

Psychosocial predictors of health-related quality of life and health service utilisation in people with chronic low back pain

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Abstract

Psychological and social factors have been shown, separately, to predict outcome in individuals with chronic low back pain. Few previous studies, however, have integrated both psychological and social factors, using prospective study of clinic populations of low back pain patients, to identify which are the most important targets for treatment. One hundred and eight patients with chronic low back pain, newly referred to an orthopaedic outpatient clinic, completed assessments of demographic characteristics, details of back pain, measures of anxiety and depression (Hospital Anxiety and Depression Scale, HADS), fearful beliefs about pain (Fear Avoidance Beliefs Questionnaire), social stresses (Life Events and Difficulties Schedule) and physical aspects of health-related quality of life [SF-36 Physical Component summary Score scale (PCS)]. Six months later subjects completed the SF-36 PCS and the number of healthcare contacts during follow-up was recorded. Independent predictors of SF-36 PCS at 6-month follow-up were duration of pain [(standardised regression coefficient (β) = -0.18 , $p = 0.04$), HADS score (β) = -0.27 , $p = 0.003$] and back pain related social difficulties (β = -0.42 , $p < 0.0005$). Number of healthcare contacts over the 6 months ranged from 1 to 29, and was independently predicted by perceived cause of pain [Incident Rate Ratio (IRR) = 1.46 , $p = 0.03$], Fear Avoidance Beliefs about work (IRR = 1.02 , $p = 0.009$) and back pain related social difficulties (IRR = 1.16 , $p = 0.03$). To conclude, anxiety, depression, fear avoidance beliefs relating to work and back pain related stresses predict impairment in subsequent physical health-related quality of life and number of healthcare contacts. Interventions targeting these psychosocial variables in clinic patients may lead to improved quality of life and healthcare costs.

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1. Introduction

The role of psychological factors in determining outcomes in individuals with back pain has been the subject of considerable recent research. Depression and fear-avoidance predict disability, time off work, and healthcare utilisation (Sullivan et al., 2003, 2005a, 2006a;

Smith et al., 2004; Boersma and Linton, 2005b; Carra-gee et al., 2005), though their predictive power may depend on the chronicity of the pain (Boersma and Linton, 2005a, 2006). Use of maladaptive coping strategies, such as distraction and praying, predicts poorer functional adjustment, and adopting a helpless/hopeless position predicts worse emotional outcomes (Koleck et al., 2006). Perceived support and stress in the work place may predict delayed return to work, though the evidence is mixed (Pincus et al., 2002; Hartvigsen et al., 2004). Intervention studies provide the strongest evidence of causal association and have demonstrated

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that improvements in depression and pain-related cognitions, particularly improvements in pain catastrophisation, are associated with return to work in individuals with chronic musculoskeletal pain (Sullivan et al., 2005b, 2006a,b).

Social factors are also important predictors of outcome in back pain. Education, socio-economic status and unemployment predict back pain duration and recurrence, though it is not clear from existing literature how these exert their effect on outcome (Dionne et al., 2001). Such social characteristics are likely to be closely associated with psychological variables, acting as both precipitating and maintaining factors for psychological problems. Whilst previous research has investigated psychological and social factors separately, no previous study has investigated the relative importance of both social and psychological factors, measured together, in determining outcomes in clinical populations with chronic low back pain. Until the relative importance of these factors is precisely understood, treatment strategies may be less than optimal (Pincus et al., 2002).

We have performed a prospective cohort study in a consecutive series of patients with simple, mechanical low back pain (LBP), newly referred to an orthopaedic clinic in an inner city hospital in the UK. We aimed to determine the relative importance of both social and psychological factors at baseline in predicting outcomes 6 months later. We investigated two main outcomes, the physical aspects of health-related quality of life (physical HRQoL) and health service utilisation, as these are important outcomes of back pain. We tested the hypothesis that emotional factors (anxiety and depression), cognitive factors (beliefs relating to pain) and social stresses would independently predict physical HRQoL and health service utilisation over the 6 months of follow-up, after controlling for the effects of socio-demographic characteristics. Our study is exceptional due to the rigour with which we have assessed social factors, recording stresses that are both related to and independent of back pain, to clarify the nature of the causal link between social stresses and outcomes.

2. Methods

Consecutive subjects with low back pain of 6 months or longer were recruited at their first appointment at an orthopaedic outpatient clinic following referral by their General Practitioner (GP). Inclusion criteria were: primary complaint of simple, mechanical LBP, aged 18–65 years with English language skills sufficient to allow completion of questionnaires. Subjects were excluded if they suffered from any other medical condition that was judged likely to have a major impact on their physical HRQoL or if their back pain was part of a systemic or malignant disease. After full explanation consent was obtained from each participant. Approval for the study was granted by the Central Manchester Local Research Ethics Committee.

All subjects completed questionnaires recording the following demographic information: age, sex, years of formal educational, marital status (living with partner versus other) and employment status. Socioeconomic status was based on current or past employment (or partners employment if never employed), categorised using the criteria of Goldthorpe and Hope and dichotomised into high or low socio-economic status based on whether the subjects were employed in non-manual or manual work, respectively, which we felt was particularly relevant to individuals disabled with chronic low back pain (Goldthorpe and Hope, 1974). The Goldthorpe and Hope classification has been used extensively in research (Rose and Pevalin 2001), which facilitates comparison with previous studies.

Details of back pain included the patient's view regarding the cause of the pain (trauma, "wear and tear" or unknown cause), the duration of low back pain (years) and whether the individual was currently seeking medico-legal compensation related to their back pain.

The Hospital Anxiety and Depression Scale (HADS) was used to measure symptoms of anxiety and depression (Zigmond and Snaith, 1983). The HADS was designed for use in people with physical illness as it omits the bodily symptoms of depression that may be caused by physical illness (such as loss of appetite and sleep disturbance). This self-rated questionnaire consists of 14 items (7 for anxiety and 7 for depression), each item is scored 0–3, with high scores representing high levels of symptoms of anxiety and/or depression. A score 11 or above on either scale indicates probable anxiety or depressive disorder. In view of the high correlation between anxiety and depression scores a combined score (i.e. the total Hospital Anxiety and Depression Scale score) was used for the main analyses.

The Fear-Avoidance Beliefs Questionnaire (FABQ) was used to elicit individuals' beliefs about the extent to which physical activity and work affects low back pain. The questionnaire was developed and has been successfully used in mixed samples of working and unemployed people. (Waddell et al., 1993; Pfingsten et al., 2000; Swinkels-Meewisse et al., 2006). The questionnaire assesses the tendency to avoid activity and work as the result of the experience of pain. For these purposes work can be paid employment or activity within the home and candidates were briefed to complete the assessment on this basis. This questionnaire consists of 16 statements for which participants respond using a scale from 0 to 6. The first section of the FABQ includes five questions relating to fear-avoidance beliefs about physical activity, with four of the questions used to calculate the FAB activity score. The second section includes 11 questions, with seven of the questions used to calculate the fear-avoidance beliefs about work (FAB work score). On both subscales high scores represent a greater tendency to avoid work/activity.

Social stress was measured using the Life Events and Difficulties Schedule (LEDS) (Brown and Harris, 1978), a semi-standardised research interview. The trained interviewer (P.K.) asked in detail about the timing, nature and impact of discrete, stressful "life events" (e.g. bereavement) and ongoing stressful "chronic difficulties" (e.g. serious ongoing marital difficulties) over the year before recruitment. The rating of severity and independence of each life event was made by a panel of experienced LEDS interviewers, blind to the severity of back

pain and the respondent's distress. The rating of severity was made according to a dictionary of standardised vignettes to maximise consistency with other projects. Life Events and Difficulties Schedule were recorded of the 12 months prior to the baseline interview and in this paper 2 measures are quoted: (a) whether subjects had experienced a severe stress or marked chronic difficulty in the year before assessment and (b) a summary score that takes into account the number and severity with high scores representing experience of more severe stresses.

The interview identified separately those stresses that were related to back pain (e.g. unemployment, financial difficulties) and from those that were independent of back pain (such as death of a close relative, aggravated theft of property), so that we could assess the effect of both of these on outcome.

2.1. Outcome measures

2.1.1. Physical health-related quality of life

We used the UK version of the 36-item Short-Form Health Survey (SF-36) Physical Component Score (PCS) as a measure of physical HRQoL, based on 4 dimensions of physical health status: physical function, physical role, body pain and general health (Ware and Sherbourne, 1992; Ware et al., 1994, 1995). We did not include the Mental Component Score (MCS) as an important outcome due to similarities in the items on the HADS scale and the MCS, which would inevitably increase the association between anxiety and depression on the one hand, and HRQoL on the other. The SF-36 PCS has advantages over its four constituent dimensions, being more sensitive to change, eliminating floor and ceiling effects and reducing the number of statistical comparisons performed (Ware et al., 1995, 1994). The SF-36 PCS, measured at the end of a period of rehabilitation, has been shown to be closely associated with subsequent return to work and socio-economic outcomes (Gatchel et al., 1999).

The Physical Component Score is standardised to the general population (mean score, 50; standard deviation 10), with high scores representing higher levels of functioning. Physical HRQoL was assessed both at base line and 6 months after recruitment.

2.1.2. Health service utilisation

Health service utilisation data for the 6 months following recruitment were collected using the Client Socio-Demographic and Service Receipt Inventory (CSSRI) (Beecham and Knapp, 1992). Patients completed this self-report assessment recording details of hospital outpatient, in-patient or day case attendance, any operations or surgical procedures, and contact with accident and emergency services. Details of any contacts with healthcare professionals in the primary care setting were recorded, including the number and duration of GP visits, interventions performed along with any urgent home visits. For the purposes of this study, total number of contacts with healthcare services was used as the outcome of interest. Health service utilisation data collected using this questionnaire have been shown to compare well with data collected from inspection of medical records (Little et al., 2001).

2.2. Statistical analyses

Descriptive data are presented as means (standard deviations) or as number of subjects (percentages). Comparisons across groups were performed using *t*-tests, ANOVAs, Chi-square tests or Fisher's Exact Test (FET) and bivariate associations were assessed using Pearson's or Spearman's correlation coefficients, as appropriate.

Multiple regression analyses were used to identify independent predictors of SF-36 PCS at 6 months follow-up. Baseline variables showing significant ($p < 0.05$) or near significant ($p < 0.2$) univariate associations with SF-36 PCS at 6 months follow-up were entered as independent variables. Independent variables were entered in sequential blocks to determine whether emotional state, cognitive factors and social stress made a significant additional contribution to the regression model, after demographic characteristics, duration and perceived cause of back pain had been entered. For the main analysis, independent variables were in the following order: (i) Block 1 – age, educational status, (ii) Block 2 – duration of back pain and perceived cause of back pain (categorised into unknown cause versus others), and (iii) Block 3 – total HADS score (combined anxiety and depression score), fear-avoidance beliefs (for work and activity separately) and presence of severe social stress in the past year (back pain related and back pain independent). This regression analysis was repeated including the SF-36 PCS at baseline in Block 1, with other variables added as above.

Assessments for problems of multi-collinearity due to associations between independent variable were performed for the multiple regression analyses. Due to a high degree of association between sociodemographic variables (socioeconomic, employment and educational status), the initial model including all three of these variables had problems with multicollinearity. After exclusion of socioeconomic and employment status, all Variance Inflation Factors (VIFs) fell within normal limits, (i.e. $VIF < 2$), without altering which variables from Block 3 contributed to the model. For the sake of brevity we have presented only the regression models with socioeconomic and employment status excluded. It is noteworthy, however, that the contribution of HADS score and back pain related stresses continued to contribute significantly to the model if employment status or socioeconomic status were used instead of educational status.

Due to the fact that health service utilisation was recorded using total count of health service contacts, negative binomial regression was used to investigate predictors of number of health service contacts. The same independent variables in the same order were added as for SF-36 PCS. Results are presented as Incident Rate Ratios (IRRs) with *p*-values and confidence intervals.

3. Results

One hundred and twenty patients were eligible to participate in the study (Table 1). One hundred and eight people completed baseline assessments (90% response rate). The main baseline characteristics of this sample can be seen in Table 1.

Table 1
Baseline characteristics of group

Investigated variables	N (%) / mean (SD) ^a
Age – mean (SD)	39.9 (12.2) years
Male	60 (55.6%)
Living with partner	65 (60.2%)
Other	43 (29.8%)
Close confidant	96 (88.9%)
High socio-economic group	52 (48.1%)
Low socio-economic group	56 (51.9%)
Education ≥12 years education	48 (44.4%)
Employed	62 (57.4%)
Duration of back pain – mean (SD)	5.5 (5.7) years, median = 4.0
Cause of pain – none known	62 (57.4%)
Cause of pain – accident/trauma	34 (31.5%)
Cause of pain – chronic “heavy work”	12 (11.1%)
Claiming or claimed medico-legal compensation for back pain	15 (13.9%)
HAD depression score (mean, SD)	7.4 (4.4%)
HAD depression score ≥ 11	27 (25.0%)
HAD anxiety score mean (SD)	9.0 (4.1)
HAD anxiety score ≥ 11	39 (36.1%)
Fear avoidance Beliefs – work score – mean (SD)	20.6 (12.4)
Fear avoidance Beliefs – activity score – mean (SD)	16.5 (5.6)
Physical HRQoL score (SF-36) – mean (SD)	33.3 (10.1)
Mental HRQoL score (SF-36) – mean (SD)	44.0 (11.5)
Severe events in past year/marked difficulties (%)	46 (49.5)
<i>Median social stress summary score (IQR)</i>	
Back pain related social stresses	1.0 (0.0–3.0)
Back pain independent social stresses	1.0 (0.0–3.5)

^a Results given represent the number of subjects (with percentages) unless otherwise stated IQR, interquartile range.

High degrees of association were evident between educational status, employment and socioeconomic status. Compared to subjects with at least 12 years of education, subjects with less than 12 years of education were more likely to be unemployed [8 (19%) versus 21 (56.9%), respectively, Fisher's Exact Test $p < 0.0005$] and more likely to be of lower socio-economic status [7 (16.7%) versus 41 (80.4%), respectively, Fisher's Exact Test $p < 0.0005$]. For the purposes of the multiple regression analyses only education was entered in block 1, to avoid problems with multicollinearity.

HAD anxiety and depression sub-scores were significantly correlated with each other (Pearson's $r = 0.59$, $p < 0.0005$), so for the purposes of the main analyses HADS total score (i.e. combined anxiety and depression scores) was used. HADS total scores were highest in subjects with low educational status ($t = 4.01$, $p < 0.0005$) and those who were unemployed ($t = 5.3$, $p < 0.0005$). The same was true of FAB scores; FAB scores relating to activity ($t = 3.6$, $p < 0.0005$) and work ($t = 4.6$, $p < 0.0005$) were greatest in those of low educational status, and the unemployed ($t = 3.7$, $p < 0.0005$ and $t = 5.3$, $p < 0.0005$, respectively). FAB relating to activity and work were significantly associated with HADS total score (Pearson's $r = 0.37$, $p < 0.0005$ and $r = 0.43$, $p < 0.0005$, respectively).

3.1. Follow-up at 6 months

3.1.1. Physical health-related quality of life

Ninety-three people (86% of 108 eligible subjects) completed the SF-36 questionnaire at 6 months follow-up. There were no differences between those who were followed up and those who dropped out with regard to socio-demographic variables, nature of back pain, emotional or cognitive characteristics, or SF-36 PCS. At follow-up the mean SF-36 PCS was 34.9 (SD 10.9) compared to the baseline score of 33.3 (SD 10.1) in the same subjects ($n = 93$). Of the 37 subjects unemployed at baseline, only 2 (5%) returned to work during our follow-up. Baseline variables significantly and near significantly associated with SF-36 PCS at 6 months are shown in Table 2.

3.1.2. Baseline predictors of SF-36 Physical Component Score at 6 months follow-up

The results of the multiple regression analysis to investigate baseline predictors of physical HRQoL at 6 months are presented in Table 3. The model predicted a total of 50% (adjusted R^2) of the variance of the SF-36 Physical Component Score at follow-up. In the final model the baseline factors that made a significant independent contribution to SF-36 Physical Component Score 6 months later were duration of back pain, HADS total score and back pain related social stresses.

When the multiple regression analysis was repeated with baseline physical HRQoL score added in Block 1, the variance of the SF-36 Physical Component Score at follow-up that was accounted for by the model increased to 72% (Table 4). In this revised model baseline SF-36 PCS contributed significantly to the model. Despite this, HADS total score and back pain related social stresses, entered in Block 3, continued to contribute significantly to the model.

3.1.3. Health service utilisation

Eighty-six people (80% of 108 eligible subjects) completed the CSSRI assessment at 6-month follow-up. The median number of health service contacts was 4 (interquartile range 2.0–8.0), with a range of 1–29 contacts in the 6 months following recruitment. Seventeen patients (20%) had 10 or more healthcare contacts over the 6 months follow-up period.

3.1.4. Baseline predictors of health service contact during 6-month follow-up

Health service contacts during the 6 months of the study were independently predicted by cause of back pain (pain attributed to traumatic cause associated with greater impairment in physical HRQoL), more fearful cognitions relating to work and back pain related social stresses. HADS total score and Fear avoidance beliefs about activity were not independent predictors. When

Table 2
Univariate associations with physical HRQoL score at 6 months follow-up

	Mean physical HRQoL score	
Age		$r = -0.28, p = 0.006$
Male ($n = 54$)	35.4 (10.4)	$t = 0.43, p = 0.67$
Female ($n = 39$)	34.3 (11.7)	
<i>Marital status</i>		
Living with partner ($n = 58$)	33.9 (11.3)	$t = 1.20, p = 0.23$
Other ($n = 35$)	36.7 (10.0)	
High socio-economic group ($n = 45$)	31.8 (9.8)	$t = -2.9, p = 0.004$
Low socio-economic group ($n = 48$)	38.2 (11.1)	
<i>Education</i>		
≥ 12 years education ($n = 42$)	39.3 (11.3)	$t = -3.7, p < 0.0005$
< 12 years education ($n = 51$)	31.4 (9.2)	
Employed ($n = 56$)	39.0 (10.3)	$t = 5.0, p < 0.0005$
Unemployed ($n = 37$)	28.7 (8.7)	
Duration of back pain (years)		^a $r = -0.32, p = 0.002$
<i>Cause of pain</i>		
None known ($n = 52$)	36.6 (11.2)	$F = 1.9, p = 0.16$
Accident/trauma ($n = 29$)	36.6 (11.2)	
Chronic “heavy work” ($n = 12$)	30.2 (7.0)	
<i>Seeking medico-legal compensation</i>		
Yes ($n = 14$)	34.9 (10.9)	$t = -0.008, p = 0.99$
No ($n = 79$)	34.9 (11.0)	
Baseline Sf-36 Physical Component Score		$r = 0.79, p < 0.0005$
<i>HAD</i>		
Depression score		$r = -0.56, p < 0.0005$
Anxiety score		$r = -0.35, p = 0.001$
Total score		$r = -0.52, p < 0.0005$
<i>Fear Avoidance Beliefs</i>		
Work score		$r = -0.43, p < 0.0005$
Activity score		$r = -0.38, p < 0.0005$
<i>Social stresses</i> [severe events/marked difficulties]		
Yes ($n = 46$)	33.2 (11.2)	$t = 1.57, p = 0.12$
No ($n = 47$)	36.7 (10.3)	
<i>Social stress summary score</i>		
Back pain related social stresses		$r = -0.64, p < 0.0005$
Back pain independent social stresses		$r = -0.13, p = 0.22$

^a r , Spearman's correlation coefficient; PCS, SF-36 Physical Component Score.

this negative binomial regression was repeated including SF-36 PCS at baseline in block 1, Fear avoidance beliefs relating to work continued to contribute to the model (IRR = 1.02, $p = 0.008$, 95% confidence intervals 1.01–1.03) but back pain related stresses did not (IRR = 1.12, $p = 0.09$) (Table 5).

4. Discussion

In this prospective cohort study of chronic low back pain sufferers our most notable findings were that social stresses predicted subsequent impairment in physical HRQoL and number of healthcare contacts over the 6-month follow-up period. This effect

was limited to social stresses related to the back pain (e.g. unemployment due to back pain); social stresses independent of the back pain (e.g. death of a close relative) did not have any effect on subsequent physical HRQoL or healthcare contacts. The contribution of work related social stresses was independent of demographic characteristics, cause and duration of back pain and the contribution of other psychological variables. In addition to the effects of social stresses, depression score at first clinic visit also predicted self-rated physical HRQoL 6 months later and Fear Avoidance Beliefs relating to work predicted number of health service contacts during follow-up. Thus our hypothesis was upheld.

Table 3

Multiple regression analysis to identify baseline variables that contribute physical HRQoL score 6 months later

Independent variables	Model 1			Model 2			Model 3		
	Standard β	<i>t</i> -value	Significance (<i>p</i> -value)	Standard β	<i>t</i> -value	Significance (<i>p</i> -value)	Standard β	<i>t</i> -value	Significance (<i>p</i> -value)
Block 1 (Constant)		5.39	<0.0005		5.05	<0.0005		7.43	<0.0005
Age	−0.17	−1.66	0.10	−0.10	−0.84	0.41	−0.048	−0.52	0.61
Education	0.30	2.89	0.005	0.27	2.63	0.01	0.02	0.222	0.83
Block 2 Cause of pain				−0.13	−1.27	0.21	−0.02	−0.27	0.79
Duration of pain (years)				−0.29	−2.77	0.007	−0.18	−2.06	0.04
Block 3 HADS total							−0.27	−3.04	0.003
FAB activity							−0.09	−1.04	0.30
FAB work							−0.06	−0.60	0.55
Back pain related social stresses							−0.42	−4.64	<0.0005
Back pain independent social stresses							0.065	0.83	0.41

Model 1: $R^2 = 0.16$, adjusted $R^2 = 0.14$, R^2 change = 0.16, F change = 8.4, significance of F change $p < 0.0005$.Model 2: $R^2 = 0.24$, adjusted $R^2 = 0.20$, R^2 change = 0.08, F change = 4.6, significance of F change $p = 0.012$.Model 3: $R^2 = 0.55$, adjusted $R^2 = 0.50$, R^2 change = 0.31, F change = 11.2, significance of F change $p < 0.0005$.

There were no problems with multicollinearity of independent variables. All variance inflation factors <2.0.

Our sample was representative of those attending a hospital orthopaedic clinic with a primary complaint of low back pain, so we believe our results are likely to be generalisable to the many patients seeking help for back pain in secondary care. Other strengths of our study were the simultaneous measurement of several key variables at baseline using well-validated and specific assessments. Our measure of socio-economic status, based solely on occupation, might be considered old fashioned, since many more recent measures take into account factors such as employment relations and conditions of employment. We considered, however, the division of subjects into those involved in manual labour or not, to be most relevant to a population with chronic low back pain.

This is the first prospective study in a clinical population to examine the importance of social stresses in such detail. Demographic variables and duration of back pain accounted for the majority of variance in physical HRQoL and healthcare costs, by virtue of the fact they were forced into the regression equation first. After demographic variables and duration of back pain had been entered into the analysis, social stresses and HADS total score continued to predict a significant proportion of the variance of SF-36 PCS at follow-up. This reflects the fact that the observed contribution to the model of these variables was independent of the confounding or mediating influence of the demographic and back pain variables.

Table 4

Multiple regression analysis to identify baseline variables that contribute physical HRQoL 6 months later: including baseline physical HRQoL as independent variable

Independent variables	Model 1			Model 2			Model 3		
	Standard β	<i>t</i> -value	Significance <i>p</i> -value	Standard β	<i>t</i> -value	Significance <i>p</i> -value	Standard β	<i>t</i> -value	Significance <i>p</i> -value
Block 1 (Constant)		1.32	0.19		2.68	0.009		4.39	<0.0005
Age	−0.009	−0.12	0.91	−0.046	−0.59	0.58	−0.043	−0.60	0.55
Education	0.05	0.72	0.47	0.027	0.38	0.71	−0.056	−0.79	0.43
SF-36 PCS	0.76	10.4	<0.0005	0.76	10.19	<0.0005	0.59	7.25	<0.0005
Block 2 Cause of pain				−0.18	−2.65	0.009	−0.10	−1.53	0.13
Duration of pain (years)				−0.06	−0.84	0.40	−0.06	−0.79	0.43
Block 3 HADS total							−0.16	−2.26	0.03
FAB activity							−0.06	−0.85	0.40
FAB work							−0.05	−0.72	0.47
Back pain related social stresses							−0.20	−2.56	0.01
Back pain independent social stresses							0.10	1.65	0.10

Model 1: $R^2 = 0.62$, adjusted $R^2 = 0.61$, R^2 change = 0.62, F change = 48.6, significance of F change $p < 0.0005$.Model 2: $R^2 = 0.65$, adjusted $R^2 = 0.63$, R^2 change = 0.03, F change = 3.9, significance of F change $p = 0.02$.Model 3: $R^2 = 0.72$, adjusted $R^2 = 0.69$, R^2 change = 0.07, F change = 4.20, significance of F change $p = 0.002$.

There were no problems with multicollinearity of independent variables. All variance inflation factors <2.0.

Table 5
Multivariate predictors of number of healthcare contacts during 6 months follow-up

Independent variables		Model 1			Model 2			Model 3		
		Incident Rate Ratio	Significance <i>p</i> -value	95% confidence intervals	Incident Rate Ratio	Significance <i>p</i> -value	95% confidence intervals	Incident Rate Ratio	Significance <i>p</i> -value	95% confidence intervals
Block 1	Age	1.01 (0.01)	0.19	1.0–1.02	1.01 (0.01)	0.15	1.0–1.03	1.01 (0.01)	0.37	0.99–1.02
	Education	0.96 (0.19)	0.83	0.66–1.40	1.01 (0.19)	0.94	0.70–1.46	1.35 (0.24)	0.09	0.96–1.92
Block 2	Cause of pain				1.65 (0.31)	0.008	1.14–2.39	1.46 (0.25)	0.031	1.03–2.05
	Duration of pain (years)						0.98–1.06	1.01 (0.02)	0.53	0.98–1.04
Block 3	HADS total							1.00 (0.0.01)	0.83	0.98–1.03
	FAB activity							1.01 (0.02)	0.46	0.98–1.04
	FAB work							1.02 (0.01)	0.009	1.00–1.03
	Back pain related social stresses							1.16 (0.076)	0.027	1.02–1.31
	Back pain independent social stresses							1.06 (0.05)	0.08	1.02–1.31

SE, standard error.

Our rigorous measure of social stresses enabled us to determine whether stresses were related to or independent of back pain. Since the adverse effects of social stresses on subsequent physical HRQoL and healthcare contacts were limited to those stresses that were associated with the back pain, it is possible that the observed association between stresses and physical HRQoL could be attributed to the severity of back pain. Against this suggestion, however, in the analysis concerning predictors of subsequent SF-36 PCS, is our finding that back pain related stresses continued to be independent predictors after baseline SF-36 PCS had been added in block 1. Since baseline SF-36 PCS contains assessments of pain and disability, our findings indicate that some of the effect of back pain related stresses on subsequent physical HRQoL was independent of the confounding effect of severe, disabling back pain.

Our finding that Fear Avoidance Beliefs in chronic low back pain sufferers predict health care utilisation has not been reported previously. Whilst Fear Avoidance Beliefs have been shown to predict level of pain and disability among back pain sufferers (Al Obaidi et al., 2000; Linton, 2000; Vlaeyen and Linton, 2000), which might lead to individuals seeking more health care, among our patients the contribution of Fear Avoidance Beliefs persisted after the effects of SF-36 Physical Component Score at baseline had been controlled. The latter contained assessments of pain and disability, suggesting that the impact of fearful beliefs relating to work on health care contacts was independent of levels of pain and disability. Other research has linked Fear Avoidance Beliefs to poor coping among chronic low back pain patients; anxious cognitions were associated with a diminished sense of control, and avoidance to an increase in pain behaviours (Asmundson et al., 1999). It is possible that Fear Avoidance Beliefs among our chronically disabled pain patients led to increased health care utilisation as part of a maladaptive coping response to chronic pain. The contribution of back pain related stresses to healthcare utilisation became non-significant after controlling for Baseline SF-36 PCS. Using the same arguments as above this indicates a possible confounding influence of severity of back pain.

The clinical implications of our findings are that clinician should remain aware that social stresses are important predictors of physical HRQoL and healthcare utilisation, and that they should evaluate such factors as part of routine assessment. Though the observed effects may be limited to stresses that result directly from the back pain itself, this does not undermine the importance of the social stresses. Among people with chronic pain that is resistant to physical therapies, interventions aimed at relieving social stresses, such as counselling or problem solving, may be beneficial for both back pain and depression (Mynors-Wallis et al., 2000; van den

Hout et al., 2003). Alternatively, techniques that help individuals cope better with stresses, such as cognitive behavioural therapy, may benefit subsequent quality of life and reduce healthcare utilisation. Proof of the benefits of intervening with social stresses must be established through intervention studies, however.

Our findings confirm that anxiety, depression and fear-avoidance beliefs have important influences on physical aspects of HRQoL and healthcare utilisation in chronic low back pain sufferers. We agree with others who have recommended that clinicians treating disabled back pain patients should evaluate mental health (Wittink et al., 2003). Interventions directed at improving anxiety and depression are likely to benefit patients directly by reducing illness burden and have potential to substantially improve physical HRQoL and reduce health service utilisation. Treatment of depression may involve physical rehabilitation, non-specific exercise (Hurwitz et al., 2002; Smeets et al., 2006) or it may include the use of antidepressants, though the effect of these drugs in depressed back pain patients is not clear (Dickens et al., 2000; Jackson et al., 2000; Staiger et al., 2003). Optimum treatment strategies are likely to involve screening subjects for social and psychological problems alongside physical assessments. This will enable delivery of treatments based on individualised assessments of need, possibly using a stepped-care model, as has been used in diabetes (Katon et al., 2004). Using such a model, individuals with the most severe disability with marked treatment resistance may require elements from all of these strategies, possibly with case manager involvement to ensure delivery of treatment.

Further intervention trials are now required to identify how best to treat psychological problems, social problems and physical problems together in chronic pain patients. Assessments of combined treatments, such as antidepressants and psychological treatments, in addition to standard treatments for the physical problems, such as physiotherapy, are required. Furthermore studies are required to determine whether outcomes, such as physical health-related quality of life and healthcare utilisation, improve when specific treatment is offered for social stresses, depression and maladaptive beliefs about back pain in addition to usual rehabilitation techniques (Sullivan et al., 2006a).

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