The Back Disability Risk Questionnaire for Work-Related, Acute Back Pain: Prediction of Unresolved Problems at 3-Month Follow-Up

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Objective: *To assess the validity of the Back Disability Risk Questionnaire (BDRQ) to predict developing chronic back disability.* ***Methods:*** *Five hundred nineteen working adults (67% male) seeking outpatient care for acute, work-related back pain (≤14 days) completed the BDRQ. After the initial medical evaluation, clinicians provided prognostic impressions in a 10-item questionnaire. Pain, functional limitation, and work status were assessed at 3-month follow-up.* ***Results:*** *In multivariate analyses, the presence of persistent pain, functional limitation, or impaired work status (31.4%) was predicted by six BDRQ questions: injury type, work absence preceding medical evaluation, job tenure, prior back surgery, worries about re-injury, expectation for early return-to-work, and stress. Classification accuracy at 3 months was 76.3%. Initial clinician impressions showed no multivariate associations with outcomes.* ***Conclusions:*** *The BDRQ may provide prognostic information not observed in a routine medical evaluation for acute BP.* (J Occup Environ Med. *2009;51:185–194*)

Although the majority of acute back pain resolves quickly and requires minimal intervention, a subset of cases with a seemingly benign clinical presentation can progress to chronic or recurrent pain.[1] One strategy that has been suggested for improving health and work outcomes of back pain is to provide earlier and more focused intervention to those patients at greatest risk for chronic pain and disability.[2,3] This requires that high-risk patients be identified as soon as possible after the onset of pain. Although a number of back pain screening questionnaires and interviews have been reported in the literature,[4–9] researchers have noted that few are focused on workplace factors and screening is rarely conducted within the first 2 weeks after pain onset, when strategies for secondary prevention of disability might be most effective.[10] Thus, there is a need for further development and evaluation of early patient screening methods.

Back pain attributed to occupational causes is a common medical problem with substantial economic consequences. Only 10% of workers filing workers' compensation claims for back pain receive treatment for more than 6 months, but these cases account for 83% of claims costs related to health care expenditures and lost work time.[11] Early intervention to reduce adverse outcomes of back pain might provide substantial cost savings to employers and insurers if high-risk cases can be accurately identified when first reported. Work-

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related back pain provides a unique opportunity for early patient screening because sudden onset is typical, a prompt medical evaluation is usually provided, and self-report questionnaires are well-suited to assess non-medical factors (psychosocial, workplace, and health beliefs) thought to influence functional recovery and return-to-work (RTW).[12]

Early patient screening of patients with back pain in primary care and occupational health settings may help to guide early intervention efforts. In primary care, early intervention trials have focused on providing more helpful advice and information about back pain,[13] improving coping skills,[14] and adhering to evidence-based guidelines for diagnostic testing and medications.[15] In occupational medicine, early intervention trials have been focused on reducing ergonomic exposure and improving support from supervisors and coworkers.[16–20] As the majority of patients with acute low back pain (LBP) improve rapidly with little or no intervention, patient screening may help to identify those patients in greatest need of supplemental education, advice, support, and job accommodation during the early weeks of recovery.

Once medical red flags indicating possible serious pathology have been ruled out, patient self-appraisals of pain severity, functional limitation, and other personal factors have been superior to both administrative data and diagnostic examination results to predict long-term consequences of LBP.[10,21–24] Thus, patient self-report appears to be the most effective means of stratifying patients by disability risk. To test the potential benefits of a patient self-report screening instrument in an occupational health setting, the authors developed the Back Disability Risk Questionnaire (BDRQ),[25] a 16-item questionnaire. Items included in the BDRQ were based on a biopsychosocial theory of the multiple influences on musculoskeletal disability[26,27] and a literature review identifying the most consistently reported factors contributing to LBP disability duration[24] including health ratings, workplace concerns, pain severity, mood, and expectations for recovery. The BDRQ has been shown to have moderate validity to predict 1-month RTW (73% correct classification) in previous analyses,[25] but its associations with longer-term outcomes have not been reported.

RTW is an important clinical marker of functional recovery from acute back pain, but this measure alone may underestimate on-going difficulties associated with lingering or recurrent pain.[28] Although 80% of workers return within 1 month,[11] some report persistent pain, physical dysfunction, and difficulties performing job tasks. General population surveys suggest that among incident cases of back pain, only 26.8% of individuals report full resolution of pain over the following year, and 40.2% of cases are described as persistent.[29] Among those seeking medical attention for the first time, the median pain rating decreases only from 43 to 33 (on a 100-point scale) over 24 months.[30] Among those returning to work within 1 month of pain onset, 41% still require job modifications or feel they are accomplishing less at work due to back pain.[25] As suggested by the World Health Organization's International Classification of Functioning, Disability, and Health,[31] assessment of patient outcome should include not only RTW, but also symptom resolution and functional health status. Integrating these three outcome measures into a clinical case rating may provide a single, comprehensive measure of the need for continuing rehabilitation treatment or medical follow-up.

In the design of the initial validation study for the BDRQ, assessment of both 1- and 3-month outcomes were included to delineate critical milestones in LBP recovery. The 1-month assessment was intended to identify patients migrating from acute to sub-acute pain duration, when physical activating therapies are typically recommended. The 3-month assessment was intended to identify those entering a more chronic phase of back pain that may require more extensive treatment and rehabilitation efforts. Classification accuracy of the BDRQ may be different during the acute and sub-acute stages of recovery, and different BDRQ items may predominate in predicting outcomes. To further evaluate the validity of the BDRQ for use in occupational health settings, the aims of the present study were: 1) to evaluate the accuracy of the BDRQ to predict chronic patterns of pain and disability 3 months after pain onset; 2) to compare classification accuracy of the BDRQ with initial clinician impressions of prognosis; and 3) to assess differences in the specific BDRQ questions that predict outcomes at 1- and 3-month follow-up.

Methods

Participants

Participants recruited into the study were 573 volunteer patients (184 female, 389 male) seeking treatment at one of eight occupational health clinics in the New England region for work-related, acute back pain. Inclusion criteria were: a) nonspecific sacral, lumbar, or thoracic back pain; b) acute onset or exacerbation in the past 14 days; c) pain presumed to be of occupational origin; d) age 18 or older; and e) fluency in English or Spanish. Of the 568 patients initially recruited into the study, 54 (9.4%) could not be reached for the 3-month follow-up assessment. Thus, 519 volunteer patients (174 female, 345 male) comprised the study sample in all subsequent analyses and tabled results. Comparisons of responders and non-responders on demographics and initial report of pain and injury showed differences ($P < 0.05$) on age, gender, and education. Non-responders were more likely to be male (81.5% vs 66.5%), of younger age ($M = 31.9$ vs 36.4 years), and

with no college education (68.5% vs 50.9%).

Procedure

Eligible patients were identified by front desk staff or clinicians during an initial medical evaluation for acute back pain. Details of the research study were described, and a consent form was provided to review and sign. The consent form described confidentiality of surveys, assurance that no surveys would be placed in medical records or shared with employers, and notice of a $25 incentive for participation. After any questions or concerns were addressed, patients were asked to complete the BDRQ along with several demographic questions. Participants returned the completed form to the reception desk before leaving the clinic. After the encounter, clinicians completed a one-page questionnaire detailing initial impressions and prognosis.

Three months after the initial medical evaluation, participants were mailed a postcard specifying a toll-free phone number and personal identifier for accessing an interactive voice response system. This computerized data collection system allowed participants to call at any time and enter data by push-button responses to recorded questions for tracking improvements in pain, function, and work status. Participants not responding within 5 days were called by a trained interviewer who administered the questions by phone. Previous analyses of pain and disability outcomes from the study have shown the interactive voice response methodology to provide comparable results to live telephone interviewing.[32]

Measures of Disability Risk

Back Disability Risk Questionnaire. The BDRQ[25] is a brief (16-item) patient questionnaire that provides a self-assessment of factors related to prognosis for work-related back pain. Factors include background demographics, physical health risks, workplace factors, pain, mood, and expectations for recovery.

Clinician Prognosis. A 10-item questionnaire assessed clinicians' impressions of presenting symptoms and prognosis. This included an overall rating of functional limitation, nonorganic signs or symptom exaggeration, pain classification (localized or diffuse; radicular or non-radicular; pain below knee), depression, availability of work modifications, problematic comorbid medical conditions, probability of developing chronic back pain, and estimated days until RTW.

Outcome Measures

Pain. Participants reported pain intensity on an 11-point numerical rating scale from 0 ("no pain at all") to 10 ("worst pain possible"). The reliability and validity of the pain numerical rating scale has been well documented,[33] and the scale has demonstrated sensitivity to pain treatments for back pain.[34]

Functional Limitation. Functional limitation due to LBP was assessed using a 16-item abbreviated form of the Roland-Morris Disability Questionnaire (RDQ).[35,36] The RDQ has good reproducibility, construct validity, and responsiveness to intervention.[37] One-week test-retest reliability for the RDQ is 0.88, and it correlates well with other established measures of physical function.[38]

Return to Work. Participants provided details about current work status, any temporary modifications or physician restrictions, and the cumulative duration of work absences and work modifications.

Composite Clinical Case Rating. A single composite outcome variable was created to reflect clinically significant back problems persisting at 3 months. A clinical case was defined by experiencing problems in at least one of three domains: work status (unable to resume full duty work), pain rating ($\geq$5), or physical dysfunction (>50% RDQ items endorsed). Rationale for the composite outcome measure was that RTW may underestimate the percentage of patients impaired[39] and the need to identify a clinically meaningful categorization of patients in need of continuing medical follow-up. The cut-off scores for defining a clinical case were based on prior studies of patient acceptable symptom and functional states. A pain score of 40 or less (on a scale of 0 to 100) has been shown to represent a patient acceptable symptom resolution.[40] For functional limitation, a cut-off score of 50 (endorsing at least half the items) was chosen for the RDQ because this corresponds to the median score of patients being referred to a chronic pain treatment center[41] and the 75th percentile of those consulting for back pain in primary care.[42]

Data Analysis

Logistic regression was used to calculate relative risks (RR) and confidence intervals for individual BDRQ items to predict persistent pain status. A separate logistic regression analysis was performed to calculate RRs and confidence intervals from initial clinician impressions. In both cases, all potential predictor variables were tested simultaneously, to avoid the potential problem of model overfitting that has been attributed to automated, stepwise entry and removal of variables.[43]

Results

Demographic characteristics of the 519 study participants who could be reached at the 3-month follow-up (Table 1) described a mostly White, blue-collar population of working adults with moderate levels of income and education, who were employed by medium to large employers. Ages of participants ranged from 18 to 65 years (M = 36.4, SD = 11.0). Based on height and weight measurements provided by participants, the mean body mass index (kg/m^2) was 27.9 (SD = 5.4). Current cigarette smoking was reported by 216 participants (41.6%). The most frequent occupational categories were health care (17.3%), transportation (13.9%), retail/restaurant (10.2%), sanitation and maintenance (9.3%), and distri-

TABLE 1
Demographic Characteristics of Study Participants ($N = 519$)

Variable	N	Sample (%)	% From National Injury Statistics[44]
Gender			
Male	345	66.5	65.0
Female	174	33.5	35.0
Ethnicity			
Black	27	5.2	12.1
White, non-Hispanic	454	87.5	71.3
White, Hispanic	30	5.8	14.0
Asian or Pacific Islander	2	0.4	2.0
(Not reported)	6	1.2	—
Marital status			
Never married	181	34.9	—
Married	241	46.4	—
Divorced	81	15.6	—
Widowed	7	1.3	—
(Not reported)	9	1.7	—
Education			
No high school diploma	98	18.9	—
High school or equivalent	161	31.0	—
Some college	176	33.9	—
College degree	79	15.2	—
(Not reported)	5	1.0	
Personal annual income			
<$10,000	35	6.7	—
$10,000–$14,999	42	8.1	—
$15,000–$24,999	133	25.6	—
$25,000–$39,999	151	29.1	—
$40,000–$60,000	108	20.8	—
>$60,000	28	5.4	—
(Not reported)	22	4.2	—
Employer size			
Small (<50 employees)	88	17.0	—
Medium (51–500 employees)	209	40.3	—
Large (>500 employees)	222	42.7	—
Occupational categories			
Health care	90	17.3	14.6
Transportation, delivery	69	13.3	11.0
Retail, restaurant, flight attendant	52	10.0	9.2
Sanitation, housekeeping, landscaping	49	9.4	5.3
Distribution, warehousing, shipping	47	9.1	7.9
Electrical/mechanical, plumbing, auto repair	42	8.1	8.5
Manufacturing, assembly, seamstress, materials handling	34	6.6	6.2
Construction trades	34	6.6	7.7
Public service (eg, police, fire, post office)	27	5.2	0.8
Airport worker (eg, ticketing, baggage, customer service)	20	3.9	0.2
Machinist, machine operator	19	3.7	9.7
Education, childcare	15	2.9	0.7
Office worker	13	2.5	6.6
(Other)	8	1.5	11.3

bution/warehousing (9.2%). These percentages matched favorably with a national data source for work-related back injuries[44] (Table 1). Clinician estimates of patient consent and participation varied from 50% to 75% of those eligible.

The initial question on the BDRQ asks respondents to provide a written description of their back injuries ("Please briefly describe what you were doing at the time of the injury or when the pain began"). Based on these written responses, injuries were classified according to event or exposure codes developed by the US Bureau of Labor Statistics for tracking workplace injuries.[45] The 10 most frequent injury types were: overexertion (66.5%), bodily reaction (15.2%), fall on same level (6.9%), bodily reaction and exertion, unspecified (2.7%), fall to lower level (2.5%), struck by object (1.2%), highway accident (1.2%), transportation accident, unspecified (0.8%), repetitive motion (0.6%), and struck against object (0.4%). These percentages were similar to those compiled by OSHA based on mandatory employer reporting (62.2% for overexertion, 16.3% for bodily reaction, 7.8% for fall on same level, 3.5% for fall to lower level).[44] The median time between pain onset and BDRQ completion was 2 days. Most participants (91.9%) completed the screen within 7 days, and 24.5% on the same day as pain onset.

At the 3-month follow-up, 102 participants (19.7%) had not been able to resume full-duty work without restrictions. Another 61 participants had resumed full duty work but reported significant pain (a pain rating ≥ 5) or functional limitation (>50% of RDQ items endorsed). The correlation (Kendall's tau) among these three dichotomous outcome variables was 0.42 for work disability and functional limitation, 0.28 for work disability and pain, and 0.45 for pain and functional limitation (all significant at $P < 0.05$). This combined group of 163 patients (31.4% of the full sample) were defined as having unresolved pain or disability at the 3-month follow-up, and this became the patient group of interest ("unresolved cases") for the purposes of evaluating the predictive validity of the BDRQ. Figure 1 is a Venn diagram illustrating the overlap between pain, dysfunction, and work disability among unresolved cases.

Logistic regression results for the BDRQ with estimates of RR for persistent pain problems are shown

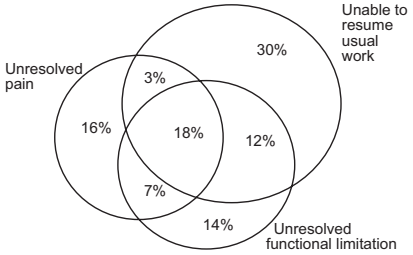

Fig. 1. Venn diagram showing the overlap of pain, dysfunction, and work disability among unresolved cases at 3 months ($n = 163$).

in Table 2. The three columns of the table provide unadjusted, adjusted, and covariate-adjusted RR values and 95% confidence intervals in relation to individual BDRQ items. All predictor variables were entered simultaneously, so RR values in the table are adjusted for all other variables listed in the table; there was no computerized selection of variables for stepwise entry or removal. Confidence intervals for the unadjusted RR values showed statistically significant associations between most BDRQ items and persistent pain and disability at 3 months. Exceptions were the 10-point rating of physical work demands, prior work absence due to back pain, employer allows modified duty, frequency of exercise, and general health rating. Unadjusted RR values were highest (in the range of 2.66 to 4.54) for having a history of back surgery, feeling downhearted or blue most or all of the time, feeling under stress most or all of the time, and having sustained an injury for reasons other than overexertion or bodily reaction, and having poor expectations for RTW. Other significant predictors of persistent pain and disability were high pain intensity (>8), worsening pain, negative supervisor response, work absence before medical evaluation, recent hire (<1 year), job dissatisfaction, and worries about re-injury.

In a multivariate analysis, adjusted RR estimates showed some overlap in the ability of individual BDRQ items to predict persistent pain and disability at 3 months. After controlling for other items on the BDRQ, a review of confidence intervals showed only seven items retained unique associations with the outcome: injury type (falls were associated with a greater risk than over-exertion), work absence before medical evaluation, job tenure (those employed 1 to 5 years showed lower risk), prior back surgery, being somewhat concerned about re-injury, poor expectation for RTW, and feeling under stress. Classification accuracy of the BDRQ was 75.0% (44.8% sensitivity, 88.8% specificity). In a final analysis including seven demographic and background variables as additional covariates (age, gender, education, income, race, body mass index, and smoking status), the results showed little change.

To compare the BDRQ with the impressions of clinicians after the initial physical examination, a separate set of logistic regression analyses was performed using clinician ratings to estimate RR of persistent pain status. Of the 519 participants included in BDRQ results, 502 had complete clinician data and were included in the analysis. Results are shown in Table 3. Confidence intervals for the unadjusted RR values showed statistically significant associations with seven of the eleven clinician ratings, but in a multivariate model, none of the adjusted RR values met criteria for statistical significance. After controlling for demographic and background variables, only one item, whether patients had undergone a previous medical evaluation for back pain, showed a statistically significant association with persistent pain status at 3 months.

Discussion

The BDRQ is one of several patient screening methods that have been introduced to evaluate the need for early intervention to prevent chronic back problems. Unlike its predecessors, the BDRQ has a greater focus on workplace factors, was designed to be administered within the first 14 days after pain onset, and was intended for work-related onset of back pain. To assess the predictive validity of the BDRQ, the 3-month follow-up interval was chosen to identify those patients who might be on the brink of chronic pain and disability. Besides assessing predictive validity of the BDRQ, this study provided an opportunity to assess the relative contribution of prognostic factors and to compare the classification accuracy of the BDRQ with that of initial clinician impressions. Results of the study suggest the BDRQ may provide useful prognostic information not observable in a typical medical examination, though the effects of individual factors may differ for transitioning from acute to sub-acute pain versus transitioning from sub-acute to chronic pain.

Prognostic factors from the BDRQ that increased the RR for persistent back problems fell within the domains of health and injury, employment factors, and patient expectations. Although few patients (2.3%) reported a history of back surgery, this was associated with a nearly 5-fold increase in persistent back problems at 3 months. These individuals may be at greater risk due to decreased muscle strength[46] or greater fears of re-injury.[47] Disability risk has been shown to increase with successive back surgeries.[48] Relative to other injury causes, falls were more likely to lead to persistent pain problems at 3 months. Although the cause of injury has generally not been a strong predictor of back pain outcomes, there is some indication from workers' compensation data that falls produce higher medical and disability costs, presumably due to greater injury severity.[49]

Significant workplace factors were job tenure and work absence before medical evaluation. Patients with a brief job tenure (<1 year) had more than double the risk of persistent problems at 3 month follow-up. This association has been reported in several patient cohorts,[50,51] and this may reflect a lack of physical conditioning to meet job demands, inexperi-

TABLE 2
Relative Risk for Unresolved Pain or Disability at 3 Month Follow-Up Based on BDRQ Scores

BDRQ Item	*n*	Unadjusted RR (95% CI)	Adjusted RR* (95% CI)	Adjusted RR With Covariates† (95% CI)
Cause of injury				
Over-exertion	348	—	—	—
Bodily reaction	93	1.15 (0.69–1.85)	1.56 (0.87–2.80)	1.86 (0.99–3.45)
Fall	50	2.66 (1.46–4.86)	2.82 (1.40–5.68)	2.60 (1.19–5.68)
Other	28	3.07 (1.41–6.70)	2.43 (0.97–6.06)	2.54 (0.90–7.17)
Pain intensity rating (0–10)				
0–4	115	—	—	—
5–7	266	1.60 (0.95–2.70)	0.97 (0.51–1.83)	0.82 (0.41–1.61)
8–10	138	2.92 (1.67–5.12)	1.65 (0.80–3.40)	1.26 (0.58–2.74)
Changes in pain since onset				
Improved	155	—	—	—
Same	185	1.38 (0.85–2.25)	1.38 (0.78–2.46)	1.42 (0.76–2.64)
Worse	179	2.05 (1.27–3.30)	1.65 (0.89–3.07)	1.89 (0.96–3.73)
Missed a day of work already?				
No	227	—	—	—
Yes	292	2.33 (1.57–3.45)	2.17 (1.35–3.51)	2.58 (1.53–4.34)
Job tenure				
Less than 1 year	146	—	—	—
1–2 yr	82	0.44 (0.25–0.80)	0.49 (0.25–0.95)	0.40 (0.19–0.84)
2–5 yr	134	0.45 (0.27–0.74)	0.41 (0.23–0.74)	0.39 (0.20–0.75)
>5 yr	157	0.40 (0.25–0.65)	0.61 (0.35–1.08)	0.59 (0.30–1.16)
Negative supervisor response				
No	429	—	—	—
Yes	90	1.77 (1.11–2.84)	1.19 (0.68–2.09)	1.27 (0.69–2.34)
Physical job demands (1–10)				
0–6	131	—	—	—
7–8	189	0.83 (0.51–1.34)	0.98 (0.55–1.75)	1.04 (0.56–1.93)
9–10	199	1.10 (0.69–1.76)	0.83 (0.46–1.47)	0.79 (0.42–1.47)
Prior back surgery?				
No	507	—	—	—
Yes	12	4.54 (1.35–15.31)	4.69 (1.18–18.61)	3.92 (0.90–17.03)
Past work absence due to LBP?				
No	370	—	—	—
Yes	149	1.31 (0.87–1.95)	1.36 (0.83–2.21)	1.43 (0.84–2.42)
Employer allows modified duty?				
No	195	—	—	—
Yes	324	0.78 (0.53–1.13)	1.06 (0.67–1.67)	1.27 (0.78–2.07)
Job enjoyment (1–10)				
1–6	95	—	—	—
7–8	192	0.52 (0.31–0.88)	0.55 (0.30–1.02)	0.55 (0.28–1.08)
9–10	232	0.59 (0.36–0.97)	0.62 (0.35–1.12)	0.69 (0.36–1.32)
Worries about re-injury				
A little or not at all concerned	144	—	—	—
Somewhat concerned	185	2.25 (1.36–3.73)	1.95 (1.08–3.52)	2.00 (1.06–3.78)
Very or extremely concerned	190	2.16 (1.30–3.58)	1.26 (0.67–2.37)	1.14 (0.58–2.24)
Full RTW within 4 wk?				
Unlikely or not sure	163	—	—	—
Probably	223	0.55 (0.36–0.84)	0.65 (0.40–1.07)	0.58 (0.34–0.99)
Definitely	133	0.26 (0.15–0.46)	0.43 (0.22–0.84)	0.37 (0.18–0.77)
Frequency of moderate exercise?				
Never or rarely	141	—	—	—
1–3 times per week	281	1.04 (0.67–1.62)	0.85 (0.50–1.43)	0.98 (0.56–1.71)
>4 times per week	97	1.33 (0.77–2.31)	1.43 (0.74–2.77)	1.82 (0.89–3.72)
General health rating				
Excellent or very good	289	—	—	—
Good	212	1.33 (0.91–1.95)	1.19 (0.75–1.88)	1.09 (0.66–1.79)
Fair or poor	18	1.24 (0.45–3.42)	1.13 (0.36–3.55)	0.94 (0.27–3.32)
Felt downhearted and blue?				
None or a little of the time	365	—	—	—
Some or a good bit of the time	128	1.67 (1.09–2.55)	1.20 (0.71–2.01)	1.10 (0.63–1.92)
Most or all of the time	26	3.66 (1.63–8.25)	1.62 (0.57–4.63)	0.96 (0.31–3.00)
Felt under stress?				
None or a little of the time	198	—	—	—
Some or a good bit of the time	248	1.94 (1.26–2.98)	1.72 (1.04–2.87)	2.04 (1.17–3.56)
Most or all of the time	73	3.61 (2.04–6.40)	2.80 (1.32–5.93)	4.45 (1.90–10.45)

*Relative risk adjusted for all other predictor variables.

†Relative risk adjusted for all other predictor variables plus demographic variables of age, gender, education, income, race, body mass index, and smoking status.

LBP; Unresolved pain or disability at 3 month reported by 163 of 519 participants (31.4%).

TABLE 3
Relative Risk for Unresolved Pain or Disability at 3 Month Follow-Up Based on Initial Clinician Impressions After Physical Exam

Clinician Response	*n*	Unadjusted RR (95% CI)	Adjusted RR* (95% CI)	Adjusted RR With Covariates† (95% CI)
Prior medical evaluation for LBP?				
No	325	—	—	—
Yes	177	1.49 (1.01–2.20)	1.40 (0.92–2.14)	1.76 (1.11–2.78)
Rating of functional limitation				
None or mild	188	—	—	—
Moderate	215	1.16 (0.75–1.80)	0.94 (0.56–1.58)	0.90 (0.51–1.58)
Significant or severe	99	1.82 (1.09–3.05)	0.95 (0.48–1.88)	1.09 (0.52–2.28)
Non-organic signs or symptoms?				
No	421	—	—	—
Yes	81	1.67 (1.02–2.72)	1.26 (0.72–2.21)	1.09 (0.60–1.99)
Pain pattern				
Localized	430	—	—	—
Diffuse	72	1.61 (0.96–2.69)	1.45 (0.82–2.55)	1.37 (0.75–2.53)
Radicular pain?				
No	413	—	—	—
Yes	89	1.76 (1.10–2.82)	0.94 (0.49–1.80)	0.98 (0.49–1.99)
Leg pain radiating below knee?				
No	467	—	—	—
Yes	35	2.86 (1.43–5.73)	2.39 (0.96–5.97)	1.94 (0.73–5.15)
Any evidence of depression?				
No	399	—	—	—
Yes	103	1.39 (0.88–2.19)	0.94 (0.55–1.62)	0.73 (0.40–1.32)
Modified duty options available?				
No or uncertain	163	—	—	—
Yes	339	0.58 (0.39–0.86)	0.66 (0.43–1.01)	0.68 (0.43–1.02)
Estimated days until full-duty RTW?				
0–7	192	—	—	—
8–14	185	0.97 (0.62–1.53)	0.93 (0.55–1.58)	0.88 (0.50–1.55)
15–45	125	2.12 (1.32–3.40)	1.66 (0.89–3.08)	1.77 (0.91–3.44)
Risk of chronic pain?				
Very unlikely	334	—	—	—
25% chance	123	1.14 (0.73–1.78)	0.87 (0.52–1.44)	0.80 (0.45–1.41)
At least 50% chance	45	1.44 (0.76–2.75)	0.94 (0.44–2.02)	0.91 (0.40–2.05)
Significant comorbidities?				
No	417	—	—	—
Yes	85	1.34 (0.82–2.19)	1.09 (0.61–1.95)	1.11 (0.60–2.06)

*Relative risk adjusted for all other predictor variables.

†Relative risk adjusted for all other predictor variables plus demographic variables of age, gender, education, income, race, body mass index, and smoking status.

LBP; Unresolved pain or disability at 3 month reported by 163 of 519 participants (31.4%).

ence to perform alternate work, or less established relationships with supervisors and coworkers who might provide assistance and advice. Another workplace factor was whether the patient had experienced at least 1 day of work absence before seeking medical attention. This variable may reflect a hesitance to report a work-related pain problem out of concerns of unfair treatment or diminished opportunities for advancement. Delays in filing workers' compensation claims for workplace back injuries have been associated with poorer outcomes in several previous studies.[24,51] Two workplace variables that were associated with 1-month, but not 3-month outcomes were the expectation that an employer would allow modified duty and the rating of physical job demands. Although there is growing evidence that employer efforts to temporarily reduce physical job demands facilitates RTW,[52] the effect on longer-term patient outcomes requires further study.

Individual concerns about stress, re-injury, and RTW each contributed a 2-fold increase in the risk of persistent pain problems at 3 months. Patients who report multiple sources of life adversity, who fear returning to physical work will lead to more serious injury, and who have meager hopes for resuming their normal job responsibilities, are, not surprisingly, at greater risk for persistent back problems. Findings such as these have led to increased interest in assessing emotional distress,[53] fears of

resuming normal activity,[54] and expectations for recovery[55] after the onset of back pain. Although psychological interventions seem best-suited to address these factors and have shown benefits to reduce back disability,[56–58] efforts to promote psychosocial assessments and behavioral interventions for back pain among general practitioners have met with considerable barriers.[59–61] One clinical tool that has received attention is the "yellow flags" assessment method, which provides clinicians with a guide for interviewing patients to identify key psychosocial influences on back pain and disability.[62] More research is needed to demonstrate the reliability and clinical utility of these methods in clinical practice.

One alternative to administering patient screening questionnaires is to simply rely on the prognostic assessments of clinicians after a routine patient interview and physical examination. In this study, a partial list of signs, symptoms, and prognosis provided by clinicians after the initial visit failed to show any significant multivariate correlations with persistent pain problems at 3 months. Therefore, important prognostic information may be missed in a typical initial physical examination and brief patient interaction. Despite the importance given to eliciting psychosocial and workplace factors in medical treatment guidelines for back pain,[63] there is only a fair level of inter-rater agreement in detecting these factors in a standard patient interview.[64] Moreover, the advice of general practitioners concerning physical and occupational activities for patients with LBP may be influenced by their own personal beliefs about pain.[65] Self-report questionnaires might help to improve the reliability of patient screening efforts by guiding clinician interviews toward specific problem areas of concern to individual patients. Lengthier screening questionnaires might have improved reliability and predictive accuracy than the BDRQ for this purpose.

Use of a composite clinical case rating in this study was helpful to assess the overall predictive validity of the BDRQ screen, but the modest correlation between pain, functional limitation, and work disability suggests these outcomes may follow somewhat independent trajectories in the recovery period following acute LBP. Even after a full resolution of pain, patients may continue to limit activities, fear re-injury, or worry about long-term career and lifestyle implications. A patient who has concerns about her employer's willingness to provide adequate flexibility and temporary job modification may experience a longer absence from work, even when levels of pain and functional limitation are low. Decrements in the ability to work may signal the need for greater workplace coordination and involvement; unresolved pain may suggest the need for palliative or pain coping treatments; and functional limitation may suggest physiotherapy, exercise, or other activating interventions. Future screening measures might strive to distinguish between these types of patient concerns.

Conclusions of this study are limited by the population sampled, the brevity of the BDRQ screening measure, and by short-term follow-up. As in any study involving volunteer patients, selection bias is a concern, although the initial patient sample compared favorably with national injury data, and dropout rates were low. Because the focus of the study was on predicting the transition from acute to sub-acute to chronic back pain, longer-term follow-up (ie, 1 year) was not included in the study design. Workers' compensation claims data suggest that for individuals not working 3 months after onset of back pain, 78% will remain out of work for at least 6 months, and 56% for at least 1 year.[11] From the study results, we conclude that brief screening questionnaires like the BDRQ have a reasonable potential for providing clinicians with helpful information to direct their evaluation and treatment of back pain; however, more work is needed to improve the accuracy of screening measures and to link screening results with specific options for early intervention.

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