Final Progress Report

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Injuries and Illnesses in Older Workers: Causes, Consequences & Prevention

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Abstract:
Accurate information on the incidence, causes, social, and economic consequences of work-related conditions in older workers is essential to guide public policy. Specific information is needed on effective methods of rehabilitation and re-injury prevention for this segment of the workforce. Unfortunately, little is known about these issues. Our pilot investigation and other studies suggested significant differences between older and younger workers' experience related to occupational injuries and illness. As the number of workers over age 55 will be growing at a rate that is at least twice that of the general workforce, this area will become more important.

We conducted a prospective, population-based study of long-term outcomes in older workers with occupationally-related conditions, building on a multifactorial model of influences on outcomes. State law requires notification by employers to the New Hampshire State Department of Labor (NHDOL) of any work-related condition reported by an employee. Using this data, workers over age 55 were contacted 2 - 6 weeks after an occupational injury or illness occured. They completed a mailed baseline questionnaire, with prospective follow-up at 12 months post initial questionnaire. A comparison younger worker with similar affected body part and gender was selected for each case. We recruited 1500 injured workers over age 55 and as many controls over a 14-month period.

Older and younger workers had similar rates of frequent body pains, obesity, having been out of work for more than 2 weeks in the past 5 years because of sickness, or a prior injury to the same body part. However, older workers had slightly higher rates of reporting difficulty doing heavy work on the job. One-third of younger workers reported that their injury was at least moderately severe, and this number was higher for older workers. Older workers actually appeared to have less concerns about return to work than younger workers. Older workers who were out of work had more severe injuries, less job tenure, and were more likely to be receiving a retirement pension. Non-work related illnesses were a factor in preventing return to work only in younger workers.

Workers over age 55 were different in several important ways. At least a quarter of them were working in a post-retirement career, and others have much longer job tenure than younger workers. RTW is complicated by pensions and less attachment to a second job / second career. However, older workers had similar length of lost time, frequency of reinjury, and actually had somewhat less negative financial and social consequences of their injuries. These highly comparable outcomes, despite greater injury severity in older workers, suggest that a healthy worker effect is prominent even at these relatively young ages.

Practical implications include the importance of tailoring treatment, return to work, and secondary preventive approaches to the unique circumstances of an individual older worker. The negative influences of severity and pre-existing health conditions appear to be less important than strong workplace attachments and RTW support as determinants of outcomes; age by itself is not very important once these factors are taken into account. Better outcomes can be achieved through a broad-based approach tha includes all factors potentially related to return to work, than by employing a more specific, narrow medical perspective.

Significant findings:

Before the injury, older and younger workers had similar rates of frequent body pains, obesity, having been out of work for more than 2 weeks in the past 5 years because of sickness, or a prior injury to the same body part. However, older workers had slightly higher rates of reporting difficulty doing heavy work on the job. Workers over age 55 were different in several important ways. At least a quarter of them were working in a post-retirement career, and others have much longer job tenure than younger workers.

One-third of younger workers reported that their injury was at least moderately severe, and this number was almost 50% for older workers. Almost a third more older than younger workers required surgery for their injury, even though the types of injuries were similar across both groups.

Outcomes were quite similar in both groups. Older workers actually appeared to have less concerns about return to work than younger workers, and had similar length of lost time, frequency of reinjury, and actually had somewhat less negative financial and social consequences of their injuries.

With some older workers, return to work is delayed or complicated by pensions and less attachment to a second job / second career. Non-work related illnesses were a factor in preventing return to work only in younger workers.

Translation of findings:

Treatment, return to work, and secondary preventive approaches should be tailored to the unique circumstances of an individual older worker.

Since strong workplace attachments and return to work support are the key determinants of outcomes, more important than health and medical care issues, there should be more emphasis on workplace-based interventions to improve outcomes after a work injury in older workers.

Age by itself does not appear to be a negative factor after a work injury; thus, there is no evidence from this study that older workers are at higher risk of negative outcomes after a work related injury.

SCIENTIFIC REPORT

Background for the project

The new Millennium brought with it a "graying of the workforce" in most developed countries. (Goldberg, 2000; Quinn, 1991) The U.S. 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 $\geq 25 - 54$ will increase only 1.1% per year. (Costello, 1997) A recent survey found that about 80% of a national sample of adults aged 33-52 expect to work past retirement age. (AARP, 1998)

There has been considerable discussion regarding the physical capacity of older workers to maintain their health and productivity on the job. (Barth and McNaught, 1991; Ilmarinen, 1997; Naegele, 1999; Wegman, 1999) An issue of particular concern has been the increased risk of work injury and subsequent disability due to age-associated decrements in cognitive function, health, and recuperative ability. (Anonymous, 1993; Benjamin and Pransky, 2000; Laflamme and Menckel, 1995; Mitchell, 1988; Zwerling, et al., 1996) Workers aged ≥ 55 are at greater risk for occupational fatalities than are younger individuals. (Kisner and Pratt, 1997) Older workers may also have longer disability and are less likely to return to work after an occupational injury. (Crook and Moldofsky, 1994; Personick and Windau, 1995; Turner, et al., 2000)

Detailed analyses of how post-injury outcomes may differ by age are not available. Most comparisons of older and younger injured workers have not taken into account factors other than age that may be responsible for observed differences. Those studies that have evaluated age-related differences in detail have used non-representative populations, such as patients with a single type of work injury or only those in a specific treatment program. (Gilbert, et al., 2000; Mayer, et al., 2001) Other research has been unable to address particular factors that may affect risk of poor outcomes due to the limitations of administrative data. (Personick and Windau, 1995)

This study was designed to provide detailed information on occupational injury circumstances and outcomes in workers age 55 and over, compared with a similar cohort of younger workers. Employing a multifactorial model of work outcome determinants, (Pransky, et al., 2002) we hypothesized that outcomes would be different for these two age groups, and that a variety of factors (some associated with aging) would account for these differences. For example, pre-injury job satisfaction has been associated with work outcomes after an occupationally related back injury. (Pransky, et al., 2000) Older employees have been shown to have lower absentee and turnover rates than younger workers, and are more satisfied with their jobs, (Hogarth and Barth, 1991) possibly contributing to better work outcomes after an occupational injury. Conversely, chronic health conditions occur much more often in persons over age 45, (Adams, et al., 1999) and these are associated with working fewer hours and more work disability. (Burkhauser and Daly, 1996) This implies that there may be more disability and greater need for continuing medical care after a work injury in older populations.

The contribution of age to outcomes after a work injury was evaluated using a multi-step process. First, age-related differences in various factors hypothesized to be related to outcomes were analyzed. Bivariate analyses were then employed to assess the relationship of age to outcomes. Finally, age and other factors were entered into multivariate models of selected outcomes in order to observe the effect of age when other variables were also considered. In this way, it was hoped that the separate role of age in outcomes after a work injury could be clarified.

Specific aims:

1. Identify age-related differences in outcomes of occupational injuries and illnesses

2. Identify characteristics of older workers, workplace organizational issues and other factors that affect outcomes.

3. Identify interventions that are effective in facilitating return to work and prevention of reinjury in older workers.

The progress in addressing each of these aims is discussed in the results and discussion below. Aims 1 and 2 were addressed in detail in this data analysis: aim 3 was addressed in part through the multivariate analyses described here, and further exploration of this data will be completed by the investigators over the next 6 months.

Methods

Survey development The survey consisted of 125 items, most of which had been previously-validated. (Pransky, et al., 2000) Outcomes measures included length of time out of work, work hours post injury, residual physical problems, change in quality of work life, economic difficulties due to the work injury, and future work concerns. Other previously-validated items assessed factors hypothesized to be related to these outcomes, including pre-injury job and employer characteristics, job satisfaction, pre-injury health, employer response to the injury, and injury-related medical care. An eight-item version of the Work Limitations Questionnaire was included as a measure of specific work-related functional limitations. (Lerner, et al., 1999) A one-item measure of injury severity was also included. (Zwerling, et al., 1996) Demographic information, employment history, respondent job and industry type and information about time lost from work were also collected. 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)

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 familiarity with the task performed at the time of the injury; ease of access to medical care; work problems encountered after the injury; and post-injury job accommodations. 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 ($80 \geq 55$ and $60 < 55$).

Survey administration The survey was administered in a mailed, self-report format, approximately 6 – 9 weeks from the reported time of injury, between November 2000 and May 2001. Nonrespondents were mailed a second questionnaire or 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. Assurance of confidentiality was provided; all study procedures were approved by the University of Massachusetts Medical School Committee for the Protection of Human Subjects in Research.

Study population Participants were drawn from the records of all work injuries reported to the New Hampshire Department of Labor between mid-November 2000 through the end of March 2002. New Hampshire was selected, as state law mandates reporting of all work-related injuries, even if no lost time occurred, thus enabling capture of a broader range of work-related injuries than in most states, where only lost time cases are recorded. All workers aged ≥ 55 who had filed a first report of injury no more than 8 weeks prior to the survey were included in the initial sample. Cases were excluded if there was an injury reported in the 12 months prior to the index injury, to minimize

confusion due to multiple events. Younger workers injured within the same reporting period as those ≥ 55 were selected sequentially on the basis of same gender and injured body part code to the older subjects and similar date of injury (all selected pairs were injured within 3 weeks of each other). In order to maintain similar proportions of gender and body part injured in younger and older workers, additional younger workers were sampled if needed. To minimize recall bias, each case was eligible for only 40 days from the initial selection and mailing.

Analysis

The first analysis was restricted to lost-time cases, as those who did not lose any work time due to their injury had minor injuries of minimal significance. Analyses were organized around comparisons of the two age groups for differences in outcomes, including lost time, work function pre-and post-injury, concerns about future employability, and perceived changes in the quality of work life after the injury. Bivariate and multivariate analyses were performed, using *t*-tests, chi-square, stepwise multiple linear regression, and logistic regression methods, as appropriate. Outcome variables were selected for detailed multivariate analysis based upon a significant bivariate association with age. Bivariate analysis was employed in order to select independent variables for inclusion in the final multivariate analyses. Age, gender and level of job physical activity were controlled for in all multivariate models. Occupation and industry were divided into major sectors according to US Bureau of the Census procedures. (U.S. Office of Management and Budget, 1997; U.S. Office of Management and Budget, 2000) All analyses were executed using SPSS 11.5 (SPSS, Inc., 2002). Other analyses in process will address all respondents, exploring those who chose early retirement as a consequence of their injury versus those who did not, gender-based differences in outcomes and associated factors, and differences in outcomes based on specific choices for medical care in common conditions (back and knee injuries).

Results

Participant response A total of 7,256 questionnaires were mailed – 3,044 to eligible workers ≥ 55 and 4,208 to workers < 55. Of these, 3,056 (1,524 from ≥ 55 respondents,

1532 from those < 55) were returned, for an overall response rate of 44%. However, for all those who could be contacted (n = 6,337), the overall response rate was 51%. Most nonrespondents (55%) did not complete the survey within the 9-week from injury event time limit. Another 22% lacked correct contact information; 16% actively refused to participate; and the remainder (7%) had no injury or were otherwise ineligible. The age groups differed significantly regarding the type of non-response; 16% of those ≤ 55 could not be traced versus 8% of those ≥ 55 ($\chi^2 = 748.5, p < .0001$). While younger workers were less likely to participate (response rate of 38% versus 53% for older workers), once contacted, they were less likely to actively refuse participation (7.8% versus 11.7%, respectively, $\chi^2 = 34.5, p < .001$). There were fewer males in the younger respondent group (49%) than there were in the nonresponse group (59%). The length of time between date of injury and survey completion was similar in both older and younger participants.

Characteristics of participants

Cases with lost time (n = 1,032) represented approximately 34% of all study respondents. Lost time cases were evenly distributed between the age groups; 51% were < 55 and 49% were ≥ 55 at the time of their injury. Demographic characteristics for all respondents with injury-related lost time are reported in Table I. Due to the overwhelming number of Caucasians living in New Hampshire (96% of the population), racial differences are not reported. Both older and younger respondents had similar distributions of gender, job physical demands, body part injured, and income. Older workers had a higher percentage of both the least educated and the most educated respondents, were more likely to be married, and had longer job and employment tenure. Body part injured for the two age subgroups is reported in Table II.

Table I. Participant demographic characteristics, workers with lost-time injuries, New Hampshire

	Age < 55 (N = 530)	Age ≥ 55 (N = 502)	*p*-value
Mean age (years)	38 (SD)	61 (SD)	
Gender			
Male	56.2%	57.1%	NS
Female	43.8%	42.9%	
Education			NS
≤ High school	11.2%	20.5%	
High school//GED	52.9%	43.3%	
Technical school/some college	27.9%	24.7%	
≥ 4 - year college graduate	8.0%	12.4%	
Marital status			
Single	40.3	28.8	<.001
Married	60.7	71.2	
Mean years doing job at time of injury	7.7 (SD)	14.3 (SD)	<.001
Mean years with employer at time of injury	5.4 (SD)	8.5 (SD)	<.001
Income per year at time of injury	5.9	4.0	
< $10,000	14.2	17.2	NS
≥ $10,000 - $20,000	23.8	20.9	
$21,000 - $30,000	25.0	31.5	
$31,000 - $50,000	21.5	17.4	
$51,000 - $75,000	9.6	9.9	
> $75,000			
Level of job physical demands (mean; high score = more physical demands)	3.5	3.4	NS

- **Proportions may not = 100% due to rounding**

Table II. Body part injuries of workers < 55 and ≥ 55, with lost-time injuries, New Hampshire

Body part injured	< 55 (%)	≥ 55 (%)	*p*-value
Back/lower back	28.0	25.0	NS
Upper extremities	35.3	33.5	
Lower extremities	26.4	30.0	
Head and neck	10.0	10.5	
Other	0.2	1.0	

The most frequently reported industry categories reported by respondents were professional and related services (22%), retail trade (21%) and manufacturing (19%). No significant industry or occupation differences by age group were observed (Table III).

Table III. Occupations of workers < 55 and ≥ 55 with lost time injuries, New Hampshire

Occupation by Major Census Category	< 55 (%)	≥ 55 (%)	Total n (%)*	*p*-value
Managerial, professional, specialty	12.0%	11.7%	123 (12%)	NS
Technical, sales, administrative	19.0%	22.6%	210 (20%)	
Service	20.2%	22.4%	220 (21%)	
Farming, forestry, fishing	1.7%	2.0%	19 (2%)	
Precision production, craft, repair	17.0%	12.7%	154 (15%)	
Operators, fabricators, laborers	25.3%	23.4%	252 (24%)	
Unknown	4.7%	6.2%	56 (5%)	

Sums to < 100% due to rounding

Age-related differences in pre- and post-injury circumstances

Age differences in pre-injury health and work capacity were mixed. Older workers reported more comorbidities than did those < 55 (mean number of comorbidities = 1.3 and 1.0, respectively, $t = -3.53, p < .0001$). Some pre-morbid conditions were significantly more common in older individuals; 35% of those ≥ 55 reported having hypertension versus only 12% of those < 55 ($\chi^2 = 77.27, p < .001$). Older respondents also reported a significant greater number of other health problems (26%) than did younger workers (16%, $\chi^2 = 14.9, p < .001$). Depression, however, was significantly more prevalent in those < 55 ($\chi^2 = 9.81, p < .01$). Age-related differences in prior serious injuries or illnesses was not significant, but among those who reported such events, those < 55 were more likely to report a work etiology (50% of those < 55 versus 34% of those ≥ 55; $\chi^2 = 8.9, p < .01$). On average, both older and younger workers reported pre-injury limitations in their work capacity (e.g., bending, lifting, sensory capacities, or ability to do fine motor work such as holding small objects or using a computer) about 25% of the time. Older workers reported significantly better job satisfaction prior to their injury (mean score 7.8 for workers < 55 and 6.6 for those ≥ 55; $t = 6.7, p < .0001$; higher score = more dissatisfaction).

There were no significant age-related differences in injury circumstances. Most (82%) injuries occurred suddenly, the majority (82%) occurring while performing a usual, as opposed to a rare or new, work task. Older workers were significantly more likely to rate their injury as "severe" (34% of those ≥ 55 versus 24% of those < 55; $\chi^2 = 13.6, p < .004$).

While about 65% of all respondents did not report any negative employer responses to their injury, those who experienced such responses were more likely to be younger(higher score = more negative employer responses; mean $< 55 = .98, \geq 55 = .51$; $t = 5.7, p < .0001$). Younger workers also reported significantly fewer attempts by their employer or supervisor to contact them after the injury (50% of workers < 55, 67% of workers ≥ 55; $\chi^2 = 29.6, p < .001$), and significantly more dissatisfaction with these attempts to communicate after the injury (21% of those < 55 versus 12.5% of those ≥ 55; $\chi^2 = 36.4$; $p < .0001$). Additionally, only 39% of younger workers versus 60% of those ≥ 55 reported being completely satisfied with the efforts of the workers' compensation insurer ($\chi^2 = 42.8$, $p < .0001$). Older workers with injury-related lost time experienced fewer job-related problems when they returned to work ($t = 3.0$; $p < .01$). They were also less likely to report that co-workers resented having to do extra work to help them (4.7% of those ≥ 55 *vs.* 11.6% of those < 55; $\chi^2 = 12.6, p < .0001$).

Over 97% of all workers with lost-time injuries received medical care for their injury. More than half in each age group were first seen in an emergency room or walk-in clinic, without any age-related differences in the type of provider who first treated the injury. Approximately 20% saw their regular doctor or nurse. Workers reported an average of 5.4 injury-related medical care encounters (SD = 6.7); no significant age difference in the number of visits was observed. Both age groups reported similar experiences with the provider; however, eighty-six percent of older workers reported that they received a clear explanation, versus 79% of those < 55 ($\chi^2 = 17.2, p < .0001$). Older workers were more often completely or mostly satisfied with the care they received for their work injury (91% of those ≥ 55, 82% of those < 55; $\chi^2 = 44.1, p < .0001$). Younger workers were significantly more likely to be treated with prescription drugs (86% of younger workers

versus 78% of older employees; $\chi^2 = 7.5, p < .01$). Conversely, 20 % of those ≥ 55 reported undergoing surgery for their work injury while those < 55 received surgical treatment only 12% of the time ($\chi^2 = 5.8, p < .02$). There were no other significant differences in types of treatment received.

Providers made return to work recommendations approximately 76% of the time in both age groups. Fewer younger workers felt that this recommendation was about right (80% versus 91% of those ≥ 55; $\chi^2 = 14.9, p < .01$). Twice as many younger workers felt they should have returned to their jobs later than was recommended by their medical care provider (17% *versus* 8%, respectively).

Outcomes

There was no evidence of significant age-related differences for the majority of the outcomes examined, including change in ability to do one's job compared to before the injury, current injury-related pain, use of pain medications due to the injury, or concerns about future job capacity or job retention as a consequence of the injury (Table IV). Duration of lost time was not significantly different for those < 55 and those ≥ 55. The majority of respondents had returned to work by the time of the survey, and workers ≥ 55 were more likely to be working fewer hours than before as a consequence of the injury. Despite this, younger workers had significantly more economic problems attributed to the injury, and significantly more negative impact of the injury on their quality of work life.

Table IV: Comparison of older and younger lost-time cases with respect to key outcomes, New Hampshire

Outcome	Aged < 55	Aged ≥ 55	Statistic	*p*-value
Returned to work at time of survey	84%	79%	$\chi^2 = 4.1$	< .05
Mean duration of work disability (days)	11.0	11.6	$t = -0.75$	NS
Mean decrease in work capacity scale pre – post injury	0.18	0.14	$t = 0.73$	NS
Perceived change in quality of work life (mean scale score; lower score = more negative change)	-.43	-.11	$t = 3.3$	< .01
Injury will prevent performance of all regular work tasks in next 4 weeks	25.7%	24.8%	$\chi^2 = 0.11$	NS
Injury will prevent working regular hours in next 4 weeks	15.6%	16.8%	$\chi^2 = 0.24$	NS
Worry about future job loss due to work injury	34.5%	28.8%	$\chi^2 = 3.6$	NS
Worries about future work capacity (mean scale score; possible score range = 1 – 5; higher = more worry)	1.5	1.5	$t = -.15$	NS
Economic difficulties due to work injury (mean scale score; higher = more difficulty)	0.91	0.55	$t = 5.1$	< .0001
Mean number of medical care visits for treatment of injury	5.6	5.0	$t = 1.4$	NS
Injury-related pain in past 7 days	66.0%	66.7%	$\chi^2 = 0.08$	NS
Mean number of days taking medication for injury-related pain, last 7 days	2.5	2.7	$t = -1.3$	NS
Working fewer hours due to injury	10.2%	13.7%	$\chi^2 = 16.00$	$p < 0.01$

Only outcomes with significant age differences in the bivariate analyses were selected for multivariate modeling. Factors were selected for evaluation in each model if there was a significant bivariate association with the outcome of interest and potential causal association. As the intent was to identify alternative explanations for observed age-related differences in outcomes, the age variable was entered into the equation first so as to observe how this factor changed the association of other variables to the outcomes. In

order to control for possible confounding due to differences in gender and job physical demands, these variables were also included in all models.

When evaluated in the context of other factors, age by itself was unrelated to all but one outcome, that of injury-related financial problems, where age by itself had a protective effect. Injury severity was significant in 3 models; return to work, injury-related financial problems, and working fewer hours after the injury. Poor overall physical functioning (as measured by lower scores on the PCS-12) was associated with less likely return to work as well as working fewer hours post-injury and a perceived negative change in respondents' quality of work life. Psychological functioning (MCS-12) was related only to this latter outcome. Gender was largely insignificant in the multivariate models, with the exception of change in quality of work life, where men were more likely to report more negative change. The job physical demands scale was also largely unrelated to outcomes, except for less return to work in physically-demanding jobs.

The work environment also appeared to be an important factor in post-injury outcomes. Measures of problems upon return to work were significant in the models for worked fewer hours and perceived negative change in quality of work life. Negative employer response to the injury was significantly associated with the quality of work life outcome and pre-injury job satisfaction with probability of return to work. Job tenure did not appear to be an important factor in any outcome. Similarly, pre-injury health factors, including prior work injuries, were not significantly associated with any of the outcomes in the multivariate models. Results are summarized in Table V.

Table V. Multivariate analyses of factors related to outcomes subsequent to work injuries in older and younger workers in New Hampshire: final models

Factors	Return to work** *OR (95% CI)*	Financial problems *Regression Coefficients*	Worked fewer hours *OR*	Negative change in Quality of Work Life *Regr. Coeff.*
Age	NS	-.23	NS	NS
Gender* **	NS	NS	NS	.10
Job physical demands	.60 (.46, .79)	NS	NS	NS
Prior work injury	NS	NS	NS	NS
Job tenure	NS	NS	NS	NS
Occupational group	-- *	-.10	--	--
Pre-injury job satisfaction	1.23 (1.11, 1.37)	--	--	--
Severity of work injury	.46 (.29, .72)	.18	1.69 (1.13, 2.54)	--
Negative Employer response to injury	--	--	--	.15
Problems when returned to work	--	--	1.5 (1.19, 1.91)	.12
Surgery for injury**	.35 (.18, .67)	--	--	--
Household income	--	-.18	--	--
Present difficulty doing job tasks	--	.19	--	--
PCS-12	1.12 (1.09, 1.16)	--	.95 (.93, .98)	-.36
MCS-12	1.02 (1.00, 1.05)	--	--	-.30
Pain in last 7 days**	NS	.13	NS	NS

***-- = Factor not included in model**
**** 0 = No, 1 = Yes**
***** 0 = Female, 1 = Male**

Discussion

In this large, population-based study, age was unrelated to significant differences in a variety of health and occupational outcomes after a work-related injury. In fact, age was related to only one outcome, that of injury-related financial difficulties, where being older had a *protective* effect, even after controlling for several other factors. These findings are remarkable, as older workers reported more frequent pre-existing illnesses, and had more severe injuries. The types of jobs and industries, physical job demands, rates of prior work-related injury, injury onset and body part involved were similar in both groups, and had little association with outcomes in multivariate analysis.

Workplace issues were key to the relative advantage of older workers. Younger workers had significantly lower pre-injury job satisfaction, experienced less positive responses from employers, were less satisfied with the response of the workers' compensation insurer post injury, and had more problems on returning to work, perhaps a consequence of less well-established relationships in the workplace. Despite considerable literature documenting age discrimination in the workplace, (Shrey and McMahon, 1995) no age-related differences in concerns about future job loss or work capabilities were found. Higher levels of work-related skills and greater job flexibility in older workers may also contribute to positive outcomes, (Mitchell, 1990) especially the absence of age-related differences in concerns about future job loss or future ability to do job tasks. Alternatively, older workers may be less concerned about future employment because they are closer to retirement age and thus are less concerned with long-term work capacity. In general, those over 55 appeared to be more content than the < 55 cohort, also reporting not just higher satisfaction with the workers' compensation insurer, but also with their pre-injury employment, the medical care they received for their injury, and the provider's return to work recommendations. Given this pattern, it may be that older workers are also more satisfied with their work abilities.

The role of health in work-related outcomes is complex when comparing older and younger workers. Although older workers had more comorbidity, there were no age-related differences in reported physical work limitations or injuries prior to the index

injury, suggesting similar pre-injury work-related health status in both groups. This contrasts with findings of striking age-related decrements in health and function in the general population, (Kramarow, et al., 1999) implying that workers in this study over age 55 represent a survivor population. The finding of slightly fewer workers over age 55 returning to work at the time of the survey may indicate a further manifestation of the "healthy worker effect," wherein older workers who are unable to perform their jobs retire or switch to less demanding work, and the remaining older employees who return to work are those who have retained good health. (Mitchell, 1990; Molinie, 2003) It could also be that years of healthy life in the U.S. population have been extended to such a degree that most individuals retain their ability to work up to and beyond the traditional retirement age, or that better health was associated with increased likelihood of older workers responding to the survey compared with younger workers. Crimmins, et al., comparing data from the U.S. National Health Interview Surveys from 1982 through 1993, found that self report of work disability has declined 24% during this time period for people in their 50's and 60's, even among those who reported a chronic condition, less work disability was reported, indicating a decrease in the severity of disease as well as the prevalence of these disorders. (Crimmins, et al., 1999) Supporting this theory, it is interesting to note that, while significant comorbidity differences existed between the age groups, this factor was not retained in any of the multivariate outcomes models, suggesting that these infirmities did not interfere appreciably with work functioning even after the occurrence of an injury.

These findings, of similar or better outcomes in younger and older workers, are in contrast to reports based on Bureau of Labor Statistics data, which found the opposite result (Personick and Windau, 1995). Possible explanations for this discrepancy include better overall health in older workers in this more recent data (compared with the earlier BLS data), and relative under-reporting of less severe injuries in national BLS data compared to New Hampshire. This may occur as a result of BLS data relying in part upon state workers' compensation reports, where lost time is often not recorded unless a threshold of five days or more has elapsed. Also, our data represents relatively short-term followup, and if a small number of older workers had prolonged disability, that

might have led to more positive results in the short-term than would be obtained form long-term follow-up.

Other studies have noted the association between improved occupational outcomes after work-related injuries and longer job tenure, job satisfaction, positive post-injury employer-employee interactions, and appropriate accommodation. (Cheadle, et al., 1994; Shannon, et al., 2001; Shaw, et al., 2001; Tate, et al., 1986) This study did not replicate the relationship of job tenure and work outcomes, and only partially supported a relationship between these outcomes and job satisfaction or employer-employee relationships. However, the "Problems on return to work" scale, which was a significant factor in most of the multivariate outcome models, contained items that refer to present job satisfaction as well as indications of employer-employee relations (i.e., the job wasn't changed enough to help the respondent cope with the injury, co-workers resented having to do extra work to help the injured employee, the respondent lost income or benefits due to decreased work hours, the respondent was not able to remain on light duty for a sufficient period of time). The only outcome model where pre-injury job satisfaction was significant was return to work. Thus, outcomes related to physical and social problems after return to work were perhaps less likely to be associated with pre-injury employment factors than were more current worker experiences.

Multivariate analyses of factors related to work injury outcomes did not reveal age to have a particularly significant association with traditional occupational measures when placed in context with other variables. The association between age and outcomes observed in the bivariate analyses appeared to be due to moderating factors independently related to both age and outcome. (James and Brett, 1984) For example, return to work was significantly associated with, among other variables, pre-injury job satisfaction, injury severity, physical function; all factors that have been found to be related to age in other studies. (Burkhauser and Quinn, 1997; Feuerstein and Beattie, 1995; Mitchell, 1988; Personick and Windau, 1995; Peters, 1990) While working fewer hours post-injury was significantly associated with older age in the univariate analysis, once injury severity, problems upon return to work and physical functional status were taken into

account, older workers were no more likely to be placed on light duty than younger workers. All of the variables significantly related to these outcomes were independently related to age (data not shown). The model of financial problems due to the work injury appeared to indicate that this outcome was associated with a mixture of post-injury work capacity and pre-injury economic well-being; thus, where financial stability is weak, a work injury that results in physical limitations may have a direct impact upon a worker's economic status. It is not surprising, therefore, that older workers, with generally higher salaries, more time to accumulate savings and better benefits, would suffer fewer economic consequences due to their work injury. The importance of studying the effect of age on work outcomes in the context of other factors is clear.

While this study had the advantage of using a population-based sample, there are some limitations to the generalizeability of these findings. Respondents all worked and for the most part resided in one small New England state that cannot be considered representative of the remainder of the nation, especially in regard to race and ethnicity. There were differences in the response rates between older and younger workers, with those < 55 less likely to respond either because they could not be contacted or because they were unwilling to participate. Nonrespondents also contained a significantly higher proportion of men than was observed in the respondent population, thus raising the possibility that results were biased towards women. If non-response was associated with another important variable related to outcomes, or reasons for non-response differed by age, this could have biased the results. The self-report nature of the study may lead to other limitations, as injury severity or perceptions of employer response could not be externally validated. Whatever their objective reality, however, these perceptions were significantly related to important outcomes and can be viewed as valid within the context of this research.

Conclusion

There has long been a contention that older workers suffer more disability after a work injury than younger workers. Duration of work absence has been shown to be longer for older workers and they are more likely to die as a result of occupational accidents.

However, for the vast majority of workers who return to their jobs, there does not appear to be any age-related difference in functioning. Indeed, among those who lost time from their jobs, older workers appeared to be more content and suffered fewer residual symptoms than younger employees. Multivariate models revealed that factors often related to, but independent from age were significantly associated with selected work outcomes. Thus, this study sheds some light on what underlies adverse outcomes of work injuries for any age group, and the nature of the contribution of age to these outcomes. These results suggest that other factors, such as job satisfaction, severity of injury, and post-injury employer response – factors where those over age 55 who are still working have an advantage – are the most important determinants of outcome, more so than age itself. Future studies should take these factors into account when investigating the role of age in work disability.

Publications:

Journal Articles

Pransky GS, Benjamin KL, Savageau JA, Currivan D, Fletcher K. Outcomes in Work-related Injuries: A Comparison of Older and Younger Workers . American Journal of Industrial Medicine, in press, 2004.

Pransky GS, Benjamin KL, Savageau JA. Early Retirement due to Occupational Injury: Who is at risk? American Journal of Industrial Medicine (in review).

Benjamin KL, Pransky GS, Occupational Injuries and the Older Worker: Challenges in Research, Policy and Practice. The Southwest Journal on Aging, 2000: Vol. 16, (2), pp. 47-61.
Reprints will be forwarded when available.

Proceedings

Pransky G, Benjamin, KL, Health and Income Security for an Aging Workforce; Living Longer, but able to Work? A Critical Review of the Evidence. National Academy of Social Insurance, Washington D.C., January 26th-27th, 2000.

Pransky G. Older workers and comorbidity. American Public Policy and Management Conference

Pransky G. Older Workers and Work Injury: Preliminary Findings. NIOSH – APA Work Stress and Health Conference, Toronto ON, 3/21/03

Pransky GS, Benjamin KL, Savageau JA, Currivan D, Fletcher K. Outcomes in Work-related Injuries: A Comparison of Older and Younger Workers. Academy for Health Policy and Health Services Research annual research meeting, 2004.

Gender and minority inclusion, and other information:

No information on minority status available.

Gender report attached.

Inclusion of children: none included.

Materials available for other investigators: Copies of questionnaires from the PI (by e-mail request to glenn.pransky@libertymutual.com) upon consent to acknowledge NIOSH sponsorship and development by the investigators.

Principal Investigator/Program Director (Last, First, Middle): Glenn Pransky MD MOccH

Inclusion Enrollment Report

This report format should NOT be used for data collection from study participants.

Study Title: Injuries and Illnesses in Older Workers: Causes, Consequences & Prevention

Total Enrollment: 3056 **Protocol Number:**

Grant Number: 1 R01 OHO 3937

PART A. TOTAL ENROLLMENT REPORT: Number of Subjects Enrolled to Date (Cumulative) by Ethnicity and Race

Ethnic Category	Sex/Gender			
	Females	Males	Unknown or Not Reported	Total
Hispanic or Latino				**
Not Hispanic or Latino				
Unknown (individuals not reporting ethnicity)	1,448	1,553	55	3,056
Ethnic Category: Total of All Subjects*	1,448	1,553	55	3,056 *
Racial Categories				
American Indian/Alaska Native				
Asian				
Native Hawaiian or Other Pacific Islander				
Black or African American				
White				
More Than One Race				
Unknown or Not Reported	1,448	1,553	55	3,056
Racial Categories: Total of All Subjects*	1,448	1,553	55	3,056 *

PART B. HISPANIC ENROLLMENT REPORT: Number of Hispanics or Latinos Enrolled to Date (Cumulative)

Racial Categories	Females	Males	Unknown or Not Reported	Total
American Indian or Alaska Native				
Asian				
Native Hawaiian or Other Pacific Islander				
Black or African American				
White				
More Than One Race				
Unknown or Not Reported				
Racial Categories: Total of Hispanics or Latinos**				**

* These totals must agree.
** These totals must agree.

Form Approved Through 9/30/2007
OMB No. 0925-0001

Department of Health and Human Services

Final Invention Statement and Certification

(For Grant or Award)

DHHS Grant or Award No.

1 R01 OHO 3937

A. We hereby certify that, to the best of our knowledge and belief, all inventions are listed below which were conceived and/or first actually reduced to practice during the course of work under the above-referenced DHHS grant or award for the period

10/1/99 *original effective date* through 1/31/04 *date of termination*

B. Inventions (Note: If no inventions have been made under the grant or award, insert the word *"NONE"* under Title below.)

NAME OF INVENTOR	TITLE OF INVENTION	DATE REPORTED TO DHHS
	None	
(Use continuation sheet if necessary)		

C. First Signature —The person responsible for the grant or award is required to sign (in ink). Sign in the block opposite the applicable type of grant or award.

TYPE OF GRANT OR AWARD	WHO MUST SIGN *(title)*	SIGNATURE
Research Grant	Principal Investigator or Project Director Glenn Pransky	
Health Services Grant	Director	
Research Career Program Award	Awardee	
All other types (*specify*):	Responsible Official	

D. Second Signature — This block ***must*** be signed by an official authorized to sign on behalf of the institution.

Title	Name and Mailing Address of Institution
Typed Name	
Signature / Date	

HHS 568 (Rev. 9/2004)