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Predictors of Outcome in Neck and Shoulder Symptoms

A Cohort Study in General Practice

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Study Design. An observational prospective cohort study in general practice.

Objectives. To describe the clinical course and to identify predictors of recovery, changes in pain intensity, and changes in functional disability in patients with neck or shoulder symptoms at 3- and 12-month follow-up.

Summary of Background Data. Knowledge on the clinical course and predictors of outcome in neck and shoulder symptoms is limited. Such knowledge would facilitate treatment decisions and may help to inform patients about their prognosis.

Methods. Four hundred and forty-three patients who consulted their general practitioner with neck or shoulder symptoms participated in the study. Baseline scores of pain and disability, symptom characteristics, sociodemographic and psychological factors, social support, physical activity, general health, and comorbidity were investigated as possible predictors of recovery, changes in pain intensity, and changes in functional disability using multiple regression analyses.

Results. The recovery rate was low; 24% of the patients reported recovery at 3 months and 32% reported recovery at 12-month follow-up. Duration of the symptoms before consulting the GP and a history of neck or shoulder symptoms increased the probability of an unfavorable outcome. Furthermore, less vitality and more worrying were consistently associated with poorer outcome after 3 and 12 months. The area under the receiver-operator characteristic curve for the model predicting recovery was 0.8 at 3 months and 0.75 at 12 months. The explained variance of the models on pain and functional disability ranged from 43 to 54%.

Conclusions. The results found in this study indicate that besides clinical characteristics, psychological factors also predict the outcome of neck and shoulder symptoms.

Key words: prognosis, neck, shoulder, recovery, pain, disability, general practice. *Spine* 2005;30:E459–E470

sulting incidence in Dutch general practice for neck symptoms has been estimated at 23.1 per 1000 person years and for shoulder symptoms at 19.0 per 1000 person years.¹ In the Netherlands, GPs are consulted 101 times annually per 1000 registered persons for neck or shoulder symptoms.¹ Little is known about the clinical course of neck and shoulder symptoms after presentation in general practice. Yet, knowledge on the course may facilitate treatment decisions and may help to inform patients about their prognosis. Knowledge of predictors of outcome should lead to the early identification of those at risk for the development of chronic symptoms.

Current knowledge of the course of neck and shoulder symptoms mainly originates from hospital surveys, although only a small proportion of patients in general practice require referral to a specialist.^{2,3} Only a few long-term prognostic cohort studies have been carried out in patients with neck or shoulder symptoms in general practice.^{2,4–6} Intense pain,^{4–6} long duration of symptoms,^{2,4–6} history of symptoms,^{2,4,5} disability,^{2,4,5} being older than 40 years,⁴ traumatic cause,⁴ concomitant low back pain,⁴ and lack of well-being⁵ were identified as prognostic indicators of poor outcome of neck or shoulder symptoms. These studies focused on the prognostic value of diagnosis, treatment and clinical characteristics of the symptoms, like duration and intensity of pain. So far, little attention has been given to the prognostic value of psychological factors, although these factors were found to be related to a high risk of chronicity in patients consulting their GPs for low back pain.^{7–10}

The objectives of this study were 1) to describe the clinical course of new episodes of neck and shoulder symptoms in adults in general practice, and 2) to identify predictors that are associated with short-term (3 months) and long-term (12 months) outcome in terms of recovery, pain intensity, and functional disability.

Materials and Methods

Design. The design was an observational prospective cohort study in general practice in the Netherlands. Ninety-seven general practitioners (GPs) from 61 general practices participated in the study. Half of the GPs participated in the second Dutch National Survey of General Practice carried out by the Netherlands Institute for Health Services Research in cooperation with the National Information Network of General Practitioners.^{11,12} From June 2001 to June 2002, GPs recruited patients with a new episode of neck or shoulder symptoms. An episode was considered to be “new” if patients had not visited their GP for the same symptoms during the preceding 3 months. Inclu-

Musculoskeletal symptoms of the neck and shoulder are frequently presented in general practice. The annual con-

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sion criteria were as follows: 18 years or older and capable of filling in Dutch questionnaires. Patients were excluded from the study if the presented symptoms were presumably caused by a fracture, malignancy, prosthesis, amputation, or congenital defect or if the patient were pregnant. At baseline and at follow-up (3 and 12 months) questionnaires were sent. Additional information about the design of the study has been described elsewhere.¹³ The informed consent procedure and protocol were approved by the Medical Ethics Committee of the VU University Medical Center. Written informed consent was obtained from all patients.

Outcome Measures. Outcome measures were perceived recovery, change in pain intensity, and change in functional disability at 3- and 12-month follow-up. Perceived recovery was measured by asking patients if their symptoms still bothered them. Patients that responded “no” were regarded as recovered. The intensity of the current pain (pain during the last 24 hours) was measured on an 11-point numerical scale, ranging from 0 (no pain) to 10 (unbearable pain). Functional disability was measured with a symptom-specific questionnaire. At the start of the study, there was no suitable disability questionnaire for patients with neck and/or shoulder disorders. Therefore, we developed a 20-item scale from several existing, validated questionnaires assessing functional disability.^{14–18} The patient had to respond to how much trouble he/she had performing that activity on a scale from 0 (no effort) to 4 (not able to do anymore). Scoring was done by adding up the response to each item and then transferring it in a score ranging between 0 (no disability) and 100 (completely disabled). Factor analysis revealed a unidimensional scale (data not shown). The internal consistency of the created questionnaire was high (Cronbach’s $\alpha = 0.96$).

Putative Predictors. We distinguished 7 categories of putative predictors as follows:

Sociodemographic Factors. Sociodemographic factors included were age, sex, body mass index, right-/left-handedness, marital status, having children in household, smoking behavior, and educational background.

Characteristics of the Symptoms. Characteristics of the symptoms included the duration of the current episode, perceived cause of the symptoms, history of neck or shoulder symptoms, discomfort caused by the symptoms, complaints (e.g., tingling in hand/fingers, numb hand/fingers, loss of strength), involvement of one or both shoulders, involvement of the dominant shoulder, headache or loss of concentration because of neck pain, and use of pain medication.

Comorbidity. Comorbidity was measured using a list of additional musculoskeletal symptoms other than at the neck or shoulder and a list of symptoms and diseases other than of the musculoskeletal system.

Physical Activity. We measured whether patients met the norm for healthy activity (yes or no), which recommends that all adults should accumulate 30 minutes or more of moderate-intensity physical activity on at least 5 days of the week,^{19,20} and whether they met the American College of Sports Medicine (ACSM) position stand (yes or no) that recommends performing heavy physical exercise or sports at least 3 times a week.²¹

Psychological Factors and Social Support. Distress was measured by the shortened version of the distress scale of the Four-Dimensional Symptom Questionnaire²² on which a higher score indicates more distress. Coping was measured with the Pain Coping Inventory (PCI),^{23,24} consisting of 6 scales measuring the use of different coping strategies: pain transformation, distraction, reducing demands, retreating, worrying, and resting. On this instrument a higher score indicates more use of the strategy. Kinesiophobia was measured using two subscales derived from the Tampa Scale^{25,26} and the Fear Avoidance and Beliefs Questionnaire,²⁷ with a higher score indicating more fear-avoidance and finding exercise more important, respectively. Social support was measured with the Social Support Scale²⁸ on which a higher score indicates less social support.

General Health. Factors of general health included vitality, measured by the vitality subscale from the 36-item Short-Form health survey; perceived general health, measured with the first question of the general health perceptions subscale of the 36-item Short-Form,²⁹ and perceived overall quality of life (QoL), measured on a 5-point rating scale, with response options “bad,” “moderate,” “good,” “very good,” and “excellent.” Higher scores indicate being more vital, better perceived health, and better quality of life.

Statistical Analyses. Cox regression analysis, with a fixed time period assigned to each patient, was applied to model the relationship between the putative predictors and perceived recovery, resulting in the assessment of a hazard ratio (HR) and corresponding confidence interval (95% CI). Linear regression analysis was used to predict changes in pain intensity and changes in functional disability since baseline.

Univariate regression analyses were performed to examine the relationship between each of the putative predictors and the three outcome measures at 3 and 12 months of follow-up. Continuous variables were examined to check whether there was a linear relation between the predictor and the outcome. Factors that were found to be nonlinearly related to the outcome were either dichotomized or divided into tertiles (low, medium, high). The “low-category” served as the reference category in all analyses. Subsequently, putative predictors that were associated with the outcome ($P < 0.20$) were included in a multiple regression model. All eligible factors were entered simultaneously in a multiple linear regression model. Manual backward elimination was used to sequentially delete factors from the initial model until only factors with a $P < 0.1$ were retained in the final model.

To evaluate the discriminative ability of the models for the prediction of perceived recovery, individual “survival” functions were calculated and converted into an individual probability of recovery. These probabilities were used to construct a receiver-operator characteristic curve and to calculate the area under the curve (AUC) as a measure of the discriminative ability of the model.³⁰ The percentage of explained variance (R^2) was calculated to assess the “goodness of fit” of the linear regression models.

■ Results

Baseline characteristics of the 443 included patients with neck or shoulder symptoms are shown in Table 1. The mean disability score was 27.7 (SD 19.7), and the mean intensity of pain score was 5.1 (SD 2.2).

Table 1. Patient Characteristics at Baseline (n = 443)

Characteristics	No. of Patients*	%
Sociodemographic factors		
Gender (female)	281	63
Age, yrs (mean, SD)	49.2 (13.8)	
Employed	260	59
Education level:		
Primary	196	44
Secondary	185	42
College/university	61	14
Married/living together	344	78
Body mass index (mean, SD)	25.7 (3.9)	
Having children	202	46
Smoking (now, ever)	301	68
Baseline score outcome measures (mean, SD)		
Intensity of pain (scale 0–10)	5.1 (2.2)	
Disability at baseline (scale 0–100)	27.7 (19.7)	
Symptom characteristics		
Duration of current episode:		
<1 wk	30	7
1 wk to 1 mo	139	31
1 mo to 6 mos	123	28
>6 mos	150	34
History of neck or shoulder symptoms	235	53
Discomfort caused by symptoms:		
Almost continuously	184	42
Regularly	125	28
Now and then	81	18
No discomfort	47	11
Localized symptom [†]	138	31
Symptoms in dominant shoulder [†]	166	43
Both shoulders involved [‡]	87	23
Use of medication	304	69
Signs:		
Tingling in hand/fingers	170	38
Numb hand/fingers	79	18
Loss of strength	131	30
Loss of hand coordination	34	8
Tendency to shake hands	70	16
tendency to massage hands	150	34
Headache [§]	196	68
Concentration problems [§]	143	50
Putative cause of the symptoms:		
Overload due to usual activities	174	39
Overload due to unusual activities	47	11
Overload due to sports/exercise	25	6
Accident during sports	16	4
Accident elsewhere	29	7
Anxiety/stress	82	19
Chronic disease	20	5
Other cause	69	16
Unknown	147	33
Comorbidity		
Additional musculoskeletal symptoms:		
No co-morbidity	186	42
Symptoms hip/knee	96	22
Symptoms ankle/ft	46	10
Symptoms back	165	37
Multiple musculoskeletal symptoms	49	11
Other diseases problems:		
Asthma	54	12
Menopause [¶]	47	11
Diabetes	26	6
Cardiovascular diseases	68	15
Psychological problems	86	19
Cancer	7	2
Physical activity		
ACSM position stand	49	11
Dutch Norm Healthy Activity	178	40
Psychological factors (mean, SD)		
Coping with pain		
Pain transformation (scale 4–16)	8.4 (2.7)	
Distraction (scale 5–20)	10.7 (3.3)	

(Continued)

Characteristics	No. of Patients*	%
Reducing demands (scale 3–12)	6.2 (1.9)	
Retreating (scale 7–28)	10.8 (3.5)	
Worrying (scale 9–36)	16.0 (4.7)	
Resting (scale 5–20)	9.8 (3.0)	
Distress (scale 0–12)	5.2 (3.5)	
Kinesiophobia:		
Fear - avoidance (scale 0–100)	49.8 (17.8)	
Importance of exercise (scale 0–100)	42.8 (21.1)	
Social support (scale 12–60)	18.5 (8.0)	
General health (mean, SD)		
Perceived general health (scale 1–5)	3.2 (0.9)	
Quality of life (scale 1–5)	3.3 (0.8)	
Vitality (scale 0–100)	58.9 (19.0)	

*For continuous scales means and standard deviations (SD) are presented.
[†]Patients with symptoms restricted to only one area of the neck or shoulder.
[‡]Selection of patients with shoulder symptoms.
[§]Selection of patients with only neck symptoms.
[¶]Selection of women.
^{||}American College of Sports Medicine Position Stand.

In total, 399 patients (90%) completed the 3-month follow-up, and 364 patients (82%) completed the 12-month follow-up questionnaire.

There were no significant differences between responders and dropouts by age, sex, functional disability, and pain intensity at 3 and 12 months of follow-up, except for age at 3 months of follow-up; the dropouts were younger ($P < 0.05$).

Clinical Course

After 3 months, 95 patients (24%) reported recovery and after 12 months 119 (32%; Figure 1). At follow-up, self-reported pain intensity and disability had improved; the mean change in pain was 1.7 (SD 2.5) points at 3 months and 2 (SD 2.8) points at 12 months ($P < 0.001$).

The mean change in disability was 6.6 (SD 13.1) points at 3 months and 8.2 (SD 15.6) points at 12 months ($P < 0.001$).

Predictors of Outcome - Recovery

The results of the univariate regression analyses are presented in the Appendix. Factors that significantly re-

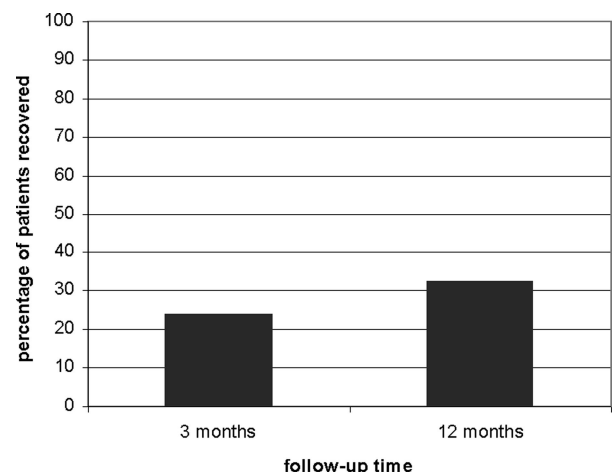


Figure 1. Percentage of recovery of patients with neck or shoulder symptoms at 3 and 12 months of follow-up.

duced the probability of recovery at 3 months were more intense pain at baseline, a longer duration of symptoms before presentation, a history of neck or shoulder symptoms, frequent discomfort, more resting, and being less vital (Table 2).

A longer duration of symptoms before presentation, a history of neck or shoulder symptoms, having both shoulders involved, numb hand/fingers, multiple musculoskeletal symptoms, and more worrying significantly reduced the probability of recovery at 12 months. The AUC was 0.8 (0.75–0.85) at 3 months and 0.75 (0.69–0.81) at 12 months.

Predictors of Outcome - Pain

A poor prognosis at 3 months was predicted by less intense pain at baseline, a longer duration of the symptoms at presentation, a history of neck or shoulder symptoms, frequent discomfort, tingling in hand/fingers, hip or knee symptoms, multiple musculoskeletal symptoms, less fear-avoidance, and less vitality (Table 3).

Predictors of poor outcome at 12 months were less intense pain at baseline, a longer duration of the symptoms at presentation, a history of neck or shoulder symptoms, having symptoms in both shoulders, tingling in hand/fingers, numb hand/fingers, more worrying, less fear-avoidance, worse perceived health, and bad or moderate quality of life. The explained variance was 0.44 at 3 months and 0.42 at 12 months.

Predictors of Outcome - Functional Disability

Factors that predicted a poor outcome were at 3 months were older age, less disabled at baseline, a longer duration of the symptoms at presentation, generalized symptoms, frequent discomfort, chronic disease as perceived cause of the symptoms, tingling of hands/fingers, loss of strength, hip or knee symptoms, more distraction, less fear-avoidance, and less vitality (Table 4).

A poor prognosis at 12 months was predicted by older age, less disability at baseline, a longer duration of the symptoms at presentation, loss of strength, numb hand/

Table 2. Predictors of Recovery at 3 Months (AUC 0.80) and 12 Months (AUC 0.75) Among Patients with Neck or Shoulder Symptoms: Results of the Multiple Regression Analyses

Prognostic Factor	3 Mos				12 Mos			
	N Recovered*	HR†	95% CI	P	N Recovered*	HR†	95% CI	P
Baseline outcome measure								
Intensity of pain (per point)		0.92	[0.84, 1.01]	0.08				
Symptom characteristics								
Duration of current episode:								
<1 wk	17/26 (65%)	1.00			15/25 (60%)	1.00		
1 wk to 1 mo	42/126 (33%)	0.69	[0.37, 1.30]	0.25	53/118 (45%)	0.75	[0.42, 1.36]	0.35
1 mo to 6 mos	19/112 (17%)	0.48	[0.22, 1.08]	0.08	32/96 (33%)	0.63	[0.34, 1.17]	0.14
>6 mos	16/133 (12%)	0.55	[0.22, 1.37]	0.20	18/124 (15%)	0.46	[0.21, 0.99]	0.05
History of symptoms:								
No	70/190 (37%)	1.00			85/175 (49%)	1.00		
Yes	25/211 (12%)	0.53	[0.29, 0.96]	0.04	34/192 (18%)	0.58	[0.36, 0.93]	0.03
Discomfort:								
No discomfort	27/41 (66%)	1.00						
Now and then	19/72 (26%)	0.53	[0.26, 1.05]	0.07				
Regularly	23/118 (20%)	0.60	[0.30, 1.19]	0.14				
Almost continuously	24/166 (15%)	0.44	[0.22, 0.87]	0.02				
One/both shoulders involved:								
1 side					93/240 (39%)	1.00		
Both sides					8/73 (11%)	0.39	[0.18, 0.85]	0.02
Missing‡					18/54 (33%)	0.88	[0.53, 1.47]	0.63
Numb hand/fingers:								
No					110/304 (36%)	1.00		
Yes					9/63 (14%)	0.51	[0.24, 1.06]	0.07
Multiple musc. symptoms:								
No					116/328 (35%)	1.00		
Yes					3/39 (8%)	0.31	[0.10, 1.00]	0.05
Psychological factors								
Coping: worrying:								
Low					58/133 (44%)	1.00		
Medium					39/114 (34%)	0.94	[0.62, 1.42]	0.77
High					21/117 (18%)	0.62	[0.37, 1.04]	0.07
Coping: resting								
Low	43/137 (31%)	1.00						
Medium	30/115 (26%)	0.94	[0.58, 1.51]	0.80				
High	22/146 (15%)	0.60	[0.35, 1.04]	0.07				
General health								
More vital (per 10%):		1.15	[1.02, 1.29]	0.02				

Note. Missing variables reduced the no. of subjects available for the multivariate analysis from 399 to 388 (3 months) and from 364 to 360 (12 months).

*No. and percentage (in brackets) of patients recovered.

†HR < 1.00, a lower probability of recovery compared to the reference group; HR > 1.00, a higher probability of recovery compared to the reference group.

‡Patients with only neck symptoms.

Table 3. Predictors of Change in Pain Intensity at 3 Months ($R^2 = 0.44$) and 12 Months ($R^2 = 0.42$) Among Patients with Neck or Shoulder Symptoms: Results of the Multiple Regression Analyses

Prognostic factor	3 Mos				12 Mos			
	n	<i>b</i> *	95% CI	<i>P</i>	n	<i>b</i> *	95% CI	<i>P</i>
Baseline outcome measure								
Intensity of pain (per point increase)	399	0.63	[0.53, 0.72]	0.00	364	0.73	[0.62, 0.84]	0.00
Symptoms characteristics								
Duration of current episode:								
<1 wk	26	0			25	0		
1 wk to 1 mo	127	-1.13	[-2.01, -0.25]	0.01	118	-0.78	[-1.74, 0.18]	0.11
1 mo to 6 mos	114	-1.43	[-2.38, -0.49]	0.00	98	-1.08	[-2.06, -0.10]	0.03
>6 mos	132	-1.51	[-2.47, -0.55]	0.00	123	-1.20	[-2.23, -0.18]	0.02
History of symptoms (versus no history)	190	-0.45	[-0.94, 0.05]	0.08	174	-0.56	[-1.10, -0.02]	0.04
One/both shoulders involved:								
1 side					240	0		
Both sides					71	-0.88	[-1.49, -0.27]	0.00
Missing†					53	0.08	[-0.58, 0.74]	0.82
Discomfort:								
No discomfort	41	0						
Now and then	72	-1.31	[-2.13, -0.48]	0.00				
Regularly	117	-1.06	[-1.85, -0.26]	0.01				
Almost continuously	165	-1.56	[-2.34, -0.79]	0.00				
Tingling in hand/fingers (versus "no")	151	-0.38	[-0.79, 0.03]	0.07	138	-0.41	[-0.89, 0.07]	0.09
Numb hand/fingers (versus "no")					62	-0.77	[-1.40, -0.14]	0.02
Symptoms hip/knee (versus "no")	89	-0.72	[-1.20, -0.24]	0.00				
Multiple musculoskeletal symptoms (versus "no")	42	-0.93	[-1.58, -0.28]	0.01				
Psychological factors								
Coping "worrying"								
Low					133	0		
Medium					113	0.13	[-0.42, 0.69]	0.63
High					115	-0.96	[-1.59, -0.34]	0.00
Fear-avoidance (per point increase)	399	0.01	[0.00, 0.03]	0.02	262	0.01	[-0.00, 0.03]	0.07
General health								
Better perceived health (per point increase)					364	0.51	[0.22, 0.80]	0.00
Moderate/bad QoL (versus good-excellent)					41	-0.99	[-1.77, -0.20]	0.01
More vital (per 10%)	399	0.30	[0.19, 0.41]	0.00				

Note. Because of missing variables, 7 patients were excluded in the multiple regression analyses of change in pain at 12 months.

b = regression coefficient.

**b* positive: favourable change in pain per unit of the independent predictor; *b* negative: unfavorable change in pain per unit of the independent predictor.

†Patients with neck symptoms.

fingers, not having a tendency to massage the hands, hip or knee symptoms, having multiple musculoskeletal symptoms, more worrying, bad or moderate quality of life, and less vitality. The explained variance of the models for change in functional disability was 0.52 at 3 months and 0.54 at 12 months.

Discussion

The results of our prospective cohort study showed that the recovery rate of patients with a new episode of symptoms at the neck or shoulder is low: less than one-quarter reported recovery after 3 months, and only a third of the patients reported recovery after 1 year of follow-up. Other studies investigating the prognosis of shoulder pain in general practice found recovery rates of 21% after 6 months,² and 51 to 59% after 12 to 18 months.^{6,31} Rekola *et al*³² reported that one-quarter of the patients seeking care for neck and shoulder pain had one or more additional episodes of care for these symptoms over the subsequent 12 months. These findings underline the recurrent and persistent nature of neck and shoulder symptoms.

In agreement with previous studies, the most consistent predictor of poor outcome was duration of the symptoms at baseline.^{2,5,6} Symptoms that were already present for a long duration at presentation are more likely to persist. Having more pain and being more disabled at baseline predicted a larger reduction in pain intensity and functional disability at follow-up. In contrast, more pain predicted a lower probability of recovery at 3-month follow-up. Having more pain and disability at baseline leaves room for a larger reduction at follow-up. Apparently, this does not necessarily result in a better prognosis in terms of recovery: the scores may still be relatively high (much pain) at follow-up. For example, a patient with a baseline pain score of 9 and a follow-up score of 6 improved more than a patient with a baseline score of 3 and a follow-up score of 1. More worrying was associated with a poor prognosis in all models at 12-month follow-up. A passive coping strategy like worrying is thought to generate a preoccupation with bodily symptoms, which in turn may exacerbate pain and functional disability.^{33,34} Several studies have found that a passive coping strategy is associated with

Table 4. Predictors of Change in Functional Disability at 3 Months ($R^2 = 0.52$) and 12 Months ($R^2 = 0.54$) Among Patients With Neck or Shoulder Symptoms: Results of the Multiple Regression Analyses

Prognostic factor	3 Mos			12 Mos				
	n	b	95.0% CI	P	n	b	95.0% CI	P
Sociodemographic factors								
Older age (per year)	399	-0.12	[-0.19, -0.05]	0.00	364	-0.09	[-0.18, 0.00]	0.05
Baseline outcome measure								
More disabled (per point increase)	399	0.47	[0.41, 0.53]	0.00	364	0.58	[0.52, 0.65]	0.00
Symptom characteristics								
Duration of current episode:								
<1 wk	26	0			25	0		
1 wk to 1 mo	127	-5.22	[-9.59, -0.85]	0.02	118	-4.31	[-9.09, 0.47]	0.08
1 mo to 6 mos	113	-6.49	[-11.23, -1.76]	0.01	96	-5.85	[-10.72, -0.98]	0.02
>6 mos	133	-8.43	[-13.15, -3.71]	0.00	125	-10.61	[-15.45, -5.77]	0.00
Localized symptoms (versus generalized)	125	1.97	[-0.22, 4.15]	0.08				
Discomfort:								
No discomfort	41	0						
Now and then	72	-2.00	[-6.02, 2.03]	0.33				
Regularly	117	-3.57	[-7.45, 0.31]	0.07				
Almost continuously	165	-4.28	[-8.21, -0.35]	0.03				
Putative cause: chronic disease (versus "no")	18	-7.14	[-11.80, -2.48]	0.00				
Tingling in hand/fingers (versus "no")	151	-2.76	[-4.77, -0.75]	0.01				
Loss of strength (versus "no")	115	-2.53	[-4.80, -0.27]	0.03	107	-2.34	[-5.03, 0.34]	0.09
Numb hand/fingers (versus "no")					62	-3.97	[-7.04, -0.90]	0.01
Tendency to massage hands (versus "no")					118	2.68	[0.20, 5.15]	0.03
Symptoms hip/knee (versus "no")	90	-3.09	[-5.46, -0.73]	0.01	82	-5.72	[-8.51, -2.93]	0.00
Multiple musculoskeletal symptoms (versus "no")					36	-5.12	[-9.16, -1.07]	0.01
Psychological factors								
Coping "distraction":								
Low	150	0						
Medium	129	0.33	[-2.05, 2.70]	0.79				
High	118	-2.66	[-5.10, -0.21]	0.03				
Coping "worrying":								
Low					132	0		
Medium					114	0.68	[-2.12, 3.48]	0.63
High					115	-2.65	[-5.73, 0.43]	0.09
Fear-avoidance:								
Low	148	0						
Medium	97	0.43	[-2.09, 2.95]	0.74				
High	154	2.28	[-0.09, 4.65]	0.06				
General health								
Moderate/bad QoL (versus good-excellent)	399	1.31	[0.75, 1.86]	0.00	41	-7.59	[-11.68, -3.50]	0.00
More vital (per 10%)					364	0.77	[0.03, 1.50]	0.04

Because of missing variables, 6 and 7 patients were excluded in the multiple regression analyses at 3 and 12 months, respectively. *b* = regression coefficient; *b* positive = favorable change in functional disability per unit of the independent predictor; *b* negative = unfavorable change in functional disability per unit of the independent predictor.

poor outcome in back pain patients^{7,35} and in patients with rheumatoid arthritis.^{33,34} Being more vital at baseline was associated with a good prognosis in all models at 3-month follow-up. Vitality is a measure of general health; a better general health leads to a quicker recovery. Frequent discomfort, tingling or numb feeling in hand or fingers, and loss of strength predicted a poor outcome in several models. These characteristics of the symptoms may express the extent of the symptoms: the more severe the symptoms, the worse the prognosis. Alternatively, these symptoms may indicate a diagnosis of carpal tunnel syndrome or other specific medical diagnosis with a relatively poor outcome. Unfortunately, we were unable to collect reliable data on medical diagnosis in our study, which makes it difficult to test this assumption.

Fear-avoidance refers to the avoidance of movements or activities based on fear. In our study, more fear-avoidance predicted a larger reduction in pain (at 3 and 12 months) and functional disability (at 3 months). This finding is in contrast with the theory, which states that avoidance of movements or activities results in the persistence or recurrence of chronic musculoskeletal pain and disability.^{36,37} Previous research has demonstrated that more fear and avoidance is correlated with an unfavorable outcome in patients with low back pain.^{8,38,39} Maybe avoidance of daily activities in a group of primary care patients with neck or shoulder symptoms results in less pain and disability at follow-up. On the other hand the effects were not very large and borderline significant (Tables 3 and 4), and thus this association may be a random finding. Further research is necessary to study the influence of fear-avoidance on change in pain and disability in patients with musculoskeletal symptoms other than low back pain.

Because of the observational design of our study, the results provide only preliminary evidence regarding a causal association between the predictors found in this study and outcome in neck and shoulder symptoms. Providing the predictors found in this study show a causal association with outcome in neck and shoulder symptoms, interventions may be designed that could improve the outcome. More worrying, resting, and distraction predicted a poorer prognosis at 3 and 12 months, respectively. An intervention to promote active coping strategies might result in better prognosis in patients with neck or shoulder symptoms. A cognitive-behavior intervention, entailing activation and promoting coping lowered the risk of developing long-term disability in primary care patients with persistent neck and back pain.^{40,41} More experimental studies are needed to test the hypotheses that promoting an active coping strategy will produce better outcomes in patients with neck and shoulder symptoms.

The AUC was 0.8 at 3 months and 0.75 at 12 months for the models predicting recovery, which we consider as moderate to satisfactory accuracy. The explained variation of the linear regression models was moderate and ranged from 43 to 54%. Despite the numerous and mul-

tidimensional predictors investigated, about half of the variability in outcome was not explained by the models. The heterogeneity of study population may have contributed to the moderate percentage of variance accounted for. There may be several subgroups in the total population with different predictors and different prognoses. Our patient sample was not large enough to investigate all putative predictors in subgroups (e.g., men versus women; acute versus chronic). Another explanation is that there may be other important factors not investigated in this study, for example the results of physical examination and management of the symptoms. Management was intentionally not incorporated because we wanted to focus on factors that were available to the general practitioner (GP) at first presentation. In addition, we did not include work-related factors in our study because more than one-third of the study population did not have paid work.

The results from this study may help GPs to provide patients with more accurate information on their prognosis. Patients who have had the same symptoms in the past, have the symptoms for longer than 1 month before consulting the GP, and more severe symptoms are likely to have a poor prognosis. The predictors found in this study may be used to develop a prognostic index that can be used to identify patients with a high probability of recovery. However, before such an index can be developed, the results found in this study need to be confirmed in other studies in general practice. Some of the predictors found may be significant by chance; therefore, the predictive capability of the model should be assessed in a different population.^{42,43}

This study is the first to examine a multidimensional battery of predictors of short and long-term outcome of patients with neck or shoulder symptoms in general practice. Besides being characteristic of the symptoms (e.g., duration, history of symptoms), several psychological factors were related to short-term and long-term outcome. These results indicate that not only clinical characteristics of the symptoms are related to the outcome of neck and shoulder symptoms but also that psychological factors are important predictors of outcome as well.

■ Key Points

- This paper describes the clinical course of predictors of neck and shoulder symptoms.
- Only a third of the patients reported recovery after 1 year of follow-up.
- Both clinical characteristics and psychological factors predict the outcome of neck and shoulder symptoms.

References

1. Bot SDM, van der Waal JM, Terwee CB, et al. Incidence and prevalence of complaints at the neck and upper extremity in general practice. *Ann Rheum Dis* 2005;64:118–23.

2. Croft P, Pope D, Silman A. The clinical course of shoulder pain: prospective cohort study in primary care. Primary Care Rheumatology Society Shoulder Study Group. *BMJ* 1996;313:601-2.
3. Miedema H. *Reuma-onderzoek meerdere echelons (ROME): basisrapport*. Leiden, Netherlands: NIPG-TNO; 1994.
4. Hoving JL, de Vet HC, Twisk JWR, et al. Prognostic factors for neck pain in general practice. *Pain* 2004;110:639-45.
5. Kjellman G, Skargren E, Oberg B. Prognostic factors for perceived pain and function at one-year follow-up in primary care patients with neck pain. *Disabil Rehabil* 2002;24:364-70.
6. van der Windt DA, Koes BW, Boeke AJ, et al. Shoulder disorders in general practice: prognostic indicators of outcome. *Br J Gen Pract* 1996;46:519-23.
7. Burton AK, Tillotson KM, Main CJ, et al. Psychosocial predictors of outcome in acute and subchronic low back trouble. *Spine* 1995;20:722-8.
8. Klenerman L, Slade PD, Stanley IM, et al. The prediction of chronicity in patients with an acute attack of low back pain in a general practice setting. *Spine* 1995;20:478-84.
9. Cherkin DC, Deyo RA, Street JH, et al. Predicting poor outcomes for back pain seen in primary care using patients' own criteria. *Spine* 1996;21:2900-7.
10. Dionne CE, Koepsell TD, Von Korff M, et al. Predicting long-term functional limitations among back pain patients in primary care settings. *J Clin Epidemiol* 1997;50:31-43.
11. Schellevis FG, Westert GP, de Bakker DH, et al. De tweede nationale studie naar ziekten en verrichtingen in de huisartsenpraktijk: aanleiding en methoden. *Huisarts en Wetenschap* 2003;46:7-12.
12. Westert GP, Schellevis FG, de Bakker DH, et al. Monitoring health inequalities through General Practice: the Second Dutch National Survey of General Practice. *Eur J Public Health* 2005;15:59-65.
13. van der Waal JM, Bot SD, Terwee CB, et al. Determinants of the clinical course of musculoskeletal complaints in general practice: design of a cohort study. *BMC Musculoskelet Disord* 2003;4:3.
14. Jordan A, Manniche C, Mosdal C, et al. The Copenhagen Neck Functional Disability Scale: a study of reliability and validity. *J Manipulative Physiol Ther* 1998;21:520-7.
15. Levine DW, Simmons BP, Koris MJ, et al. A self-administered questionnaire for the assessment of severity of symptoms and functional status in carpal tunnel syndrome. *J Bone Joint Surg Am* 1993;75:1585-92.
16. Stratford P, Levy D, Levy K, et al. Extensor carpi radialis tendonitis: a validation of selected outcome measures. *Physiotherapy Can* 1987;39:250-5.
17. van der Heijden GJ, Leffers P, Bouter LM. Shoulder disability questionnaire design and responsiveness of a functional status measure. *J Clin Epidemiol* 2000;53:29-38.
18. Vernon H, Mior S. The Neck Disability Index: a study of reliability and validity. *J Manipulative Physiol Ther* 1991;14:409-15.
19. Kemper H, Ooijendijk W, Stiggelbout M. Consensus about the Dutch recommendation for physical activity to promote health (Consensus over de Nederlandse norm gezond bewegen). *Tijdschrift voor Gezondheidswetenschappen* 2000;78:180-3.
20. Pate RR, Pratt M, Blair SN, et al. Physical activity and public health. A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA* 1995;273:402-7.
21. American College of Sports Medicine Position Stand. The recommended quantity and quality of exercise for the developing and maintaining cardiorespiratory and muscular fitness in healthy adults. *Med Sci Sports Exerc* 1990;22:265-74.
22. Terluin B. The Four Dimensional Symptom Questionnaire (4DSQ) in general practice. *De Psycholoog* 1998;33:18-24.
23. Kraaijmaat FW, Evers AW. Pain-coping strategies in chronic pain patients: psychometric characteristics of the pain-coping inventory (PCI). *Int J Behav Med* 2003;10:343-63.
24. Kraaijmaat F, Bakker A, Evers A. Pain coping strategies in chronic pain patients: the development of the Pain Coping Inventory (PCI). *Gedragstherapie* 1997;30:185-201.
25. Goubert L, Crombez G, Vlaeyen J, et al. The Tampa Scale for Kinesiophobia: psychometric characteristics and norms. *Gedrag en Gezondheid* 2000;28:54-62.
26. Goubert L, Crombez G, Van Damme S, et al. Confirmatory factor analysis of the Tampa Scale for Kinesiophobia: invariant two-factor model across low back pain patients and fibromyalgia patients. *Clin J Pain* 2004;20:103-10.
27. Waddell G, Newton M, Henderson I, et al. A Fear-Avoidance Beliefs Questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability. *Pain* 1993;52:157-68.
28. Feij J, Doorn C, van Kampen D, et al. Sensation seeking and social support as moderators of the relationship between life events and physical illness/psychological distress. In: Winnubst JAM, Maes S, eds. *Lifestyles Stress and Health*. Leiden, Netherlands: DSWO Press 1992;285-302.
29. Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care* 1992;30:473-83.
30. Hanley JA, McNeil BJ. The meaning and use of the area under a receiver operating characteristic (ROC) curve. *Radiology* 1982;143:29-36.
31. Winters JC, Sobel JS, Groenier KH, et al. The long-term course of shoulder complaints: a prospective study in general practice. *Rheumatology (Oxford)* 1999;38:160-3.
32. Rekola KE, Levoska S, Takala J, et al. Patients with neck and shoulder complaints and multisite musculoskeletal symptoms—a prospective study. *J Rheumatol* 1997;24:2424-8.
33. Evers AW, Kraaijmaat FW, Geenen R, et al. Pain coping and social support as predictors of long-term functional disability and pain in early rheumatoid arthritis. *Behav Res Ther* 2003;41:1295-1310.
34. Covic T, Adamson B, Hough M. The impact of passive coping on rheumatoid arthritis pain. *Rheumatology (Oxford)* 2000;39:1027-30.
35. Linton SJ. Occupational psychological factors increase the risk for back pain: a systematic review. *J Occup Rehabil* 2001;11:53-66.
36. Vlaeyen JW, Kole-Snijders AM, Boeren RG, et al. Fear of movement/(re)injury in chronic low back pain and its relation to behavioral performance. *Pain* 1995;62:363-72.
37. Vlaeyen JW, Linton SJ. Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain* 2000;85:317-32.
38. Fritz JM, George SZ, Delitto A. The role of fear-avoidance beliefs in acute low back pain: relationships with current and future disability and work status. *Pain* 2001;94:7-15.
39. Picavet HS, Vlaeyen JW, Schouten JS. Pain catastrophizing and kinesiophobia: predictors of chronic low back pain. *Am J Epidemiol* 2002;156:1028-34.
40. Linton SJ, Andersson T. Can chronic disability be prevented? A randomized trial of a cognitive-behavior intervention and two forms of information for patients with spinal pain. *Spine* 2000;25:2825-31.
41. Linton SJ, Ryberg M. A cognitive-behavioral group intervention as prevention for persistent neck and back pain in a non-patient population: a randomized controlled trial. *Pain* 2001;90:83-90.
42. Altman GA. *Practical statistics for medical research*. London: Chapman & Hall; 1991.
43. Bleeker SE, Moll HA, Steyerberg EW, et al. External validation is necessary in prediction research: a clinical example. *J Clin Epidemiol* 2003;56:826-32.

Appendix. Predictors for Recovery, Change in Functional Disability, and Change in Pain Intensity at 3 Months (n = 395) and 12 Months (n = 360) Among Patients with Neck or Shoulder Symptoms: Results of Univariate Regression Analyses

Prognostic Factor	Recovery			Pain Intensity			Functional Disability					
	3 Mos			3 Mos			3 Mos					
	HRT	95% CI	HRT	95% CI	b†	95% CI	b†	95% CI	b†	95% CI		
Sociodemographic factors												
Female (versus male)	0.73	[0.49, 1.10]*	0.83	[0.58, 1.20]	-0.25	[-0.776, 0.27]	0.29	[-0.31, 0.89]	0.59	[-2.11, 3.30]	3.02	[-0.33, 6.37]*
Older age (per year)	0.99	[1.00, 1.01]	1.00	[0.98, 1.01]	-0.01	[-0.29, 0.01]	-0.01	[-0.03, 0.01]	-0.11	[-0.20, -0.02]*	-0.12	[-0.24, 0.00]*
Employed (versus not employed)	1.69	[1.09, 2.63]*	1.32	[0.91, 1.93]*	0.42	[-0.09, 0.93]*	0.22	[-0.37, 0.80]	1.65	[-0.98, 4.27]	0.69	[-2.60, 3.99]
Smoking – never (versus yes/ever)	1.02	[0.67, 1.57]	0.97	[0.66, 1.44]	0.01	[-0.47, 0.60]	0.01	[-0.61, 0.63]	-1.35	[-4.12, 1.42]	-1.72	[-5.22, 1.77]
Education level:												
Primary	1.00		1.00		0.00		0.00		0.00		0.00	
Secondary	1.58	[1.00, 2.50]*	1.14	[0.77, 1.71]	0.10	[-0.45, 0.64]	0.18	[-0.45, 0.80]	0.56	[-2.25, 3.36]	-0.30	[-3.79, 3.19]
College/university	1.90	[1.07, 3.36]*	1.55	[0.94, 2.54]*	-0.39	[-1.15, 0.37]	-0.06	[-0.94, 0.81]	-0.94	[-4.87, 2.99]	0.77	[-4.13, 5.67]
Married/living together (versus single)	1.11	[0.67, 1.83]	1.13	[0.71, 1.78]	0.32	[-0.29, 0.93]	0.50	[-0.20, 1.21]*	0.62	[-2.51, 3.75]	1.38	[-2.55, 5.30]
Body mass index ≥ 25 (kg/m ²) (versus < 25)	0.65	[0.43, 0.99]*	0.87	[0.61, 1.26]	-0.28	[-0.79, 0.22]	-0.12	[-0.70, 0.45]	-0.59	[-3.22, 2.03]	0.85	[-2.42, 4.12]
Having no children (versus having children)	1.22	[0.82, 1.83]	1.10	[0.76, 1.58]	0.10	[-0.40, 0.60]	-0.27	[-0.31, 0.84]	2.15	[-0.45, 4.76]*	2.49	[-0.74, 5.73]*
Baseline scores outcome measures												
More intense pain (per point)	0.85	[0.78, 0.93]*	0.91	[0.84, 0.98]*	0.51	[0.41, 0.61]*	0.55	[0.44, 0.67]*	1.29	[0.72, 1.86]*	1.78	[1.08, 2.48]*
More disabled (per point)	0.99	[0.98, 1.00]*	0.99	[0.98, 1.00]*	0.02	[0.01, 0.05]*	0.03	[0.02, 0.05]*	0.45	[0.38, 0.52]*	0.54	[0.45, 0.62]*
Symptom characteristics												
Duration of current episode:												
<1 wk	1.00		1.00		0.00		0.00		0.00		0.00	
1 wk to 1 mo	0.51	[0.29, 0.90]*	0.75	[0.42, 1.33]	-1.25	[-2.30, -0.20]*	-0.35	[-1.53, 0.84]	-10.79	[-16.17, -5.41]*	-5.61	[-12.27, 1.06]*
1 mo to 6 mos	0.26	[0.13, 0.50]*	0.56	[0.30, 1.03]*	-2.02	[-3.08, -0.97]*	-1.09	[-2.30, 0.11]	-13.29	[-18.73, -7.85]*	-7.81	[-14.61, -1.01]*
>6 mos	0.18	[0.09, 0.36]*	0.24	[0.12, 0.48]*	-2.23	[-3.28, -1.19]*	-1.54	[-2.72, -0.36]*	-14.15	[-19.52, -8.79]*	-10.87	[-17.51, -4.24]*
History of symptoms (versus no history)	0.32	[0.20, 0.51]*	0.36	[0.24, 0.54]*	-0.90	[1.40, -0.41]*	-1.14	[-1.70, -0.57]*	-4.07	[-6.63, -1.51]*	-5.61	[-8.78, -2.43]*
Discomfort												
No discomfort	1.00		1.00		0.00		0.00		0.00		0.00	
Now and then	0.40	[0.22, 0.72]*	0.55	[0.30, 1.00]*	-2.63	[-3.54, -1.72]*	-1.53	[-2.61, -0.45]*	-6.15	[-11.12, -1.18]*	-1.57	[-7.82, 4.67]
Regularly	0.30	[0.17, 0.52]*	0.49	[0.28, 0.85]*	-2.01	[-2.85, -1.17]*	-0.90	[-1.89, 0.09]*	-8.57	[-13.18, -3.96]*	-3.51	[-9.27, 2.25]
Almost continuously	0.22	[0.13, 0.36]*	0.53	[0.32, 0.88]*	-2.37	[-3.17, -1.56]*	-1.06	[-2.01, -0.11]*	-7.69	[-12.12, -3.25]*	-2.45	[-8.00, 3.09]
Localized symptoms†† (versus generalized)	2.43	[1.62, 3.63]*	1.89	[1.32, 2.71]*	0.92	[0.39, 1.46]*	0.74	[0.12, 1.36]*	4.25	[1.49, 7.01]*	3.53	[0.06, 7.01]*
Both shoulder involved‡‡ (versus one)	0.43	[0.21, 0.85]*	0.28	[0.14, 0.58]*	-1.07	[-1.71, -0.44]*	-1.56	[-2.29, -0.82]*	-4.80	[-8.24, -1.37]*	-7.11	[-11.3, -2.85]*

(Continued)

Appendix (Continued)

Prognostic Factor	Recovery			Pain Intensity			Functional Disability					
	3 Mos			3 Mos			3 Mos			12 Mos		
	HRT	95% CI	HRT	95% CI	b†	95% CI	b†	95% CI	b†	95% CI	b†	95% CI
Symptoms dominant shoulder (versus other)	1.27	[0.82, 1.97]	1.27	[0.86, 1.88]	0.52	[-0.02, 1.06]*	0.28	[-0.35, 0.91]	2.52	[-0.40, 5.44]*	3.79	[0.16, 7.43]*
No use of medication (versus use)	1.16	[0.76, 1.77]	1.18	[0.81, 1.71]	-0.26	[-0.80, 0.28]	-0.11	[-0.72, 0.51]	-3.35	[-6.12, -0.57]*	-2.63	[-6.06, 0.80]*
Headaches (versus no headache)	0.58	[0.34, 0.99]*	0.68	[0.41, 1.13]*	-0.64	[-1.33, 0.05]*	-0.60	[-1.39, 0.19]*	-0.74	[-3.57, 2.09]	-1.71	[-5.50, 2.09]
Loss of concentrations (versus no loss)	0.59	[0.34, 1.03]*	0.56	[0.34, 0.95]*	-0.15	[-0.79, 0.49]	-0.19	[-0.92, 0.54]	0.93	[-1.73, 3.59]	0.31	[-3.26, 3.88]
Signs:												
Tingling in hand/fingers (versus "no"):	0.69	[0.44, 1.06]*	0.62	[0.42, 0.93]*	-0.60	[-1.11, -0.08]*	-0.65	[-1.24, -0.06]*	-1.97	[-4.64, 0.69]*	-2.33	[-5.64, 0.98]*
Numb hand/fingers (versus "no"):	0.57	[0.29, 1.09]*	0.39	[0.20, 0.78]*	0.08	[-0.57, 0.75]	-0.72	[-1.48, 0.04]*	-0.55	[-3.97, 2.87]	-3.24	[-7.51, 1.04]*
Loss of strength (versus "no"):	0.79	[0.49, 1.26]	0.61	[0.39, 0.96]*	0.01	[-0.54, 0.57]	-0.06	[-0.69, 0.58]	3.06	[0.22, 5.90]*	4.07	[0.55, 7.58]*
Loss of hand coordination (versus "no"):	0.62	[0.25, 1.53]	0.58	[0.25, 1.31]*	-0.60	[-1.51, 0.31]*	-0.87	[-1.89, 0.16]*	-1.06	[-5.76, 3.69]	-4.07	[-9.83, 1.69]*
Tendency to shake hands (versus "no"):	1.01	[0.59, 1.73]	0.85	[0.51, 1.43]	-3.02	[-0.97, 0.37]	0.06	[-0.72, 0.84]	0.45	[-3.01, 3.91]	1.10	[-3.24, 5.44]
Tendency to massage hands (versus "no"):	0.73	[0.46, 1.15]*	0.83	[0.56, 1.24]	-0.66	[-1.19, 0.13]*	-0.60	[-1.21, 0.02]*	0.39	[-2.37, 3.14]	3.89	[0.47, 7.32]*
Putative cause of symptoms (versus "no"):												
Overload by usual activities	0.71	[0.42, 1.09]*	0.69	[0.47, 1.01]*	-0.69	[-1.23, -0.15]*	-0.74	[-1.37, -0.11]*	-2.25	[-5.19, 0.69]*	-5.11	[-8.73, -1.49]*
Overload by unusual activities	1.15	[0.61, 2.16]	1.26	[0.72, 2.21]	0.19	[-0.69, 1.07]	0.84	[-0.22, 1.91]*	-2.83	[-7.57, 1.91]	-0.13	[-6.30, 6.03]
Overload by sports	1.22	[0.53, 2.79]	1.16	[0.51, 2.65]	0.29	[-0.95, 1.54]	0.24	[-1.40, 1.88]	-1.38	[-8.09, 5.33]	-2.48	[-11.92, 6.97]
Accident during sports	1.66	[0.67, 4.08]	1.96	[0.96, 4.02]*	0.73	[-0.80, 2.25]	0.89	[-0.89, 2.68]	7.75	[-0.48, 15.98]*	3.69	[-6.62, 14.00]
Accident elsewhere	0.31	[0.08, 1.26]*	0.52	[0.19, 1.41]	-0.22	[-1.32, 0.88]	0.39	[-0.90, 1.67]	-0.90	[-6.84, 5.05]	4.99	[-2.41, 12.39]*
Anxiety/stress	0.90	[0.52, 1.53]	0.56	[0.31, 0.99]*	0.01	[-0.70, 0.72]	-0.66	[-1.49, 0.17]*	-1.66	[-5.43, 2.12]	-3.05	[-7.81, 1.70]
Chronic disease	0.23	[0.03, 1.62]*	0.50	[0.16, 1.58]	-1.74	[-3.01, -0.48]*	-1.40	[-2.87, 0.06]*	-8.94	[-15.79, -2.10]*	-6.98	[-15.18, 1.23]*
Other cause	1.36	[0.90, 2.04]*	1.22	[0.84, 1.76]	0.64	[0.08, 1.20]*	0.62	[-0.04, 1.28]*	1.65	[-1.41, 4.72]	2.56	[-1.27, 6.39]*
Unknown	0.55	[0.28, 1.10]*	0.97	[0.60, 1.59]	-0.27	[-1.00, 0.47]	-0.28	[-1.14, 0.58]	-2.79	[-6.74, 1.17]*	-2.66	[-7.56, 2.25]

(Continued)

Appendix (Continued)

Prognostic Factor	Recovery			Pain Intensity			Functional Disability					
	12 Mos			3 Mos			12 Mos					
	HRT	95% CI	HRT	95% CI	b†	95% CI	b†	95% CI	b†	95% CI		
Co-morbidity												
Musculoskeletal co-morbidity (versus "no"); No co-morbidity	1.64	[1.10, 2.46]*	1.56	[1.09, 2.23]*	0.37	[-0.14, 0.87]*	0.59	[0.01, 1.16]*	1.19	[-1.43, 3.83]	2.21	[-1.04, 5.46]*
Symptoms hip/knee	0.36	[0.18, 0.72]*	0.69	[0.43, 1.12]*	-1.09	[-1.69, -0.50]*	-0.94	[-1.62, -0.26]*	-3.03	[-6.38, -0.22]*	-3.45	[-7.30, 0.39]*
Symptoms ankle/ft	0.19	[0.05, 0.77]*	0.42	[0.19, 0.96]*	-0.86	[-1.68, -0.03]*	-1.07	[-1.98, -0.16]*	-5.24	[-9.52, -0.96]*	-4.77	[-9.90, 0.37]*
Symptoms back	0.70	[0.45, 1.10]*	0.65	[0.43, 0.97]*	-0.11	[-0.63, 0.41]	-0.29	[-0.88, 0.31]	-1.21	[-3.90, 1.48]	-1.22	[-4.57, 2.13]
Multiple musculoskeletal symptoms	0.37	[0.13, 1.00]*	0.22	[0.07, 0.68]*	-0.83	[-1.64, -0.02]*	-0.88	[-1.83, 0.07]*	-1.47	[-5.68, 2.75]	-3.90	[-9.29, 1.49]*
Other diseases problems (versus "no");												
Asthma	0.97	[0.53, 1.78]	0.71	[0.37, 1.36]	0.00	[-0.74, 0.75]	-0.32	[-1.22, 0.58]	-1.73	[-5.64, 2.17]	0.53	[-4.57, 5.63]
Menopause	1.06	[0.52, 2.17]	0.73	[0.36, 1.47]	-0.28	[-1.12, 0.56]	-0.13	[-1.12, 0.87]	-2.31	[-6.81, 2.20]	-1.22	[-6.77, 4.32]
Diabetes	0.87	[0.44, 1.73]	0.67	[0.34, 1.32]	0.62	[-0.43, 1.67]	0.15	[-1.08, 1.38]	2.63	[-2.91, 8.18]	0.28	[-6.80, 7.35]
Cardiovascular diseases	0.89	[0.51, 1.57]	0.71	[0.41, 1.24]	0.03	[-0.65, 0.71]	-0.28	[-1.07, 0.51]	-0.33	[-3.85, 3.20]	-3.29	[-7.71, 1.13]*
Psychological problems	0.83	[0.48, 1.41]	0.63	[0.37, 1.09]*	-0.16	[-0.78, 0.47]	-0.63	[-1.37, 0.12]*	0.44	[-2.81, 3.69]	-1.99	[-6.12, 2.14]
Cancer	0.70	[0.10, 5.02]	1.33	[0.42, 4.18]	0.67	[-1.38, 2.73]	1.06	[-1.19, 3.32]	0.51	[-11.13, 12.14]	10.08	[-2.54, 22.70]*
Physical activity (versus not met)												
ACSM** position stand met	1.09	[0.59, 1.99]	1.50	[0.91, 2.48]*	-0.67	[-1.45, 0.10]*	-1.09	[-2.03, -0.16]*	-2.68	[-6.69, 1.32]*	-1.36	[-6.59, 3.86]
Norm Healthy Activity met	1.19	[0.79, 1.81]	1.15	[0.79, 1.67]	-0.01	[-0.52, 0.50]	-0.08	[-0.66, 0.51]	-1.05	[-3.69, 1.59]	-1.61	[-4.91, 1.69]
Psychological factors & social support												
Coping with pain:												
Pain transformation	1.00		1.00		0.00		0.00		0.00		0.00	
Low	0.77	[0.59, 1.23]	0.73	[0.48, 1.13]*	0.21	[-0.42, 0.84]	0.65	[-0.06, 1.36]*	1.82	[-1.41, 5.05]	1.11	[-2.91, 5.14]
Medium	0.58	[0.34, 1.00]*	0.74	[0.47, 1.17]*	0.13	[-0.52, 0.78]	0.01	[-0.73, 0.74]	2.30	[-1.03, 5.63]*	1.71	[-2.46, 5.87]
High	1.00		1.00		0.00		0.00		0.00		0.00	
Distraction	0.95	[0.61, 1.49]	0.93	[0.61, 1.42]	0.42	[-0.18, 1.02]*	0.40	[-0.29, 1.09]	2.89	[-0.21, 5.98]*	4.31	[0.44, 8.18]*
Low	0.50	[0.29, 0.88]*	0.74	[0.47, 1.17]	-0.32	[-0.93, 0.29]	0.08	[-0.62, 0.78]	1.20	[-1.97, 4.37]	2.24	[-1.69, 6.17]
Medium	1.00		1.00		0.00		0.00		0.00		0.00	
High	0.99	[0.59, 1.66]	0.89	[0.55, 1.43]	-0.12	[-0.80, 0.55]	-0.01	[-0.78, 0.75]	-0.31	[-3.80, 3.17]	-1.35	[-5.65, 2.95]
Reducing demands	0.80	[0.50, 1.26]	0.83	[0.55, 1.25]	-0.08	[-0.65, 0.48]	-0.19	[-0.84, 0.46]	0.81	[-2.12, 3.74]	0.99	[-2.67, 4.65]
Low												
Medium												
High												

(Continued)

Appendix (Continued)

Prognostic Factor	Recovery			Pain Intensity			Functional Disability					
	3 Mos			3 Mos			3 Mos			12 Mos		
	HRT	95% CI	HRT†	95% CI	b‡	95% CI	b‡	95% CI	b‡	95% CI	b‡	95% CI
Retreating	1.00		1.00		0.00		0.00		0.00		0.00	
Low	0.67	[0.41, 1.09]*	0.71	[0.46, 1.10]*	-0.14	[-0.75, 0.48]	-0.07	[-0.77, 0.64]	-0.20	[-3.35, 2.95]	-0.08	[-4.03, 3.86]
High	0.68	[0.41, 1.10]*	0.74	[0.48, 1.14]*	0.04	[-0.58, 0.66]	-0.16	[-0.86, 0.55]	2.69	[-0.50, 5.88]*	3.47	[-0.50, 7.44]*
Worrying	1.00		1.00		0.00		0.00		0.00		0.00	
Low	0.73	[0.45, 1.17]*	0.78	[0.52, 1.18]	-0.05	[-0.66, 0.56]	0.34	[-0.36, 1.03]	-0.18	[-3.31, 2.95]	2.12	[-1.81, 6.05]
High	0.65	[0.40, 1.08]*	0.41	[0.25, 0.68]*	0.06	[-0.55, 0.68]	-0.43	[-1.13, 0.26]	0.81	[-2.36, 3.99]	-0.09	[-4.01, 3.83]
Resting	1.00		1.00		0.00		0.00		0.00		0.00	
Low	0.83	[0.52, 1.33]	0.89	[0.58, 1.37]	-0.12	[-0.75, 0.51]	0.25	[-0.47, 0.98]	-0.40	[-3.68, 2.88]	-0.39	[-4.50, 3.73]
Medium	0.48	[0.29, 0.80]*	0.62	[0.40, 0.97]*	-0.45	[-1.04, 0.15]*	-0.40	[-1.08, 0.28]	0.07	[-3.01, 3.15]	0.88	[-2.94, 4.69]
High	0.92	[0.86, 0.98]*	0.92	[0.87, 0.98]*	-0.04	[-0.11, 0.04]	-0.03	[-0.12, 0.05]	-0.06	[-0.43, 0.31]	-0.15	[-0.62, 0.31]
Distress (per point increase)												
Kinesiophobia:												
Fear and avoidance	1.00		1.00		0.00		0.00		0.00		0.00	
Low	0.79	[0.46, 1.38]	0.77	[0.48, 1.24]	-0.08	[-0.73, 0.57]	-0.13	[-0.88, 0.63]	2.06	[-1.22, 5.35]	0.07	[-4.12, 4.27]
High	1.03	[0.66, 1.61]	0.74	[0.49, 1.11]*	0.65	[0.08, 1.23]*	0.17	[-0.48, 0.83]	6.91	[4.01, 9.80]*	6.17	[2.54, 9.79]*
Importance of exercise												
Low	1.00		1.00		-0.28	[-0.90, 0.34]	-0.28	[-1.11, 0.55]	0.44	[-3.25, 4.14]	0.00	[-5.58, 3.65]
Medium	1.62	[0.90, 2.93]*	1.03	[0.60, 1.77]	-0.28	[-0.93, 0.30]	0.29	[-0.41, 0.99]	3.64	[0.49, 6.79]*	4.59	[0.69, 8.48]*
High	1.31	[0.76, 2.25]	1.16	[0.74, 1.82]	-0.31							
Social support†††												
Low	1.00		1.00		0.00		0.00		0.00		0.00	
Medium	0.85	[0.58, 1.24]	0.89	[0.61, 1.30]	-0.54	[-1.10, 0.02]*	-0.23	[-0.87, 0.41]	-1.64	[-4.53, 1.25]	0.46	[-3.11, 4.03]
High	0.45	[0.24, 0.84]*	0.45	[0.24, 0.84]*	-0.51	[-1.20, 0.17]*	-0.63	[-1.44, 0.17]*	-1.82	[-5.37, 1.73]	-3.80	[-8.30, 0.69]*
General health												
Better perceived health (per point)	1.40	[1.12, 1.74]*	1.46	[1.21, 1.78]*	0.40	[0.11, 0.69]*	0.55	[0.23, 0.88]*	1.35	[-0.16, 2.85]*	1.93	[0.10, 3.77]*
Moderate/bad QoL (versus good-excellent)	0.35	[0.16, 0.80]*	0.19	[0.06, 0.61]*	-1.08	[-1.83, -0.33]*	-1.39	[-2.28, -0.50]*	-4.10	[-8.03, -0.17]*	-8.66	[-13.61, -3.70]*
More vital (per point increase)	1.02	[1.01, 1.03]*	1.02	[1.01, 1.03]*	0.02	[0.01, 0.04]*	0.02	[0.01, 0.04]*	0.08	[0.01, 0.15]*	0.06	[0.02, 0.15]*

b = regression coefficient.

*P < 0.20.

†A HR < 1 means a reduced probability of recovery as compared to the reference group; a HR > 1 means an increased probability of recovery as compared to the reference group.

‡A positive b indicates a favourable change in functional disability or pain per unit of the independent variable; a negative b indicates an unfavourable in functional disability or pain per unit of the independent variable.

§Selection of patients with neck symptoms.

¶Patients with either only neck or only shoulder symptoms.

||Selection of patients with shoulder symptoms.

**American College of Sports Medicine Position Stand.

††A higher score on the social support scale means less social support.