer response was supportive (employer concern for worker, attempts to help worker, blaming worker for the injury event, anger towards worker for becoming injured), and the nature and satisfaction with employer communication. Post-injury factors included the type of medical care received, how extensively the provider addressed workplace issues, satisfaction with provider care and recommendations, and scales to assess work accommodations and problems on returning to work.

Outcomes included length of time out of work, residual physical problems (including ongoing pain, ongoing medical care, exacerbation of pain after working, and difficulties performing job tasks both pre- and post-injury), current physical and mental health-related function, change in quality of work life (e.g., change in motivation to work, work abilities, job satisfaction and level of responsibility), economic difficulties due to the work injury (problems

paying bills, borrowing money or using savings, or selling possessions in order to cover expenses), and future work concerns (worries about ability to work in the future, inability to cope with stress, fears that injury has permanently altered health status).

Almost all of the single item measures and scales had been tested for reliability and validity, through cognitive interviews, common factor analyses, and test-retest evaluation [Pransky et al., 2000, 2005]. Internal consistency reliability was good to excellent, according to established criteria [Bartko and Carpenter, 1976; Robinson et al., 1991] with Cronbach or KR-20 alphas ranging from 0.77 to 0.92. Average scale inter-item correlations ranged from 0.41 to 0.71. Test-retest reliability studies of multi-item scales resulted in intraclass correlations ranging from 0.41 to 0.99, with an average ICC of 0.80. Dichotomous item kappas were all significant at $P < 0.01$ and ranged between 0.52 and 1.0. Items with lower test-retest reliability were those that might be expected to change over time, such as job satisfaction. The Work Limitations Questionnaire and single-item job satisfaction scales have good reliability as reported elsewhere [Zwerling et al., 1996; Lerner et al., 1999].

Four focus groups were held, consisting of 28 participants representing both younger and older (>age 55) workers with a recently reported work injury. Based upon their feedback and a review of the literature, several new items were constructed to evaluate ease of access to medical care; work problems encountered after the injury; post-injury job accommodations, and retirement plans in relation to the work injury. Respondents were asked whether, as a consequence of their work injury, they now want to stop working (retire) sooner than previously planned. New items generated by focus group discussions were constructed and tested in subsequent focus groups. The instrument was cognitively tested on recently injured individuals in both age groups for clarity of the meaning and wording of all items. The draft survey was piloted on a total of 140 work-injured respondents ($80 > 55$ and $60 < 55$).

Analysis

Analysis was restricted to respondents who lost at least 1 day of work due to the work injury, as injuries that resulted in less than a day of lost time represented minor, self-limiting conditions. Analyses were organized around comparisons of those who reported early retirement plans with those who did not intend to change their retirement plans. Comparisons of outcomes included duration of lost time, work function, concerns about future employability, and perceived changes in the quality of work life after the injury. Factors hypothesized to be associated with changed retirement plans were also compared for the two groups. Bivariate analyses were performed, using *t*-tests, or Chi-square statistics, as appropriate. Multivariate analyses using logistic regression methods were used to evaluate significant factors from bivariate analyses. All analyses were executed using SPSS 11.5.

RESULTS

The survey was sent to 2,734 injured workers >55 with valid addresses, and 1,449 (53%) responded. Most non-respondents (68%) did not complete the survey within the 9-week from injury event time limit. Another 8% lacked correct contact information; 12% actively refused to participate; and the remainder (12%) had no injury or were otherwise ineligible. Respondents and non-respondents did not differ by gender or injured body part.

Of the respondents, 504 workers (47%) lost at least 1 day of work due to their work injury, and were the focus of subsequent analyses. Their average age was 60 (range: 55–80), 42% were female, 79% had graduated high school, 71% were married, 21% had already retired from a previous job. On average, they had been working in the current type of occupation for over 14 years, and with the current employer for over 8.5 years. Overall, 21% earned <$21,000/year pre-injury (Table II). Fifty-five (11%) responded that the work injury had altered their retirement decision. Thus, comparisons were made between this group and those who lost at least a day of work due to their injury but whose retirement plans were not altered by this event ($n = 449$).

There were no statistically significant differences in type of occupation, difficulty performing job tasks before the injury, pre-injury level of job physical activity, or number of prior work-related injuries for the two groups. The group intending to retire early had significantly lower pre-injury job satisfaction, and more comorbid illnesses prior to their work injury (Table II).

Those whose retirement plans had changed were significantly more likely to rate their injuries as severe (Table III). No differences were observed in type of injury; upper extremities were most commonly affected, with 34% of injuries overall. Back injuries represented 25% of the injuries in both groups of respondents. After the injury, respondents whose retirement plans had changed experienced significantly more negative immediate employer responses to the injury and were less satisfied with their supervisor's communication with them after the injury. This group also was much less satisfied with the attempts of the workers' compensation insurer to assist them in obtaining what they perceived as needed medical care for their injuries.

Type of provider who first treated these workers was not significantly different for the two groups, with 55% overall treated initially by an emergency room provider (Table IV). Providers' level of attention to the worker's actual job tasks and the percent of providers who gave advice on preventing reinjury were similar in both groups. Those whose retirement plans had changed were significantly less likely to report that

TABLE II. Demographic and Pre-Injury Characteristics of Workers ≥55 Who Lost Time From Work: Comparison of Those Whose Retirement Plans Changed due to the Injury Versus Those Whose Plans Were Not Affected

Variable	Injury affected retirement plans (N = 55)	Injury did not affect retirement plans (N = 440)	Significance of difference
Age (mean)	60.4	60.5	N/S
Percent female	50.9	41.6	N/S
Percent married	63.6	72.5	N/S
Education level (% each category)			
<High school	19	20	N/S
High school graduate	44	43	
Some college	23	25	
College graduate	14	12	
Household income prior to injury (%)			
<$10,000	54	4	N/S
$10,000–20,000	20	18	
$21,000–30,000	2,929	32	
$31,000–50,000	14	19	
$51,000–75,000	4	18	
>$75,0000		10	
Mean years with this employer at time of injury	7.9	8.5	N/S
Mean years performing this kind of work	11.8	14.6	N/S
Pre-injury job dissatisfaction (high score = less satisfied) (mean, SD)	7.9 (2.9)	6.4 (2.4)	$t = 3.64$, $P = 0.001$
Average % of the time having difficulty doing job tasks before work injury	25.2	18.4	NS
Number of pre-injury comorbidities (mean, SD)	1.9 (1.3)	1.2 (1.2)	$t = 3.93$, $P = 0.000$
Percent having pre-injury sickness absence of >2 weeks	44	29	$\chi^2 = 4.99$, $P = 0.037$
Percent with prior injury to same body part	33	23	N/S
Pre-injury level of job physical activity (mean O*NET score)	3.36	3.40	N/S
Percent now receiving retirement benefits	24	22	N/S
Percent with previous retirement	23	22	N/S

the provider made recommendations about when the respondent could return to work. When these recommendations were made, this group was significantly less likely to think they were appropriate; a higher proportion thought they should have returned to work at a later time. Medical care was similar in terms of percentage who had physical therapy, injections, and surgery, but significantly more persons with changed retirement decisions were given prescription medications for their injury. Those with changed retirement plans were much less satisfied with their medical care.

At the time of the survey (on average, about 6 weeks post-injury), those with changed retirement decisions appeared to be faring much worse on several measures of physical and mental health, work function and concerns about their future ability to work (Table V). Upon return to work, they reported significantly more problems obtaining appropriate accommodations and lost income or benefits more frequently than those whose retirement plans remained unchanged. They had more ongoing medical care and use of pain medications for the injury, and more economic problems attributed to the injury. Those with changed retirement plans reported significantly worse capacity to do their normal work tasks. Indicative of this diminished physical capacity, they also were less likely to perform all of their pre-injury job tasks when they returned to work. This group also perceived more negative change on the quality of work life scale compared to before the work injury. They also reported significantly more financial difficulties related to their work injury.

To identify those factors that contributed most to early retirement decisions, stepwise multivariate logistic regression was employed. Factors were grouped as pre-injury, peri-injury, and post-injury factors (including outcomes) based upon a sequential, multifactorial theory of determinants of

TABLE III. Injury and Post-Injury Experiences: Comparison of Those Whose Retirement Plans Changed Due to the Injury Versus Those Whose Plans Were Not Affected

	Injury affected retirement plans (N = 55)	Injury did not affect retirement plans (N = 440)	Significance of difference
Percent rating injury as severe	58	36	$\chi^2 = 13.4$, $P = 0.001$
Negative employer response to injury (high score = more negative response) (mean, SD)	1.15 (1.42)	0.49 (1.01)	t = 3.33, $P = 0.001$
Percent where supervisor contacted employee post-injury	51	68	$\chi^2 = 5.7$, $P = 0.017$
Percent dissatisfied with employer communication	35	9.7	$\chi^2 = 30.4$, $P = 0.000$
Percent using sick or vacation time to obtain needed medical care	45	22	$\chi^2 = 11.12$, $P = 0.001$
Return to work problem scale (high score = more problems (mean, SD)	1.29 (1.01)	0.61 (0.83)	t = 4.02, $P = 0.000$
Percent dissatisfied with worker's compensation insurer	34	9.5	$\chi^2 = 41.56$, $P < 0.001$

TABLE IV. Medical Care for Injured Workers With and Without Injury-Related Changes in Retirement Plans

	Injury affected retirement plans (N = 55)	Injury did not affect retirement plans (N = 440)	Significance of difference
Percent in each category where provider:			
Tried to understand job	86	91	NS
Explained condition clearly	89	92	
Advised on how to prevent reinjury	37	37	
Asked about other health problems	63	66	
Percent where provider made return to work recommendations	66	78	$\chi^2 = 9.6$; $P < 0.01$
Percent where provider return to work recommendations were judged to be			$\chi^2 = 37.03$; $P < 0.001$
About right	68	93	
Should have gone back sooner	0	1.3	
Should have gone back later	32	6.0	
Medical care: percent in each category receiving			
Physical or occupational therapy	61	47	NS
Injections	37	23	NS
Surgery	29	19	NS
Prescribed meds	92	76	$\chi^2 = 4.66$, $P = 0.031$
Massage	31	19	NS
Satisfaction with medical care (percent)			
Completely satisfied	34	70	$\chi^2 = 34.74$; $P < 0.001$
Mostly satisfied	37	22	
Somewhat satisfied	17	5	
Not at all satisfied	11	3	

TABLE V. Outcomes: Injured Workers With and Without Injury-Related Changes in Retirement Plans

Outcome	Injury affected retirement plans (N = 55)	Injury did not affect retirement plans (N = 440)	Significance of difference
Percent who had returned to work at time of survey	66	82	$\chi^2 = 18.81, P < 0.001$
Days out of work (mean, SD)	13.2 (11.8)	11.4 (15.2)	$t = 1.02, P = 0.39$
Percent doing same job tasks after return to work	35	60	$\chi^2 = 2.95, P = 0.005$
Change in quality of work life scale (positive = worse; mean, SD)	1.08 (1.35)	0.25 (0.86)	$\chi^2 = 3.73, P = 0.001$
Mean financial difficulties score (high = more problems)	1.2 (1.2)	0.46 (0.89)	$t = 4.71, P = 0.000$
Mean future work concerns (high score = more concerns)	2.51 (0.95)	1.35 (0.66)	$t = 8.62, P = 0.000$
SF-12 mental subscale (mean, SD)	42.7 (12.8)	53.9 (9.1)	$t = 5.97, P = 0.000$
SF-12 physical subscale (mean, SD)	34.0 (7.5)	44.3 (10.6)	$t = 8.56, P = 0.000$
Percent receiving medical care at time of survey	77	57	$\chi^2 = 5.20, P = 0.023$
Percent used pain medications for injury in past week (% yes)	74	47	$\chi^2 = 11.9, P = 0.001$
Pain worse after working (% yes)	63%	40.5%	$\chi^2 = 54.20, P < 0.001$
Average % of the time having difficulty doing job tasks at time of survey	33.4%	19.33%	$t = 3.28, P < 0.01$

work injury outcome [Feuerstein, 1991]. The order of grouped variable entry was chosen to represent a logical temporal causal sequence, corresponding to the variable groups in Tables I–III, and then Table IV. Significant factors from each step ($P < 0.10$ threshold for retention) were collected into a final model, with results in Table VI. The final factors included pre-injury job dissatisfaction, dissatisfaction with medical care, and lower scores on both the PCS-12 as well as the MCS-12 scales.

DISCUSSION

In a population-based sample of workers over age 55 with work-related injuries, 11% reported intent to retire earlier due to their work injury. Though demographically similar to other older workers who had been injured on the job, those who planned earlier retirement differed significantly with respect to many pre-and post-injury factors. Prior to the injury, they reported more health problems and

TABLE VI. Multivariate Model of Factors Affecting a Decision to Retire Earlier After a Work Injury in Workers ≥55, With Significant Factors From Each Separate Step

Variable	B	SE	Wald	df	*P*-value	OR	95% CI for OR	
							Lower	Upper
Pre-injury job satisfaction	0.15	0.089	2.75	1	<0.09	1.16	0.97	1.38
Satisfaction with medical care	0.53	0.249	4.50	1	<0.04	1.70	1.04	2.77
PCS-12	−0.06	0.023	7.85	1	<0.005	0.94	0.90	0.98
MCS-12	−0.04	0.018	5.39	1	<0.02	0.96	0.93	0.99
Number of comorbidities	0.11	0.168	0.46	1	0.499	1.12	0.81	1.56
Severity of injury (high score = more severe)	−0.02	0.399	0.003	1	0.958	0.98	0.45	2.14
Employer response to injury (high score = negative response)	0.05	0.204	0.05	1	0.823	1.05	0.70	1.56
Use of prescription medications	0.84	0.667	1.60	1	0.206	2.32	0.63	8.58

more difficulties at work, including lower job satisfaction. In addition to experiencing more severe injuries, they appeared to return to a work environment that was less supportive, where accommodations were less available or effective.

The relationships among pre-injury and post-injury factors and several outcomes can be evaluated in the context of a multidimensional model of work outcomes, as proposed by Feuerstein [1991]. A range of personal, psychosocial, occupational, and injury factors all influence immediate post-injury outcomes, which in turn (along with a variety of other outcomes) influence longer-term post-injury outcomes. Although outcomes can be independent (such as symptoms, function and return to work), many have similar relationships to causal factors [Pransky et al., 2000].

Intention to pursue early retirement because of the work injury was strongly associated with other adverse outcomes. These included negative trends in quality of work life, more difficulty keeping up with required tasks, and more health-related work limitations. Even though there was little difference in the length of work absence, between the two groups, almost twice as many of those with changed retirement decisions had not returned to performing their usual job tasks at the time of the survey. This is likely a consequence of persistent post-injury difficulties in conjunction with respondents' reported pre-injury work and health problems.

Each of these negative outcomes can provide significant reinforcement to the notion that an acceptable return to work will not be achievable, thus forcing early retirement [Rix, 1990]. The lack of self-efficacy demonstrated in the reduced capacity to perform job tasks also may lead to a desire to withdraw from the workforce. As a consequence, this subgroup had far more concerns about their ability to earn a living in the future, and were much more likely to feel that they would not be able to continue their job due to their poor health. The loss of full employment may be the reason that adverse economic consequences due to the work injury occurred more often in those with changed retirement decisions—a finding consistent with population-based studies that have demonstrated significant economic hardship associated with forced early retirement [Boaz and Muller, 1990; Mitchell, 1993].

Severity of injury is a factor frequently found to be related to early retirement in several nonoccupational studies of injury and outcome. [MacKenzie et al., 1998; Wagner et al., 2002]. Greater severity is also reflected by more use of prescriptions, more use of pain medications and need for ongoing medical care at the time of the survey, as well as the report of more pain after work. While there is no independent validation of injury severity and respondents' perceptions of the seriousness of their condition, this finding is similar to other research that found a relationship between long-term disability and self-report of pain [Gatchel et al., 2002] or ''self-prediction of disability'' [Frymoyer and Cats-Baril, 1987] in workers injured on the job.

Comorbidity has received much attention, especially in older populations where significant coexisting illness can influence recovery and employment [Tuomi et al., 1991]. Studies of working populations often fail to identify a significant comorbidity effect, in part due to the low prevalence of significant pre-existing illness in relatively young populations [Lancourt and Kettelhut, 1992; McIntosh et al., 2000]. Comorbid conditions may affect both the risk of injury as well as potential for recovery, return to work and return to pre-injury functional capacity [Chirikos and Nestel, 1989]. High disease prevalence has also been associated with poor work ability in workers $\geq$55 [Tuomi et al., 1991]. Less satisfaction with medical care might reflect relatively deficient care, although this was not supported by other measures of how the provider responded to specific work-related concerns, and overall ratings of quality of care by participants in this study. In other investigations of work-related injuries, those persons who did not achieve favorable outcomes were more likely to rate their care as inferior, even if there is no evidence that an actual deficiency in care occurred [Kyes et al., 1999].

Occupational characteristics associated with other adverse outcomes were more common in this subgroup. Poor job satisfaction, negative employer responses to the injury, ineffective post-injury communication with the worker, and difficulty arranging alternative duty are all associated with prolongation of work disability [Goertz, 1990; Cleary et al., 1995; Pransky et al., 2000] and thus may also indirectly influence retirement decisions. Although the measure of job physical requirements was not related to retirement decisions, those with changed retirement decisions had more difficulty performing their job tasks before the injury, suggesting that the occurrence of a mismatch between job physical requirements and worker capacity is more important than the absolute level of physical requirements [Garg, 1991; de Zwart et al., 1995].

As in other studies, a number of demographic factors were not associated with early retirement intention due to work injury, including education, income, job tenure, gender, and marital status [Gatchel et al., 1995; Hazard et al., 1996; Dasinger et al., 2000]. By contrast, many of these factors have been shown to influence the retirement decision in populations without work injuries [Herzog et al., 1991]. This suggests that people who decide to retire due to a work injury are more similar to those who retire early due to nonoccupational illness and to those with prolonged work disability than to those who retire in good health. Other research [Lund and Borg, 1999] has found that, along with the tenor of the work environment, perceptions of health in older workers was predictive of remaining in the workplace.

Although a decision to pursue earlier retirement was relatively infrequent, it represents an important concern for workers, employers, and policy-makers [Burtless, 1987]. Other studies of involuntary early retirement have demon-

strated subsequent difficulty obtaining even part-time gainful employment, permanent reduction in income, and eventual poverty [Coberly, 1985]. Early retirement due to ill-health has even been linked to premature death [Boaz and Muller, 1990]. A combination of factors—poor mental and physical functioning due to health problems, job dissatisfaction, and dissatisfaction with injury-related medical care—may be useful early indicators that an injury or adverse heath event would be more likely to lead to an early withdrawal from the workforce. These findings confirm the impressions of others who have suggested that specific indicators can help target early intervention programs for older workers at highest risk for early retirement [Jessup and Greenberg, 1989]. Possible interventions include appropriate job modifications, more attention to chronic health problems, wellness programs targeting older workers, directed physical training, job coaching, facilitated employer communication, and retirement counseling [Shrey and Hursh, 1995; Tuomi et al., 1997b].

STRENGTHS AND LIMITATIONS OF THE STUDY

This study has several attributes that set it apart from other research on older workers and retirement decisions. It is population-based, thus eliminating the bias that can accrue when study participants are selected from single-condition populations or treatment programs [Gilbert et al., 2000; Mayer et al., 2001]. The self-report survey design provides more detailed and specific information than studies utilizing administrative data sources [Personick and Windau, 1995]. Moreover, no previous research has focused on how work injuries influence the retirement decision, nor have other studies investigated a broad range of non-injury related influences on the retirement decision in the context of work injuries.

Limitations include low response rates (though not dissimilar from other surveys of injured workers), reliance on self-report as the sole source of information on retirement decisions and outcomes, and absence of long-term follow-up data on outcomes. However, the limited information available did not indicate significant differences between respondents and non-respondents. Because the study was cross-sectional, it was not possible to determine whether retirement intentions would lead to actual changes in employment [Baldwin et al., 1996; Rudolph et al., 2002]. It is possible that retirement plans made soon after the injury may change over time due to completion of the healing process, more effective and permanent workplace accommodations, or more time for the respondent to thoroughly evaluate their options. Although most measures were well-validated, some factors hypothesized to be important may have not been detected due to measurement error, especially when a single item was used to measure an important construct.

Recall bias may affect reports of pre-injury factors, especially if those with changed retirement plans are more likely to have a negative global perspective, perhaps a function of having more severe injuries. Although the overall sample size is large, the number of persons with changed retirement decisions is relatively small, thus limiting the study's statistical power, especially in multivariate analyses.

CONCLUSION

Although a decision to retire earlier due to a work injury is infrequent, this study suggests that it is associated with significantly worse outcomes, and may lead to poverty and further poor health for the worker, and significant expense and workplace disruption for the employer. Risk factors associated with a change in retirement plans due to a work injury suggest that those at risk can be identified soon after the injury, and thus may benefit from interventions directed towards improving health, physical rehabilitation, assistance with job modification or change, and efforts to improve employer-employee relationships. Since multiple causes are often present, effective approaches will need to be multi-factorial and individualized. As the percentage of older persons who stay in the workforce increases, these issues will become more important for practitioners in occupational health and gerontology. Though focused on work-related injury, these findings may provide insights for early retirement due to other, non-occupational health problems as well. These results are based on relatively small numbers and cross-sectional data and represent an initial, exploratory analysis. Longitudinal studies are required to confirm these suggested causal relationships, and to evaluate the predictive value of the most significant factors identified in the multivariate analysis (poor physical and mental health, job dissatisfaction, and inadequate medical care).

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