

Workers' Compensation Recipients with Carpal Tunnel Syndrome: The Validity of Self-Reported Health Measures

ABSTRACT

Objectives. This study compared the reliability, validity, and responsiveness of self-reported measures of health-related quality of life in recipients and non-recipients of workers' compensation who have carpal tunnel syndrome.

Methods. Patients with carpal tunnel syndrome completed questionnaires at study enrollment and 6 months later; scales measuring symptom severity, functional status, and satisfaction were included. The scales' internal consistency, validity, and responsiveness were assessed.

Results. The internal consistencies for each scale were high (Cronbach's alpha .88 to .96) and virtually identical in recipients and nonrecipients of workers' compensation. The correlations between self-reported and objectively measured grip strength were .32 in recipients and .30 in nonrecipients; these correlations were not influenced by whether workers' compensation recipients were out of work. Correlations between changes in scale scores and three indicators of perceived improvement were higher in recipients (.48 to .69) than in nonrecipients (.19 to .41).

Conclusions. The reliability, validity, and responsiveness of these measures were comparable in nonrecipients and recipients of workers' compensation; these data support the use of self-report measures in studies of workers. (*Am J Public Health*. 1996;86:52-56)

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Introduction

Studies of prognosis and treatment outcomes in work-related disorders have focused primarily on work status and disability costs.^{1,2} These economic outcomes are nonspecific indicators of clinical status, because they are also influenced by physical and organizational aspects of the job, psychosocial factors,^{3,4} and receipt of workers' compensation benefits.⁵⁻⁷ Furthermore, economic outcomes provide a limited, unidimensional view of the injured worker. A more direct and comprehensive approach to assessing the status of workers would incorporate patient self-report of health-related quality of life.⁸ Quality of life evaluation generally involves patient assessment of symptoms, functional status, and satisfaction with the process and outcomes of care. Numerous self-report measures of health-related quality of life have been developed^{9,10} and shown to be reproducible, valid, and more responsive to clinical change in nonoccupational settings than traditional measures such as physical examinations¹¹ or laboratory tests.¹² Furthermore, patient self-report provides accurate information on the presence¹³ or activity¹⁴ of specific diseases.

Reluctance to use self-report measures of health-related quality of life in workers may stem from doubt about the validity of self-report in patients receiving workers' compensation. It has been argued that workers' compensation creates incentives for patients to provide inaccurate information to their physicians,¹⁵ and to amplify and seek medical care for symptoms that others manage without complaint.¹⁶

Additional study of treatment and prognosis in workers' compensation recipients is needed because this population

accounts for substantial health care and indemnity costs and experiences worse outcomes following medical, surgical, and rehabilitative interventions than nonrecipients of workers' compensation.⁵⁻⁷ Because self-report measures would facilitate and strengthen research involving workers' compensation recipients, validation of self-report in this population would provide an important methodological contribution.

Validation is methodologically difficult because objective and self-reported measures of health status typically are poorly correlated in musculoskeletal disorders.¹⁷ For example, self-reported symptom severity has been shown to have a correlation of .12 with median nerve conduction velocity in patients with carpal tunnel syndrome.¹⁸ These observations indicate that quality of life measures tap dimensions of health different from those tapped by traditional objective assessments of musculoskeletal impairment. Fortunately, some self-report items can be validated more easily because they ask

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patients to report on phenomena that can also be measured objectively. For example, in the study presented here, patients with carpal tunnel syndrome were asked to rate the severity of hand weakness, and grip strength was also measured directly with a dynamometer. The association between self-report and observed grip strength provides a reasonable test of validity.

The fundamental psychometric properties critical for health status measurement include reliability, validity, and responsiveness to clinical change.⁸ Thus, the specific aims of this study were to compare the reliability, validity, and responsiveness of self-report scales in recipients and nonrecipients of workers' compensation.

Methods

Design

Data for this analysis were obtained from a prospective observational community-based study of the outcomes of conservative and surgical therapy for carpal tunnel syndrome. Eligible patients were identified by physicians and staff in the offices of surgeons who performed carpal tunnel release as well as a few rheumatologists and occupational medicine physicians throughout Maine. From July 1992 to October 1993, participating physicians identified eligible patients and referred their names to the data collection center where study personnel called patients to initiate the study protocol.

Patients

Patients were eligible if they had paresthesia involving at least two of the first four fingers and duration of symptoms of at least 1 month and if their physician had a clinical impression of carpal tunnel syndrome. Nerve conduction tests were not incorporated into entry criteria because they were not obtained routinely, and provocative tests were not used because of their limited sensitivity and specificity.^{19,20} Subjects were excluded if they were less than 18 years old, pregnant, or unable to complete questionnaires because of cognitive or language difficulties or if they had prior carpal tunnel release in the same extremity. Patients scheduled for surgery were followed in a surgical cohort, and those managed conservatively were followed in a nonoperative cohort.

For the analyses presented in this paper, we included patients 18 to 55 years

old who were working at least part time outside the home when they entered the cohort or were not working because of carpal tunnel syndrome. These additional selection criteria enhanced the comparability of the recipients and non-recipients of workers' compensation.

Data Collection Procedures

Baseline data, including questionnaires and physical examination parameters, were collected in patients' homes by study investigators trained specifically in the conduct of the interview and examination. Follow-up data were obtained by mailed questionnaire 6 months after the baseline interview. The payment source for medical care associated with carpal tunnel syndrome at enrollment was determined from the referring physicians' billing data and used to identify recipients of workers' compensation.

Data Elements

Grip strength was measured with a "My-Gripper" dynamometer (Yamasa Tokei, Japan). Demographic data were obtained by questionnaire. Subjects were asked at baseline and follow-up whether they were out of work because of carpal tunnel syndrome. Three self-report scales were administered: an 11-item symptom severity scale (including pain, nocturnal symptoms, numbness, tingling, and weakness), an 8-item functional status scale (including difficulty in writing, buttoning clothes, opening jars, and other activities), and a 7-item satisfaction scale measuring satisfaction with the outcome of surgery (including satisfaction with relief of pain, tingling, numbness, weakness, and the like). The reproducibility, internal consistency, validity, and responsiveness of the symptom severity and functional status scales have been demonstrated in a population made up of fewer than 10% workers' compensation recipients.¹⁸ Each scale has Likert response formats with five ordinal categories. Responses to individual items were averaged, without differential weighting, to yield an overall score for each scale (as described previously¹⁸).

Analysis

Statistical analyses were performed with the SAS statistical package.²¹ All correlations were expressed with the Spearman coefficient. The Fisher's *Z* transformation²² was used to assess the statistical significance of differences between correlation coefficients. All *P* values are two-tailed.

Analyses of reliability, validity, and responsiveness were performed separately in recipients and nonrecipients of worker's compensation. Reliability was assessed with Cronbach's alpha, a measure of internal consistency.²³ Validity was assessed by the correlation between objectively measured grip strength and response to the question "Do you have weakness in your hand or wrist?" (responses included no weakness, mild weakness, moderate weakness, severe weakness, and very severe weakness). Three grip strength determinations were obtained in the principally affected hand, and the mean was used in analyses. (The principal hand was the operated hand in surgical patients and the most severely affected hand in nonsurgical patients; if both were equally affected, the dominant hand was used.) The correlation between self-report and objectively measured grip strength was also assessed separately in patients who were not working because of carpal tunnel syndrome at study enrollment and in patients whose principally affected hand was the dominant hand.

Responsiveness was assessed solely in surgical patients by determining whether the changes in scale scores between preoperative and 6-month postoperative assessments correlated with other indicators of change in patients' clinical status; higher correlations indicate greater responsiveness.^{24,25} The other indicators of clinical change included the satisfaction scale and responses to the questions "How much did the operation change the quality of your life?" and "Overall, are your carpal tunnel symptoms better or worse than you expected them to be at this point?" (These questions had eight and six ordered responses, respectively.)

Results

Recruitment

Thirty physicians referred 474 eligible subjects into the parent study; 8.9% of eligible patients refused to participate, leaving 431. After exclusion of 137 patients who were older than 55 years of age and 26 who were either full-time homemakers or students, the final sample for the present analysis included 268 subjects: 155 worker's compensation recipients and 113 nonrecipients. Of these, 216 (81%) completed 6-month follow-up forms, including 121 workers' compensation recipients (78% of those contacted) and 95 nonrecipients (84%). The 52 patients who did not return the forms included 9 who

TABLE 1—Features of Study Cohort: Recipients and Nonrecipients of Workers' Compensation (WC) with Carpal Tunnel Syndrome

	Men		Women	
	WC Recipients	WC Nonrecipients	WC Recipients	WC Nonrecipients
Baseline features				
No.	35	36	120	77
Age, y, mean (SD)	37.9 (7.2)	42.7 (6.7)**	38.8 (8.8)	41.8 (8.2)**
Symptom severity score, mean (SD)	3.1 (0.7)	2.6 (0.9)*	3.2 (0.8)	3.0 (0.8)
Functional status score, mean (SD)	2.3 (0.8)	2.1 (0.9)	3.0 (0.8)	2.6 (0.9)**
Grip, kg, mean (SD)	14.8 (14.0)	23.2 (17.6)	9.4 (8.1)	10.8 (7.5)
+ Tinel sign, %	90	30**	63	53
+ Phalen sign, %	81	66	77	78
Out of work due to carpal tunnel syndrome, %	13	8	38	12**
6-month follow-up status in surgical patients				
No.	21	22	60	37
Change in symptoms, mean (SD)	1.0 (1.0)	1.2 (0.9)	1.3 (0.9)	1.7 (0.9)*
Change in function, mean (SD)	0.52 (0.9)	0.69 (0.5)	1.0 (1.0)	1.3 (0.9)
Satisfaction, mean (SD)	2.2 (1.0)	1.9 (0.8)	2.5 (1.0)	1.8 (0.8)**
Completely or very satisfied, %	62	76	53	69

Notes. *P* values represent comparisons (within gender strata) between recipients and nonrecipients. Symptom severity and functional status scores ranged from 1 to 5 (1 = completely satisfied, 5 = very unsatisfied).

P* < .05; *P* < .005.

could not be located and 43 who did not return questionnaires despite written requests. There were no substantial differences in age, sex, or workers' compensation status between those who returned their 6-month forms and those who did not.

Baseline Features

Recipients of worker's compensation were, on average, a few years younger than nonrecipients and had somewhat worse symptom severity and functional status scores at enrollment (Table 1). Among both recipients and nonrecipients, women had worse functional status scores at the time of evaluation than men; grip strength was substantially greater in men, although not significantly because of the large standard deviations. Symptom duration was shorter in the workers' compensation recipients (2.2 vs 5.6 months; *P* = .0001).

The male occupations were distributed fairly evenly among assembly work, service sector jobs, managerial/professional jobs, and trades such as plumbing and electrical work. Women's occupations were also distributed rather evenly

among these categories, except that only 4% of women were employed in the trades and 25% performed clerical work.

Follow-up at 6 months revealed that female recipients of workers' compensation who received surgery were, on average, less satisfied with the results of surgery (*P* = .0003) and less symptomatically improved (*P* = .02) than nonrecipients, whereas there was no substantial difference in satisfaction or symptomatic improvement according to compensation status among men.

Reliability

For the functional status, symptom severity, and satisfaction scales, the Cronbach's alphas for recipients and nonrecipients of workers' compensation were virtually identical and in the range of .88 to .96 (Table 2).

Validity

The correlations between subjective assessment of weakness and objectively determined grip strength were .32 in recipients of workers' compensation and .30 in nonrecipients. In men, the correla-

TABLE 2—Internal Consistency (Cronbach's Alpha) of Self-Reported Scales in Recipients and Nonrecipients of Workers' Compensation

Scale	Recipients	Nonrecipients
Functional status	.89	.88
Symptom severity	.89	.89
Satisfaction	.96	.95

tions were somewhat lower in the recipients of workers' compensation than in the nonrecipients (.25 vs .49); in women, the correlations were higher in recipients (.34 vs .18). For both men and women, these differences in correlation coefficients were not statistically significant (*P* > .20). The correlations were not influenced by hand dominance. Stratification by duration of symptoms revealed no significant differences between recipients and nonrecipients. The correlations between objectively measured grip strength and self-reported weakness were .26 in worker's compensation recipients who were out of work as a result of carpal tunnel syndrome at enrollment and .25 in those working at enrollment.

Responsiveness

The correlations between improvement in symptom severity and functional status scale scores and the other measures of improvement in clinical status (patient satisfaction, perceived improvement in quality of life, and perceived improvement in symptoms) were higher in recipients of workers' compensation (.48 to .69) than in nonrecipients (.19 to .41; Table 3). When the analysis of workers' compensation recipients was restricted to patients with satisfaction scores less than the median among recipients, the correlations between scale scores and patients' perceptions of outcomes were quite similar to those of the nonrecipients.

Discussion

Work disability and compensation costs are critical outcomes in injured workers; from the employer's standpoint, they represent the bottom line. However, because these outcomes are influenced by workplace policies and psychological and social factors, as well as response to treatment, they are nonspecific measures of care rendered to injured workers.

Furthermore, health-related quality of life is arguably a more relevant outcome from the worker's point of view. However, the psychometric properties of measures of health-related quality of life have not been studied previously in recipients of workers' compensation. Our data show that self-report measures of symptom severity, functional status, and satisfaction had comparable reliability, validity, and responsiveness in recipients and nonrecipients of workers' compensation, suggesting that they are suitable for use in research on patients receiving workers' compensation.

The analyses of validity merit additional comment. First, correlations between self-reported and observed health status were modest, as noted in our prior investigations,¹⁸ and reported by others. For example, in patients with rheumatoid arthritis, the correlations between self-reported functional status and erythrocyte sedimentation rate, walking time, and joint count were .24, .44, and .60, respectively.²⁶ Patients' subjective impressions cannot be inferred from objective parameters; rather, they must be measured directly. Second, the correlations between subjective and objective measures of grip strength were virtually identical among recipients and nonrecipients of workers' compensation, supporting the validity of self-report in recipients of workers' compensation. Finally, the correlation between self-reported and observed grip strength in recipients of workers' compensation was not influenced by whether the subject was working (.25) or out of work because of carpal tunnel syndrome (.26), suggesting that the responses were not influenced by the potential for secondary gain.

The data on instrument responsiveness (Table 3) provide additional evidence of validity, showing that greater improvement in scale score was associated with greater satisfaction and perceived improvement in symptoms and quality of life. The higher correlations noted in workers' compensation recipients appear to relate to the broader range of outcomes among recipients than among nonrecipients.

Our study has several strengths. The patients were recruited from community practices across an entire state rather than from a single referral center or workplace, enhancing generalizability. Women, underrepresented in most studies of workers' compensation, constituted 75% of the sample. Data were obtained by interviewers not involved in the care of

TABLE 3—Spearman Correlations between Change in Self-Reported Scale Scores and Satisfaction with Results of Surgery and Perceived Improvement in Quality of Life and Symptoms

	Satisfaction		Perceived Improvement in Quality of Life		Perceived Improvement in Symptoms	
	WC Recipients	WC Nonrecipients	WC Recipients	WC Nonrecipients	WC Recipient	WC Nonrecipients
Change in functional status	.55*	.21	.54	.41	.48	.19
Change in symptom severity	.69*	.37	.68*	.37	.59	.31

Note. WC = workers' compensation.
*P < .05 (difference between recipients and nonrecipients).

the patients and by self-report, precluding observer bias. Sample sizes were adequate to yield stable correlations, and refusal rates were acceptable.

Several limitations must be acknowledged as well. First, we did not have data on reproducibility, an important feature of reliability. Second, we had observed and self-report measures of just one construct, grip strength, limiting the breadth of our validity testing. Also, grip strength is generally regarded as "objective" but can be influenced by patient motivation as well. Third, the analyses of responsiveness compared changes in scale scores with other self-reported measures; comparison with a measure that was not self-reported, such as a clinician's perception of improvement, would have enhanced the analysis, but such data were unavailable. Fourth, subjects understood that they were participating in a research study that would have no impact on their compensation benefits. We do not know whether self-report would be valid in settings that explicitly link patient responses to financial benefits. Similarly, patients were interviewed and examined in their homes at baseline and filled out mailed questionnaires at follow-up. It is possible that this resulted in more candid responses than might be observed in an office-based interview. Fifth, our office-based recruitment strategy may have produced a sample that differed with respect to baseline features from the general population with carpal tunnel syndrome in Maine (although analyses of a similar office-based recruitment of women undergoing hysterectomy in Maine revealed no substantial differences²⁷).

Sixth, the study involved a single condition and should be confirmed in other clinical settings.

Finally, there may have been misclassification with respect to some of the variables. Because electrophysiologic confirmation of carpal tunnel syndrome was not required, some cases may have been misclassified. Similarly, patients who applied for but did not receive compensation by the 6-month follow-up were considered nonrecipients, potentially misclassifying a few patients who ultimately received compensation. Work status was obtained by self-report, without verification by employers' data. We suspect that these misclassifications were infrequent and did not influence the psychometric properties of the instruments in the workers' compensation recipients.

These caveats notwithstanding, our data suggest that measures of health-related quality of life are reliable, valid, and responsive to clinical change in recipients of workers' compensation with carpal tunnel syndrome. While financial incentives may influence return to work,⁵⁻⁷ they do not appear to compromise subjects' responses to questionnaires in the research setting. We encourage investigators to examine the psychometric properties of self-report measures in other clinical settings. Because these measures provide a more complete assessment of the injured worker than traditional measures of economic impact, we advocate the inclusion of quality of life measures in studies of occupation-associated illness. □

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