Research Report

Identifying Psychosocial Variables in Patients With Acute Work-Related Low Back Pain: The Importance of Fear-Avoidance Beliefs

Background and Purpose. Psychosocial factors are known to affect recovery from acute low back pain. The factors with the greatest influence and the optimal methods of measurement and interpretation have not been established. The purpose of this study was to examine baseline psychosocial variables and their ability to predict prolonged work restrictions. Subjects. The subjects were 78 people with work-related low back pain who were participating in a clinical trial (mean age=37.4 years, SD=10.4, range=18–58; mean duration of pain=5.5 days, SD=4.6, range=0–19). Methods. A baseline examination including measures of impairment, disability, and psychosocial variables was performed. All subjects had physical therapy interventions. Work status was assessed after 4 weeks. Sensitivity, specificity, and likelihood ratios were calculated for the prediction of work status by the use of psychosocial variables. Receiver operator characteristic curves and logistic regression were used to identify the variables that were most predictive of work status. Results. Twenty-two subjects (29%) had persistent work restrictions. The work subscale of the Fear-Avoidance Beliefs Questionnaire was the strongest predictor of work status (negative likelihood ratio of 0.08 for scores less than 30, positive likelihood ratio of 3.33 for scores greater than 34). Discussion and Conclusion. Fear-avoidance beliefs about work was the psychosocial factor that could best be used to predict return to work in patients with acute work-related low back pain. Examination of fear-avoidance beliefs may serve as a useful screening tool for identifying patients who are at risk for prolonged work restrictions. [Fritz JM, George SZ. Identifying psychosocial variables in patients with acute work-related low back pain: the importance of fear-avoidance beliefs. *Phys Ther.* 2002;82:973–983.]

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The prevalence of and costs associated with occupational low back pain (LBP) have made prevention an important research goal.[1,2] Despite many attempts, efforts at preventing new episodes of LBP (primary prevention) have proven largely fruitless.[3] In addition, attempts to prevent continued disability in injured workers who already have chronic LBP (duration greater than 8–12 weeks), also called "tertiary prevention," have met with varied success.[4,5] The inability to identify effective primary or tertiary prevention strategies has led some clinicians and researchers to focus on the prevention of prolonged disability following the onset of an acute episode of LBP (ie, secondary prevention).[4,6]

An emphasis on secondary prevention is supported by data that demonstrate the majority of patients with work-related LBP are able to return to work within 4 to 8 weeks after the onset of pain.[7–9] Patients who are unable to return to work in this time frame, however, become increasingly unlikely to ever return to work, and these individuals account for the majority of the costs associated with occupational LBP.[7,10] Hashemi et al,[7] in a study of 16,987 people with work-related LBP requiring work absence in 1996, found that 66% of the injured workers returned to work within 4 weeks. After 1 year, 95% of the workers had returned to work, but those remaining off work accounted for 65% of the total costs for all of the workers. Williams et al[10] studied approximately 29,000 injured workers and found that 66% returned to work within 8 weeks, but those remaining off work accounted for 75% of the costs. The early identification of patients who are at risk for prolonged work absence and disability could allow for targeted interventions within the acute phase that may reduce costs and the likelihood of chronic disability.

Researchers have examined various factors for their potential value in identifying patients with acute LBP who are at risk for prolonged work absence. Most researchers have found little predictive value from patient characteristics, such as age and sex, or findings from clinical examinations.[11–16] Variables that have shown some ability to predict prolonged disability and work absence have generally been psychological in nature.[17–20] For example, depression, anxiety, coping strategies, fear-avoidance beliefs, and health locus of control have been linked to chronic disability from LBP.[15,17,21–23] Uncertainty remains, however, regarding the psychosocial variables that are most associated with the development of prolonged work restrictions and the optimal methods of measurement and interpretation for these variables. The purposes of our study were: (1) to identify variables measured during the initial examination of patients with acute work-related LBP that are predictive of prolonged work restrictions and (2) to determine which psychosocial variables had the most value in predicting prolonged work restrictions.

Method

Subjects

Subjects in our study were participants in a clinical trial comparing 2 different physical therapy interventions for patients with acute work-related LBP (Fritz and colleagues, unpublished research). All subjects gave their informed consent for participation. Subjects had LBP of less than 3 weeks' duration due to work-related activities. All subjects were recruited from occupational health care providers and required modification of employment duties due to LBP. Seventy-eight subjects were enrolled. The subjects' mean age was 37.4 years (SD=10.4, range=18–58) and the mean time from onset of LBP to the baseline examination was 5.5 days (SD=4.6, range=0–19). Thirty subjects (38%) were female, 39 subjects (50%) had a prior history of activity-limiting LBP, and 14 subjects (18%) had symptoms distal to the knee. Twenty-three subjects (29%) were employed as health care workers in direct patient care, 50 subjects (64%) had other manual labor occupations, and 5 subjects (6%) had jobs that did not involve manual labor.

Measures

All subjects underwent an baseline examination performed by a licensed physical therapist. The following measures were used:

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Measure of impairment. The Physical Impairment Index, a 7-item index of physical impairment due to LBP that was described by Waddell et al,[24] was used. The 7 items are 4 range of motion variables (total flexion, total extension, average side bending, and average straight leg raise), 2 muscle force variables (active sit-up and bilateral straight leg raise), and 1 pain variable (spinal tenderness). Each item is scored as positive (1) or negative (0) based on published values, resulting in a total score of from 0 to 7.[24] The developers of the scale found high levels of interrater reliability on 120 patients with chronic LBP for each item measured (kappa or intraclass correlation coefficient [ICC] values ranging from .86 to .96), and they reported that the scale successfully discriminated between individuals with and without LBP.[24]

Measure of pain. Subjects were asked to rate their current level of LBP intensity using an 11-point pain rating scale ranging from 0 (no pain) to 10 (worst imaginable pain).[25] We did not assess the reliability of the measurements.

Measures of disability. Low back–related disability was measured with a modified Oswestry Questionnaire (OSW), a 10-item scale originally described by Fairbank et al.[26] Each item is scored from 0 to 5, and the final score is expressed as a percentage, with higher numbers indicating greater disability. The OSW that we used was modified by substituting a section regarding employment or homemaking ability for the section related to sex life. We have found scores obtained with this modified version of the OSW to have high levels of reliability (ICC=.90), construct validity (correlations with global patient ratings and other region-specific disability measures greater than .80), and responsiveness (effect size of 1.8 in 69 patients who were receiving physical therapy interventions for work-related LBP).[27] These findings are similar to those reported for the original version.[26]

The Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) was used to measure general health status. The SF-36 measures 8 dimensions of health (general health, physical function, role–physical, bodily pain, social functioning, mental health, role–emotional, and vitality).[28] Each subscale is reported on a scale of 0 to 100, with higher numbers indicating better health status. The SF-36 has well-established psychometric properties for the general population[28] and people with LBP.[29]

Psychosocial measures. Waddell and colleagues identified 7 nonorganic symptoms[30] and 5 nonorganic signs,[31] which they proposed would indicate by their presence abnormal illness behavior. They defined *abnormal illness behavior* as "maladaptive overt illness related behavior which is out of proportion to the underlying physical disease and more readily attributable to associated cognitive and affective disturbances."[32(p739)] The nonorganic index is created by adding the number of positive symptoms and signs, resulting in a total possible score ranging between 0 and 12. Preliminary work has indicated that the nonorganic index may have better predictive value than symptoms or signs alone, demonstrating higher sensitivity (64%) and specificity (62%) values for predicting return to work in patients with acute work-related LBP.[33] The nonorganic signs and symptoms have been shown to have high levels of agreement between examiners, with percentages of agreement ranging between 78% and 100%.[31,32]

Depressive symptoms were measured with the Center for Epidemiological Studies Depression Scale (CES-D), a 20-item scale designed for use with community-dwelling adults.[34] Each item asks the subject to rate the frequency of a depressive symptom on a scale of 0 to 3, for a total possible score of 0 to 60. Higher numbers indicate greater severity of depressive symptoms. The CES-D has been tested in general samples and in groups with psychiatric diagnoses and has been shown to yield measurements with some reliability (ICC=.85–.91 for individual items) and predictive validity (sensitivity=86%–100% and specificity=53%–84% for detecting depression using a cutoff score of 16).[35–37]

The Fear-Avoidance Beliefs Questionnaire (FABQ) is used to quantify the level of fear of pain and beliefs about the need to change behavior to avoid pain in individuals with LBP.[38] The FABQ has 16 items, each scored from 0 to 6, with higher numbers indicating increased levels of fear-avoidance beliefs. The FABQ contains 2 subscales: a 7-item work subscale (score range=0–42) and a 4-item physical activity subscale (score range=0–24). Researchers have found the FABQ work subscale to be associated with current and future disability and work loss in patients with chronic LBP[16,38,39] and acute LBP.[40] We did not assess the reliability of the FABQ data. The test-retest reliability of scores for the work and physical activity subscales of the FABQ has been reported to be high (ICC values of .90 and .77, respectively).[41]

The Beck Anxiety Index (BAI) was used to determine the presence and magnitude of anxiety symptoms.[42] The BAI consists of 21 items, each scored between 0 and 3, for a total score ranging from 0 to 63. Higher scores indicate higher levels of anxiety. The BAI has been reported to have good reliability (ICC=.75 for 1-week test-retest reliability in 1,086 patients with various psychiatric diagnoses).[42,43]

Intervention

Following the baseline examination, subjects were randomly assigned to 1 of 2 intervention groups. Thirty-seven subjects received physical therapy based on the recommendations of the Agency for Health Care Policy and Research (AHCPR) clinical practice guidelines,[44] and 41 subjects received therapy based on the classification system developed by Delitto and colleagues.[45,46] All subjects in the first group received therapy based on the guidelines regardless of their individual signs and symptoms and history. The treatment for this group consisted of low-stress aerobic exercise (walking on a treadmill or stationary cycling), general muscle reconditioning exercises (eg, abdominal curls, quadruped arm and leg extensions), and advice to remain as active as possible within the limits of pain. Participants also were reassured by the therapist that they would recover and return to full work capacity. Subjects in the second group were re-examined during each appointment by the treating physical therapist, and they were placed into 1 of 4 treatment classifications based on the subjects' signs and symptoms. Subjects then received treatment based on their classification. The 4 classifications were: (1) manipulation followed by active range of motion exercises, (2) repeated end-range exercises (ie, flexion or extension exercises), (3) spinal stabilization exercises, and (4) traction. Further description of the classification categories and associated interventions has been published elsewhere.[45,46] All subjects were scheduled for 2 to 3 therapy sessions per week, and they were re-examined by the occupational medicine physician on a weekly or biweekly basis. Return to work and therapy discharge decisions were made by the occupational medicine physician, who was blinded to the treatment group. Outcomes were assessed after 4 weeks.

Outcomes

All measurements taken at baseline were taken again 4 weeks after randomization. In addition, the subjects' work status was categorized as either "returned to work without restrictions" or "continued work restrictions." A subject was considered returned to work without restrictions if he or she returned to his or her previous job, performing the same duties, without any restrictions. If a subject had any restrictions on his or her work duties (eg, reduced hours, lifting limitations, placed on light duty, off work entirely), he or she was considered to have continued work restrictions. The primary outcome measure used for this study was work status after 4 weeks.

Data Analysis

Descriptive statistics (mean, standard deviation) were calculated for all variables measured at baseline. The distribution of measurements obtained for those variables was examined for normality. One-sample Kolmogorov-Smirnov (K-S) tests were used to test the hypothesis that the measurements of each variable came from a population with normally distributed values. If the K-S test statistic was not significant ($P \geq .05$), the null hypothesis that the measurements came from a normally distributed population was retained, and the variable was subsequently examined using parametric statistical tests. Variables with significant K-S test statistics were the nonorganic index, Physical Impairment Index, pain rating, FABQ physical activity subscale, and SF-36 role–physical, role–emotional, and bodily pain subscales. These variables were subsequently analyzed with nonparametric statistics.

Using the dichotomous outcome of work status after 4 weeks as the dependent variable, we analyzed the baseline measurements for univariate significance with work status. We used Pearson chi-square tests for dichotomous variables (sex, symptoms distal to the knee, prior history of LBP, and treatment group). We used independent sample t tests to examine the baseline measurements with a normal distribution, and we used Mann-Whitney U tests to analyze measurements with non-normal distributions. A significance level of $P < .05$ was used for all comparisons. We did not adjust the significance level because this step served as a filtering mechanism to identify variables with some relationship to work status.

We explored relationships among variables with significant univariate relationships to work status using Pearson or Spearman correlation coefficients as appropriate, based on the type of distribution. We further examined variables that reached statistical significance for validity to predict 4-week work status. This examination was performed in 2 steps. First, the predictive validity of each significant variable was determined through receiver operator characteristic (ROC) curves. An ROC curve is constructed by graphing the true positive rate (sensitivity) against the false positive rate (1−specificity) for each possible cutoff score of the variable.[47] The area under the curve (AUC) was calculated using the nonparametric method described by Hanley and McNeil[47] and Bamber.[48] We chose the nonparametric method because it does not require a binormal data distribution.[47] The AUC can be interpreted as the probability of correctly identifying the patient who will return to work from a randomly selected pair of patients, and may range between 0.50 (no predictive ability) and 1.00 (perfect predictive ability).[49] The variable with the largest AUC represents the variable with the greatest predictive validity. The second step was to determine whether a multivariate model might offer greater predictive validity. A logistic regression was performed with work status as the dependent variable and all significant variables measured at baseline used as independent variables. Entry was stepwise, with a significance level of .05 to enter a variable and .15 to remove a variable.

We examined the baseline variable with the greatest AUC and any variables retained by the logistic regression for their ability to be used to predict work status after 4 weeks. Sensitivity, specificity, and positive and negative likelihood ratio (LR) values were calculated for all possible cutoff scores of these variables (ie, the score above which a score would be considered "positive").[50] Continued work restrictions at 4 weeks served as the target condition (ie, "disease positive" state) for these calculations. Sensitivity was calculated as the proportion of subjects with continued work restrictions who had a positive test score. Specificity was calculated as the proportion of subjects without work restrictions with a negative test score. Positive and negative LR values combine sensitivity and specificity to describe the odds favoring the condition (ie, continued work restrictions) given a certain test result.[51] The positive LR is calculated as sensitivity/(1−specificity) and indicates the increase in odds favoring the condition given a positive test result.[52] The negative LR is calculated as (1−sensitivity)/specificity and indicates the change in odds favoring the condition given a negative test result.[52] An LR of 1 indicates that the test result does nothing to change the odds favoring the condition, whereas an LR greater than 1 increases the odds of the condition and an LR less than 1 diminishes the odds favoring the condition.[53]

Results

Baseline measurements for all variables are given in Table 1. After 4 weeks, 55 subjects (71%) had returned to work without restrictions, and 22 subjects (29%) remained on work restrictions. One subject dropped out, and work status could not be ascertained. Univariate significance tests showed that there were differences between restricted and nonrestricted patients for all psychosocial variables as well as for pain ratings and impairment and disability scores ($P<.05$). Two of the 8 SF-36 subscales showed differences (Tab. 2). There were no differences between the groups with respect to age, sex, prior episodes of LBP, or the presence of distal symptoms (Tabs. 2 and 3). There was a relationship between the treatment group and 4-week work status. Twenty-one subjects (58%) who received physical therapy based on the AHCPR guidelines returned to work without restrictions, compared with 34 subjects (83%) who received therapy based on the classification system of Delitto and colleagues ($P=.02$). Correlation coefficients among baseline variables are given in Table 4. The AUC was calculated for all significant baseline variables (Tab. 2). The greatest AUC was found for the FABQ work subscale.

Because 4-week work status was related to the treatment received, treatment group was entered in the first step of the logistic regression to control for its effect. In the second step, all significant baseline variables were considered for stepwise entry. The only variable to enter was the FABQ work subscale (Tab. 5). The resulting logistic regression model, therefore, had 2 independent variables (treatment group and FABQ work subscale). The overall fit of this model to the data was affirmed using the Hosmer and Lemeshow goodness-of-fit test, which failed to reject the null hypothesis that the model fit the data ($P=.32$). Because the FABQ work subscale had the greatest AUC and was the only variable to enter the regression equation, it was further examined by evaluating different cutoff scores in predicting work status. The cutoff score yielding the smallest negative LR was 29 (negative LR=0.08; 95% confidence interval=0.01, 0.54), and the cutoff score producing the largest positive LR was 34 (positive LR=3.33; 95% confidence interval=1.65, 6.77) (Tab. 6).

Table 1.
Means and Standard Deviations for Variables Measured During the Baseline Examination on the 78 Subjects[a]

Variable	Possible Score Range	$\bar{X}$	SD
Physical Impairment Index	0–7	4.6*	1.7
Pain rating	0–10	6.6	1.8
OSW score	0–100	42.9	15.8
SF-36 subscale scores			
Role–physical	0–100	16.6*	30.5
Bodily pain	0–100	31.0*	18.9
Physical functioning	0–100	39.4*	21.3
Vitality	0–100	46.0*	19.7
General health	0–100	73.0*	19.6
Social functioning	0–100	57.5*	25.4
Role–emotional	0–100	71.0*	39.9
Mental health	0–100	74.2*	16.5
Nonorganic index	0–12	2.9	2.1
CES-D score	0–60	13.1	7.6
FABQ score			
Work subscale	0–42	27.9	8.6
Physical activity subscale	0–24	18.9*	5.8
Beck Anxiety Inventory	0–63	7.0**	5.7

[a] OSW=Oswestry Questionnaire, SF-36=Medical Outcomes Study 36-Item Short-Form Health Survey, CES-D=Center for Epidemiological Studies Depression Scale, FABQ=Fear-Avoidance Beliefs Questionnaire. Asterisk indicates n=77, double asterisk indicates n=75.

Discussion

Similar to other researchers, our results showed most subjects (71%) were able to return to work within 4 weeks. This percentage compares favorably with the findings of Hashemi et al[7] and Spitzer,[9] who reported 4-week return-to-work rates of 76% and 74%, respectively. Despite the relatively low occurrence of prolonged work absence in patients with acute LBP, the economic impact of this subset of patients is substantial.[9,54] Return

Table 2.
Univariate Significance Tests for Continuous Baseline Variables, With Work Status as the Dependent Variable[a]

Variable	Persistent Restrictions (n=22) $\bar{X}$	SD	No Restrictions (n=55) $\bar{X}$	SD	Mean Difference (95% CI)	P	Area Under the Curve (95% CI)
Age (y)	39.7	10.6	36.9	10.0	2.9 (−2.5, 8.2)	.27	
Time from injury to evaluation (d)	7.1	5.3	4.8	4.2	2.3 (−0.27, 4.9)	.08	
Physical Impairment Index†	6.0		4.0			.02	0.67 (0.53, 0.80)
Pain rating†	8.0		7.0			.003	0.71 (0.60, 0.83)
OSW score	50.4	13.3	40.3	15.7	10.0 (2.5, 17.6)	.007	0.68 (0.56, 0.80)
SF-36 subscale scores							
Role–physical†	0.0		0.0			.10	
Bodily pain†	22.0		32.0			.02	0.67 (0.55, 0.79)
Physical functioning	28.9	14.2	43.0	22.4	−14.1 (−24.6, −3.7)	.009	0.70 (0.58, 0.82)
Vitality	39.6	17.3	48.5	20.4	−8.8 (−18.9, 1.2)	.07	
General health	68.7	21.0	74.9	19.1	−6.2 (−16.2, 3.8)	.22	
Social functioning	48.2	17.8	60.5	27.1	−12.3 (−25.0, 0.50)	.06	
Role–emotional†	100.0		100.0			.31	
Mental health	70.1	13.5	75.4	17.4	−5.3 (−13.7, 3.1)	.21	
Nonorganic index†	2.0		3.5			.04	0.65 (0.50, 0.80)
CES-D score	16.4	7.6	12.0	7.1	4.4 (0.70, 8.0)	.02	0.66 (0.53, 0.80)
FABQ							
Work subscale	34.0	4.2	25.7	9.0	8.3 (4.2, 12.2)	<.001	0.79 (0.69, 0.89)
Physical activity subscale†	24.0		18.0			.009	0.69 (0.56, 0.82)
Beck Anxiety Inventory	9.3	5.3	6.3	5.6	3.0 (.04, 5.9)	.047	0.69 (0.56, 0.81)

[a] Area under the receiver operating characteristic curve was calculated for variables with a significant univariate relationship to work status. Dagger indicates variable with a non-normal distribution; values represent medians, and probability value is based on a Mann-Whitney *U* test. OSW=Oswestry Questionnaire, SF-36=Medical Outcomes Study 36-Item Short-Form Health Survey, CES-D=Center for Epidemiological Studies Depression Scale, FABQ=Fear-Avoidance Beliefs Questionnaire, CI=confidence interval.

Table 3.
Univariate Significance Tests for Categorical Baseline Variables, With Work Status as the Dependent Variable

Variable	Persistent Work Restrictions (n=22)	No Work Restrictions (n=55)	P
Sex (% female)	36.4	40.0	.77
Distal symptoms (% with symptoms distal to knee)	22.7	16.4	.51
Prior episodes (% with prior episodes)	59.1	45.5	.28
Treatment group (% in AHCPR[a] group)	68.2	38.2	.02

[a] AHCPR=Agency for Health Care Policy and Research.

to work is an important outcome measure for patients with LBP due to its adverse impact on quality of life and economic consequences.[55] We determined work status after 4 weeks because data from previous studies have shown that the risk of prolonged work absence and high medical costs substantially increase for those individuals off work 4 to 8 weeks.[9,10] In addition, Loisel et al[56] found that people with LBP who remained on modified work status were often unable to resume full work status. This finding indicated that the goal of treatment may need to be return to full, and not modified, work status.

Because of the economic impact of prolonged absence from work, early identification of individuals who are at risk for long-term altered work status, as indicated by having altered work status after 4 weeks, might benefit from early, targeted interventions designed to increase the likelihood of returning to work. Although such interventions have yet to be identified, it is likely, in our view, that they will require increased utilization of multidisciplinary services and increased costs. Given the small percentage of patients for whom this type of intervention may be indicated, the cost-effectiveness of implementing such an intervention for all patients with work-related LBP would be questionable. We contend that it would be valuable to have a method for detecting people who are at risk for long-term altered work status.

Useful statistics for examining screening methods and risk levels in individual patients are LR values because they permit the calculation of probability revisions given

a certain test result.[57] A test result with a large positive LR is useful for identifying patients who are at increased risk for long-term altered work status because a positive test increases the odds of the condition. Conversely, a test with a small negative LR is useful for identifying patients with reduced risk because a negative test will diminish the odds of the condition. For example, we found that 29% of subjects with acute work-related LBP were unable to return to regular work duties within 4 weeks. The largest positive LR was 3.33 for a FABQ work subscale score greater than 34. Using the computational method described by Sackett et al,[50] the risk of prolonged work restrictions would increase from 29% to 58% when a score greater than 34 is obtained. The smallest negative LR was 0.08 for an FABQ work subscale cutoff score of 29. Therefore, in a patient with a score of 29 or less, the risk of prolonged work restrictions would decrease from 29% to 3%.[50]

Although most of the psychosocial measures we used showed differences at baseline between subjects with and without prolonged work restrictions, the FABQ work subscale had the greatest predictive validity. This finding supports that of other authors who have advocated that fear-avoidance beliefs may be the most important cognitive factor influencing the development of chronic disability in patients with LBP.[38,40,58] The FABQ was developed to quantify a patient's fear of pain and subsequent avoidance of activity due to that fear.[38] The work subscale is designed to measure avoidance related to work activities. The FABQ is based on the Fear-Avoidance Model of Exaggerated Pain Perception developed by Lethem et al[59] to help explain why some people with acute painful conditions progress to chronic pain, whereas others are able to recover. The model proposed by Lethem et al indicates that an individual experiencing acute pain exists along a continuum between 2 extremes: confrontation and avoidance.[60] At what point on the continuum an individual patient will exist is determined by his or her fear of pain.[59,61] Confrontation is generally considered to be adaptive, because according to this view the individual views pain as a nuisance and has strong motivation to return to activity, gradually leading to a reduction in fear and a resumption of activity.[59] Avoidance is viewed as maladaptive, causing the patient to avoid certain activities anticipated to cause increased pain.[62] Avoidance may lead to reduced activity levels, an exacerbation of the fear and avoidance behaviors, prolonged disability, and adverse physical and psychological effects.[59,63,64]

Investigators have demonstrated a strong relationship between elevated fear avoidance beliefs and chronic disability due to LBP.[18,38,39] Pearson correlation coefficients between disability scores and measures of fear-avoidance beliefs in studies involving patients with

Table 4.
Pearson Correlation Coefficients Among the Baseline Variables[a]

Variable	Physical Impairment Index†	Pain Rating†	OSW Score	SF-36 Bodily Pain Subscale Score†	SF-36 Physical Function Subscale Score	Nonorganic Index†	CES-D Score	FABQ–Work Subscale	FABQ–Physical Activity Subscale†	Beck Anxiety Inventory
Physical Impairment Index†		0.51**	0.41**	−0.26*	−0.25*	0.46**	−0.072	0.17	0.28*	0.35**
Pain rating†			0.59**	−0.49**	−0.45**	0.52**	0.056	0.47**	0.42**	0.38**
OSW score				−0.63**	−0.74**	0.27*	0.34**	0.40**	0.30**	0.56**
SF-36 bodily pain subscale score†					0.55**	−0.23	−0.35**	−0.57**	−0.31**	−0.49**
SF-36 physical function subscale score						−0.26*	−0.20	−0.35**	−0.30**	−0.40**
Nonorganic index†							−0.072	0.30**	0.46**	0.21
CES-D score								0.26*	0.072	0.44**
FABQ work subscale score									0.51**	0.35**
FABQ physical activity subscale score†										0.22
Beck Anxiety Inventory										

[a] Dagger indicates Spearman correlation coefficient was used due to non-normal data distribution, asterisk indicates $P<.05$, double asterisk indicates $P<.01$. OSW=Oswestry Questionnaire, SF-36=Medical Outcomes Study 36-Item Short-Form Health Survey, CES-D=Center for Epidemiological Studies Depression Scale, FABQ=Fear-Avoidance Beliefs Questionnaire.

Table 5.
Hierarchical Logistic Regression, With Work Status After Four Weeks as the Dependent Variable[a]

Variables Entered	Chi-Square Value–Step	Significance of Chi-Square Value	Nagelkerke R^2	Odds Ratio–Final Model (95% CI)	Significance of Odds Ratio
Step 1: treatment group	χ^2=5.26, *df*=1	.022	.10	0.31 (0.09, 1.06)	.062
Step 2: FABQ work subscale	χ^2=15.92, *df*=1	<.0001	.37	1.20 (1.07, 1.34)	.002

[a] Treatment group was entered on the first step. All baseline variables with significant univariate relationships to work status were considered in a stepwise manner in step 2. Only the Fear-Avoidance Beliefs Questionnaire (FABQ) work subscale was entered into the regression equation. CI=confidence interval.

Table 6.
Cutoff Scores for the Fear-Avoidance Beliefs Questionnaire Work Subscale Scores[a]

Cutoff Score	No. of Subjects Above the Cutoff Score	Sensitivity (95% CI)	Specificity (95% CI)	Positive LR (95% CI)	Negative LR (95% CI)
29	44	0.95 (0.87, 1.0)	0.58 (0.45, 0.71)	2.28 (1.65, 3.16)	0.08 (0.01, 0.54)
34	21	0.55 (0.34, 0.75)	0.84 (0.73, 0.94)	3.33 (1.65, 6.77)	0.54 (0.34, 0.87)

[a] LR=likelihood ratio, CI=confidence interval.

chronic LBP have ranged between .37 and .55.[38,39,63,65] In addition, investigators[18,40] have suggested that excessive fear-avoidance beliefs in patients with acute LBP may be a precursor of future disability. In previous work, we found fear-avoidance beliefs about work to be predictors of 4-week disability and work status even after controlling for initial levels of pain intensity, physical impairment, disability, and the type of therapy received.[40] Because of this relationship, several authors[38–40,66] have advocated the use of the FABQ as a screening tool to identify excessive fear-avoidance beliefs in patients with acute LBP. Our study reported here is the first study in which the value of the FABQ as a screening tool was investigated and in which cutoff scores were identified to assist clinicians in interpretation of scores.

Our results suggest that the FABQ work subscale may be able to serve as a useful screening tool to identify increased risk for prolonged work absence for patients with acute work-related LBP. Caution must be used, however, when interpreting and applying the results of the FABQ work subscale to individual patients. Our results suggest that the FABQ work subscale is a potentially valuable predictor of patients who are at low risk for prolonged work restrictions. Based on our results, a score of 29 or less would reduce the risk for prolonged work restrictions from 29% to 3% in a patient receiving therapy for acute work-related LBP. However, the scale was less effective when it was used to identify patients who are at high risk for prolonged work restrictions. Even the best positive LR (for a score greater than 34) only increased the risk to 58%. We believe caution must be exercised in avoiding overinterpretation of a "positive" score on the FABQ work subscale. In addition, the confidence intervals for the LR values in our study were rather wide, indicating that further research is needed to determine these ratios with greater precision.

Our results also indicate the important role of the selection of particular intervention strategies on return to work. In the final logistic regression model (Tab. 5), the odds ratio of 0.31 for the treatment group of the patient approached statistical significance (P=.06), even after the FABQ work subscale was entered. In this study, successful return to work occurred more frequently in the group treated using a classification-based approach versus an approach based on the AHCPR clinical practice guidelines. Although more research is needed to identify optimal strategies for managing patients with acute LBP, this finding indicates that successful management likely requires both the selection of the appropriate intervention and attention to the psychological distress of the patient.

Fear-avoidance beliefs appear to be an important factor in the development of prolonged work restrictions and chronic LBP for at least some patients. The use of screening tools such as the FABQ may assist clinicians in determining a particular patient's risk for prolonged work restrictions and in tailoring the intervention to more specifically address the patient's needs. For example, patients whose risk level is determined to be low may not require modifications or additions to their physical therapy management. Those whose risk level is heightened, however, may need intervention strategies that take into account those risk factors. Although further research is needed, the intervention for patients with LBP and a high level of fear-avoidance beliefs may require a cognitive behavioral approach utilizing graded

exposure to the activities creating the fear.[67,68] There has been integration of cognitive behavioral interventions into the rehabilitation of patients with chronic LBP[69–72]; however, patients with acute LBP have not been studied. Researchers have not attempted to classify patients prior to the intervention with respect to their risk status for prolonged disability.

All subjects in our study had work-related LBP. Research has shown that compensation status may affect outcome in patients with LBP.[73] The results of our study, therefore, may not be generalized to patients with LBP that is not work related. In patients with LBP that is not work related, there may be different psychosocial variables influencing the transition from acute pain to chronic disability. The FABQ physical activity subscale may prove useful in determining risk based on fear-avoidance beliefs related to general physical activity. This hypothesis, however, warrants further study.

Conclusion

The influence of psychosocial factors on patients with acute LBP has been well-established; however, little information has been available on the psychosocial variables that influence the transition from acute LBP to chronic disability and work loss. The results of our study support previous researchers who suggested fear-avoidance beliefs are the most important psychosocial variable for patients with acute, work-related LBP. The FABQ work subscale may serve as an effective screening tool for estimating risk of prolonged work restrictions based on an assessment of the level of fear-avoidance beliefs about work activities.

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