Prognostic Factors for Recovery in Chronic Nonspecific Low Back Pain: A Systematic Review

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Background. Few data are available on predictors for a favorable outcome in patients with chronic nonspecific low back pain (CNLBP).

Purpose. The aim of this study was to assess prognostic factors for pain intensity, disability, return to work, quality of life, and global perceived effect in patients with CNLBP at short-term (≤6 months) and long-term (>6 months) follow-up.

Data Sources. Relevant studies evaluating the prognosis of CNLBP were searched in PubMed, CINAHL, and EMBASE (through March 2010).

Study Selection. Articles with all types of study designs were included. Inclusion criteria were: participants were patients with CNLBP (≥12 weeks' duration), participants were older than 18 years of age, and the study was related to prognostic factors for recovery. Fourteen studies met the inclusion criteria.

Data Extraction. Two reviewers extracted the data and details of each study.

Data Synthesis. A qualitative analysis using "level of evidence" was performed for all included studies. Data were summarized in tables and critically appraised.

Limitations. The results of the studies reviewed were limited by their methodological weaknesses.

Conclusions. At short-term follow-up, no association was found for the factors of age and sex with the outcomes of pain intensity and disability. At long-term follow-up, smoking had the same result. At long-term follow-up, pain intensity and fear of movement had no association with disability. At short-term follow-up, conflicting evidence was found for the association between the outcomes pain intensity and disability and the factor of fear of movement. At long-term follow-up, conflicting evidence was found for the factors of age, sex, and physical job demands. At long-term follow-up, conflicting evidence also was found for the association between return to work and age, sex, and activities of daily living. At baseline, there was limited evidence of a positive influence of lower pain intensity and physical job demands on return to work. No high-quality studies were found for the outcomes of quality of life and global perceived effect.

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Prognostic factors are important in providing clinicians information related to clinical decision making, understanding of the disease process, defining the risk groups based on prognosis, and allowing more accurate prediction of disease outcome.[1] Prognostic factors are suspected to differ between acute nonspecific low back pain (NLBP) and chronic nonspecific low back pain (CNLBP) because the natural course of these 2 conditions also differs.[2]

Some data are available (based on systematic reviews) on prognostic factors for recovery from acute NLBP and the transition from acute NLBP to CNLBP, but not for the course of CNLBP.[3–8] Given its high rate of prevalence, investigation of the course of CNLBP and possible prognostic factors is needed for effective patient management, especially when modifiable prognostic factors can be identified. However, little information is available about CNLBP. One review found consistent evidence that among patients with CNLBP, expectations regarding recovery was a predictor for the decision to return to work.[9]

There is growing interest in the course and prognostic factors of CNLBP and in the various outcomes related to the recovery of patients with CNLBP.[6,10]

The aim of this systematic review was to determine prognostic factors for the outcomes of pain intensity, disability, return to work, quality of life, and global perceived effect in patients with CNLBP at short-term and long-term follow-ups.

Materials and Method

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA statement) was used for this systematic review.[11]

Data Sources and Searches

Using the strategy of broad search terms for systematic reviews on prognostic research,[12] one reviewer (K.V.) searched for eligible studies in PubMed/MEDLINE (1966 through March 2010), CINAHL (1984 through March 2010), EMBASE (1950 through March 2010), the Cochrane Library (Cochrane Central Register of Reviews and Trials through March 2010), and PEDro (1929 through March 2010). Appendix 1 shows the full search strategy with the key words used (MeSH, EMTREE, and text words). Full-text articles published in English, Danish, Norwegian, Swedish, and Dutch were eligible. The inclusion criteria for this review were applied independently by 2 reviewers (K.V., P.A.J.L.). First, they screened the title, key words, and abstract for eligibility. Second, they assessed the selected full-text articles with regard to the inclusion criteria (ie, design, participants, and reported outcomes and prognostic factors). In case of disagreements, the consensus method was used to discuss and resolve disagreement. When disagreement persisted, a third independent reviewer (B.W.K.) was consulted for a final decision. The reference lists of all full-text articles were checked for eligibility.

Study Selection

Only randomized cohort designs, including randomized controlled trials that reported regarding prognostic factors on targeted outcomes, were eligible. The studies had to meet the following criteria: (1) the focus was on patients with CNLBP (≥12 weeks' duration), defined as low back pain that has no specified physical cause (eg, nerve root compression, trauma, infection, presence of a tumor), and (2) participants were older than 18 years of age. Pain in the lumbosacral region is the most common symptom in patients with NLBP. Pain may radiate to the gluteal region or to the thighs, or to both.[13]

A study was excluded if the study population had a specific pathology (eg, lumbar radicular syndrome, oncological disease, arthritis, rheumatoid arthritis, systemic impairments, fractures, dislocation of the lumbar or sacral spine) or the primary aim of the study was to identify etiological factors.

Outcomes of interest were: (1) pain intensity, (2) disability, (3) return to work, (4) quality of life, and (5) global perceived effect. All reported prognostic factors (measured at baseline) on these outcomes at short-term (≤6 months) and long-term (>6 months) follow-up were reviewed.

Data Extraction and Quality Assessment

Two reviewers (K.V., P.A.J.L.) extracted data on study population, design, setting, follow-up period, loss to follow-up, prognostic factors, outcomes, and strength of association using a standardized form. The associations at short-term and long-term follow-ups (reported as odds ratios or relative risk values, with corresponding *P* value or 95% confidence interval) between the prognostic factors and the outcomes were extracted or calculated by the reviewers.

The methodological quality of the studies was assessed using the Quality In Prognosis Studies (QUIPS) tool with a list of issues or considerations.[4,12,14] Detailed information about the issues or considerations can be retrieved by the first author. We adjusted the criteria list aimed at our population, establishing criteria for follow-up and dropout percentage[15,16] and scoring each item with "yes," "no," or "don't know," which led to the overall scoring of low,

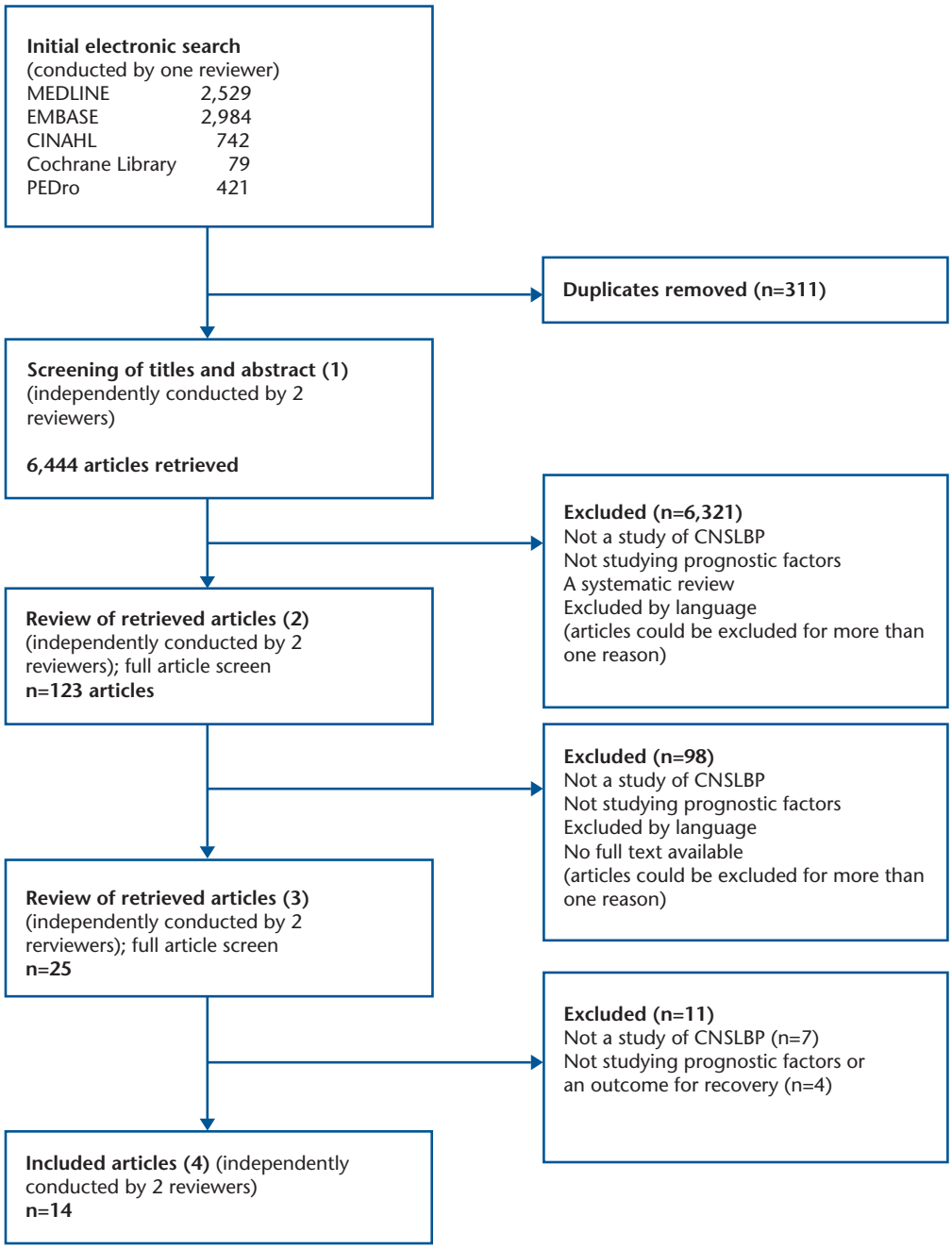

Figure.
Flowchart showing the search strategy. CNLBP=chronic nonspecific low back pain.

moderate, or high risk of bias per domain.

The quality assessment considered 6 domains of potential biases: (1) study participation, (2) study attrition, (3) measurement of prognostic factors, (4) measurement of and controlling for confounding variables, (5) measurement of outcomes, and (6) analysis approaches (Appendix 2).[14] All criteria were first scored as follows: "yes" (Y) for informative description of the criterion at issue and study meets the criterion; "no" (N) for informative description of the criterion at issue and study does not meet the criterion, or there is no information; or "don't know" (U) for information that is lacking or insufficient. The issues were not rated or scored individually, but were taken together to create an overall judgment for each of the domains of

potential bias. For each of the 6 potential biases, a study was rated as having low, moderate, or high risk of bias per domain. All criteria were weighted equally. We considered a study to be of high quality when the methodological risk of bias was rated as low or moderate on all of the 6 important domains.

Two reviewers independently assessed the methodological quality of the included studies. Discrepancies were resolved by discussion until consensus was reached. The reviewers were not blinded to the authors or the journal name. The interobserver agreement of the quality assessment and data extraction was calculated using percentage of agreement.

Data Synthesis and Analysis

Because of the many different potential prognostic factors that were presented in the included studies, the methodological heterogeneity, and the low response rate (one author responded, but incorrectly), we refrained from statistical pooling.

The strength of evidence for the reported prognostic factors associated with recovery for the outcomes of pain intensity, disability, return to work, quality of life, and global perceived effect was assessed by 4 levels of evidence[17]: (1) consistent evidence: consistent findings in 2 or more studies, or at least 75% of the studies reporting similar conclusions (1 of the studies should be of high quality); (2) limited evidence: findings in 1 study of high quality or 2 or more studies of low quality; (3) conflicting evidence: <75% of available studies reporting similar findings, or contradictory findings present within 1 study; and (4) no evidence: no associations with an outcome of interest.[9]

Results

Search Strategy and Selection Criteria

The search identified 6,755 citations (Figure). In the first round, 2 reviewers (K.V., P.A.J.L.) included 123 studies. Finally, 14 studies met all inclusion criteria and were included in the review.[18–31]

Study Characteristics

Table 1 presents the characteristics of the included studies.

Design of the studies. Of the 14 included studies, 8 were prospective cohort studies[18,23,24,26–29,31] and 3 were randomized controlled trials.[20,25,30] Of the 3 remaining studies, 1 was a prospective case series,[21] 1 was a retrospective correlation study,[22] and 1 was a retrospective case series.[19] The follow-up period ranged from 6 weeks[22] to 4 years.[29] The percentage of loss to follow-up ranged from 0% to 23%[18–20,24,26–31] or was unclear.[21–23,25]

Study population. Seven studies[19–21,24,28,30,31] included patients from either rehabilitation or specialized back centers, 2 included patients from an orthopedic outpatient clinic,[25,27] and 4 included patients from other rehabilitation settings such as a primary care clinic,[23] a hospital,[22] or general practice.[29] The setting of recruitment was not specified by Hansson and Hansson[26] and Anema et al,[18] both reporting on the same multinational study.

Sample size ranged from 50[24] to 5,035[29] patients, with 10 studies enrolling more than 100 patients. Mean age of the patients ranged from 36 to 46 years, and the male-female ratio ranged from 10:1 to 1:1.

Methodological Quality

The overall interobserver agreement was 80% for methodological quality and 90% for data extraction. Table 2 presents the methodological quality scores (risk of bias) for all included studies. Ten studies were considered to be of low quality,[19–21,23,25,27–31] and 4 studies were considered to be of high quality.[18,22,24,26] The methodological shortcomings most frequently noted were: no information about nonresponders versus responders (item D) and no specified confounding measurement and no appropriate accounting of confounders (items J, K, and L) (Appendix 2). Nine of the 14 studies had no (or unclear) information about the presence of a prognostic model (item N).[19–25,28,29] Three studies[18,22,26] clearly defined one or more confounders (item J). Only 2 studies[30,31] provided information on the methods used to measure the confounders in a valid and reliable way (item K), and only 3 studies[18,22,24] applied appropriate accounting for confounding (item L). In addition to the score on prognostic factors and outcomes defined in the studies (items H and I), the reliability and validity of the instruments used to measure the prognostic factors and outcomes also were scored positive (low risk of bias) when consensus was reached by the reviewers.[19,24,25,27,28]

Prognostic Factors and Outcome Measures

Table 3 presents the prognostic factors that were reported in only one study.[18,20–31] The level of evidence for these prognostic factors was limited, or there was no evidence. A large number of different prognostic factors (n=77) were studied in relation to the outcomes of interest. A few prognostic factors showed some influence on improving or delaying recovery, but most showed no association. Nine studies[20,22–27,30,31] had more than one outcome of interest.

Table 4 shows the 14 prognostic factors that were reported in at least 2 studies evaluating associations with the outcomes of pain intensity, dis-

Table 1.
Characteristics of the 14 Included Studies[a]

Study	Design	Study Population	Setting	Recruitment	No. of Participants	Age (y) of Participants	Follow-up Measurements	% Lost to Follow-up
Anema et al[b] (2009)[18]	Prospective cohort study	Low back problems ≥3 mo	Six different countries, location not specified	May 1995–September 1996	N=2,825, not reported	Not reported	1 and 2 y	First year 15%, second year 23%
Costa et al (2009)[23]	Inception cohort study (nested)	Chronic nonspecific low back pain ≥3 mo	Primary care clinics in Sydney, Australia	November 2003–July 2005	N=406; 214 men and 192 women	$\overline{X}$=44.1 (SD=14.5)	9 and 12 mo	Not described
van der Hulst et al (2008)[30]	Randomized controlled trial	Chronic nonspecific low back pain ≥3 mo: (1) back rehabilitation and (2) usual care	Outpatient multidisciplinary back rehabilitation program, ''Het Roessingh'', the Netherlands	Not specified	N=163: (1) back rehabilitation, n=79 (47 men, 32 women) and (2) usual care, n=84 (52 men, 32 women)	(1) Back rehabilitation, $\overline{X}$=38 (SD=10), and (2) usual care, $\overline{X}$=40 (SD=10)	8 wk and 6 mo	n=21 (13%)
Keeley et al (2008)[27]	Prospective cohort study	Low back pain ≥6 mo	Orthopedic outpatient clinic	Not specified	N=120 (60 men, 60 women) (n=108 at baseline)	$\overline{X}$=39.9 (SD=12.2)	6 mo	20% loss to follow-up for CSSR and 14% loss to follow-up for PCS of the 108 eligible participants
Chan and Chin (2008)[22]	Longitudinal retrospective correlation study	Chronic low back pain ≥3 mo	Canossa Hospital, Hong Kong	2001–2006	N=178 (92 men, 86 women)	$\overline{X}$=46.01 (SD=12.40)	6 and 12 wk	Unclear
Grotle et al (2006)[24]	Prospective inception cohort study	Acute and chronic low back pain: chronic for ≥3 mo	Back Clinic at Ostfold Hospital, Norway	Not specified	N=50 (19 men, 31 women)	$\overline{X}$=40.4 (SD=9.5)	Patients with chronic low back pain: 6, 9, and 12 mo	n=3 (6%)
Koopman et al (2005)[28]	Prospective cohort study	Chronic low back pain	Institute of Vocational Assessment and Education, Rehabilitation Center Heliomare, the Netherlands	June 1998–April 2001	N=68 (36 men, 32 women), n=51 at baseline (30 men, 21 women)	$\overline{X}$=41.7 (n=51)	12 mo	n=13 (19%)
Casso et al (2004)[21]	Prospective case series study	Chronic nonspecific low back pain ≥3 mo, absence of work	Treatment and Rehabilitation Center of Orbe Hospital, Vaud Canton, Switzerland	June 1996	N=125 (115 men, 10 women)	$\overline{X}$=40 (range=23–59)	1 y	Not described
Woby et al (2004)[31]	Prospective cohort study	Chronic low back pain ≥3 mo	Active, physical therapist–led rehabilitation program	Not specified	N=83 (46 men, 37 women)	$\overline{X}$=41.1 (SD=10)	8 wk	n=26 (31%) dropout and n=3 missing posttreatment, FABQ-W

(continued)

Table 1.
Continued

Study	Design	Study Population	Setting	Recruitment	No. of Participants	Age (y) of Participants	Follow-up Measurements	% Lost to Follow-up
Smith et al (2004)[29]	Prospective longitudinal study	CBP ≥3 mo: (1) persistent CBP and (2) recovered CBP	29 general practices in the Grampian region of Scotland	1996 baseline, 2000 follow-up	In 1996, N=5,036 were approached In 1996, n=212 of the 3,605 participants had CBP In 2000, n=152 of the 1,608 participants had persistent CBP (over 4 years [1996–2000]) and n=252 had CBP in 2000 (first episode)	>25–75	4 y	17%
Hagg et al (2003)[25]	Prospective, multicenter, randomized controlled trial	Severe chronic low back pain ≥2 y; surgical group (n=201) and nonsurgical group (n=63)	19 orthopedics departments, Sweden	1992–1998	N=294 (129 men and 135 woman at baseline)	$\bar{X}$=43 (SD=8.3, (range=25–65)	2 y	Unclear
Hansson and Hansson[b] (2000)[26]	Prospective cohort study	Low back problems ≥3 mo	Six different countries, location not specified	Not specified	N=2,752 (1,448 men, 1,304 women)	$\bar{X}$=39–44 (SD=9–11) (6 countries)	1 and 2 y	23.5%
Bendix et al (1998)[20]	Prospective clinical trial	Chronic disabling back pain for at least 6 mo	Copenhagen Back Center	June 1991–June 1995	N=816; women 67%–75%	Median for the 6 groups=40–42	1 y	15%
Barnes et al (1989)[19]	Retrospective case series	Chronic low back pain	Productive Rehabilitation Institute of Dallas for Ergonomics (PRIDE)	Not specified	N=150: (1) RTW n=60, (2) no RTW n=30, (3) noncompleters n=60 (105 men, 45 women)	Mean: (1) 36.9, (2) 39.9, (3) 35.6	1 and 2 y	0%

[a] CBP=chronic back pain, CSSR=Client Socio-Demographic and Service Receipt Inventory, PCS=Physical Component Scale of the 36-Item Short-Form Health Survey questionnaire, FABQ-PA and FABQ-W=Fear-Avoidance Beliefs Questionnaire for physical activity (PA) and work (W) subscales, RTW=return to work.
[b] Articles of Anema et al and Hansson and Hansson report on the same study data.

ability, return to work, and quality of life.[18–31] For 8 of the factors,[20,22–24,30,31] there was consistence evidence of no association. For 15 factors,[18,20–28,30,31] there was conflicting evidence, and for 6 factors,[18,20,21,23,26] there was limited evidence of no association or positive influence. Seven out of 14 prognostic factors were reported by low-quality studies.[20,21,23,25,27,30] The 4 high-quality studies reported either positive significance value or no significance value of factors on outcomes.[18,22,24,26]

It was not possible to present the strength and confidence interval of the associations due to poor presentation of the results in the studies. Contacting the authors did not provide additional information because of the low response rate (one author responded, but incorrectly). The results are described for each outcome of interest for those prognostic factors whereby at least one study of high quality was involved (Tab. 4).

Pain intensity. In 7 studies,[20,22–24,26,29,31] pain intensity was the primary outcome. Six different instruments were used in these studies: visual analog scale (0–100 mm),[22,31] numeric rating scale (0–10),[24] Von Korff pain score,[26] 6-point Likert scale,[23] a measure of pain severity of the back or leg (0–10),[20] and the Chronic Pain

Table 2.
Results of the Methodological Assessment of the 14 Reviewed Studies[a]

Study	Study Participation	Study Attrition (Follow-up)	Prognostic Factor	Outcome	Confounding Factor	Analysis	Quality
Anema et al (2009)[18]	Low	Low	Moderate	Low	Moderate	Low	High
Costa et al (2009)[23]	Low	Low	Low	Low	High	Low	Low
van der Hulst et al (2008)[30]	Low	Moderate	Low	Low	High	Low	Low
Keeley et al (2008)[27]	Moderate	Low	Low	Low	High	Low	Low
Chan and Chin (2008)[22]	Low	Moderate	Low	Low	Moderate	Low	High
Grotle et al (2006)[24]	Low	Moderate	Low	Low	Moderate	Low	High
Koopman et al (2005)[28]	Moderate	Moderate	Low	Moderate	High	Low	Low
Woby et al (2004)[31]	Low	High	Low	Low	High	Low	Low
Casso et al (2004)[21]	Low	Low	Low	Low	High	Low	Low
Smith et al (2004)[29]	Moderate	High	Moderate	Moderate	High	Moderate	Low
Hagg et al (2003)[25]	Low	Moderate	Low	Low	High	Low	Low
Hansson and Hansson (2000)[26]	Low	Moderate	Low	Low	Moderate	Low	High
Bendix et al (1998)[20]	Low	Moderate	Moderate	Low	High	High	Low
Barnes et al (1989)[19]	Moderate	Moderate	Low	High	High	Low	Low

[a] A study was rated for each of the 6 potential biases as having low (Y,YYY, YYYY, YYYU, NYYY, NYYU), moderate (U, YUU, NYUU, NYYU, NNYY, NNYU), or high (N, NNU, NNUU, NNNY, NNNU, NNNN) risk of bias per domain.

Grade questionnaire.[29] Three studies were of high quality.[22,24,26]

Overall, the studies show consistent evidence that at short-term follow-up, age[22,31] and sex[22,31] were not predictive for pain decrease. The high-quality study by Chan and Chin[22] demonstrated a significant improvement for the change in pain at the 6-week follow-up associated with the baseline Fear-Avoidance Beliefs Questionnaire score ($\bar{X}$=27.73, SD=15.93), although accounting for only 3% of the variance in outcome. This finding was inconsistent with the findings at 8 weeks[31] and 12 weeks.[22]

Long-term follow-up provided consistent evidence that smoking[20,23,24] was not a predictive factor. Conflicting evidence was found for age,[20,24,26] sex,[20,24,26,29] and physical job demands[20,26] in association with pain intensity at long-term follow-up; these studies were of low and high quality. Conflicting evidence also was found for sick leave[20,23,25,30] and work status,[20,23] but these studies were of low quality.

Disability. The Roland-Morris Disability Questionnaire[30,31] and the Oswestry Disability Index[24,25] were each used in 2 studies. Four studies[20,22,23,26] used other instruments to measure disability, including a 5-point Likert scale,[23] a physical impairment score (0–33),[22] a change in level of activities of daily living,[20] and the Hannover Activities of Daily Living Scale (0–100).[26] Three studies were of high quality.[22,24,26] Consistent with the finding for the outcome of pain for the short term, there was no association between the factors age and sex and the outcome disability.[24,31] At short-term follow-up, conflicting evidence was found that fear-avoidance beliefs[22,30,31] were associated with disability. The study by Woby et al[31] and the high-quality study by Chan and Chin[22] showed a positive association between the Fear-Avoidance Beliefs Questionnaire score and disability, although accounting for only 3% of the variance in outcome at 6 weeks. The positive association between the Fear-Avoidance Beliefs Questionnaire score and disability accounted for 12% of the variance in outcome at 12 weeks in the study by Chan and Chin.[22] Van der Hulst et al[30] found no association between the Tampa Scale for Kinesiophobia–Dutch Version score and disability.

The study by Hagg et al[25] had a 2-year follow-up period and demonstrated no association for improvement in all the assessed factors, but they did not present the data. The high-quality study by Hansson and

Table 3.

Prognostic Factors and Their Outcomes Each Reported by Only One Study, at Short-Term and Long-Term Follow-ups[a]

Personal	Short Term	Long Term	Work (continued)	Short Term	Long Term
Age[27]		Q	Therapeutic work resumption[18]		R
Smoking[20]		R	Job redesign[18]		R
Duration of complaints[22,27]	P, D	R	Work adaptation[18]		R
Height[20]		P, D, R	Job strain[18]		R
Weight[20]		P, D, R	Longer tenure[18]		R
No. of adults at home[29]		P	Previous sick leave due to LBP[23]		P, D, R
Citizenship[21,23]		D, R	Sick leave (days/months/many/few)[20,25,30]	D, Q	P, D, Q, R
Health			Compensable LBP[18,23]		P, D, R
No surgery[18]		R	Work status[21,30]	D, Q	Q, R
Surgery[18]		R	Decision latitude (control)[26]		P, D, R
Comorbidity[18]		R	Psychological demands[26]		P, D, R
Cause of pain[27]		Q	Vibrations in the job[20]		P, D, R
Smoking[20]		R	**Physical**		
Vitality[26]		R	Physical job demands[20]		P, D, R
General health[23,26]		P, R	ADL scores[20]		P, D
Coexisting arthritis[29]		P	Sport activities[20]		P, D, R
Currently taking medication for LBP[18,23]		P, D, R	Aerobic capacity[20]		P, D, R
Treatment before sick-listing[26]		P, D, R	Mobility[20]		P
Treatments during present problems (eg, LBP)[26]		P, D, R	Strength[20]		P, D
Treatment[18,30]	D, Q	D, Q, R	Disability level at chronic presentation (SF-36)[23]		P, D
Treatment × sick leave[30]	D, Q	D, Q	Functional disability[28]		R
Treatment × SCL-90-dep[30]	D, Q	D, Q	Disability at acute or chronic presentation[23]		P, D
Treatment × work status [30]	D, Q	D, Q	**Psychological health**		
Treatment × TSK[30]	D, Q	D, Q	MPI-DLV[30]	D, Q	D, Q
Treatment × MPI-DLV[30]	D, Q	D, Q	TSK[30]	Q	
Treatment × pain[30]	D, Q	D, Q	FABQ (0–96)/FABQ-PA and FABQ-W[24]		P
Pain			Catastrophizing subscale of the CSQ[31]	P, D	
Age at first onset of back pain[20]		P, D, R	Control over pain (CSQ)[31]	P, D	
Perceived risk of persistent pain[23]		P, D	Ability to decrease pain (CSQ) [31]	P, D	
Pain intensity at acute or chronic presentation[23]		P, D	Feelings of depression (SCL-90-dep/ZDS)[23,25,30]	D, Q	P, Q, G
Back pain level[20]		P, D, R	HADS[27]		Q
Leg pain level[20]		P, R	Distress[24]		P, D
Distribution of the pain: localized vs diffuse[21]		R	Back pain–related social stresses[27]		Q
Reinterpretation of pain sensation[28]		R	Back pain–independent social stresses[27]		Q
Pain intensity[30]	D, Q	Q	Level of expressed need[29]		P
Social			**Cognitive factors**		
Education[23,27]		P, D, Q	Mental health[26,29]		P, R
Social functioning[26]		R	**Others**		
Social status[20]		D, R	Overall evaluation by patient: disappointing vs failure[21]		R
Work			Overall evaluation by patient: satisfaction vs failure[21]		R
Work hours adaptation[18]		R	"Red flag" symptoms[23]		P, D

[a] P=pain intensity, D=disability, R=return to work, Q=quality of life, G=patient global assessment, LBP=low back pain, ADL=activities of daily living, SF-36=36-Item Short-Form Health Survey questionnaire, MPI-DLV=Multidimensional Pain Inventory–Dutch Language Version, TSK=Tampa Scale for Kinesiophobia, FABQ-PA=Fear-Avoidance Beliefs Questionnaire for physical activity (PA), FABQ-W=Fear-Avoidance Beliefs Questionnaire for work (W), CSQ=Coping Strategies Questionnaire, HADS=Hospital Anxiety and Depression Scale, SCL-90-dep=Symptom Checklist-90 depression subscale, ZDS=Zung Depression Scale.

Table 4.
Prognostic Factors and Their Outcomes of Interest (≥2 Studies) at Short-Term and Long-Term Follow-ups[a]

Group	Prognostic Factor	Outcome	Short Term	Long Term	+ High Quality	+ Low Quality	0 High Quality	0 Low Quality	− Low Quality	Evidence
Personal	Age	Pain	X				1[22]	1[31]		Consistent
		Pain		X	1[26] (a-f)	1[20] (F/C)		1[24]		Conflicting
		Disability	X				1[22]	1[31]		Consistent
		Disability		X	1[26] (a-f)		1[24]	2[20] (F/C)[25]		Conflicting
		RTW		X	1[26] (a, b, c, e)	2[20] (F/C)[28]	1[26] (d, f)	1[21]		Conflicting
	Sex	Pain	X				1[22]	1[31]		Consistent
		Pain		X	1[26] (a)	1[20] (C)	2[24,26] (b-f)	2[20] (F)[29]		Conflicting
		Disability	X				1[22]	1[31]		Consistent
		Disability		X	1[26] (a, c, d, e)		2[24,26] (b, f)	1[20] (F/C)[25]		Conflicting
		RTW		X	1[26] (a, b)	2[20] (F/C)[28]	1[26] (c, d, e, f)	1[25]		Conflicting
	Smoking	Pain		X			1[24]	2[20] (F/C)[23]		Consistent
		Disability		X			1[24]	2[20] (F/C)[23]		Consistent
Pain	Leg pain level	Disability		X				2[20] (F/C)[23]		Limited
	Pain intensity β (lower)	Disability		X			1[24]	1[30] (*,%)		Consistent
		RTW		X	2[18,26] (a-f)			1[21]		Limited
Social	Social work	Pain		X				2[20] (F/C)[23]		Limited
Work	Sick leave (days/ months)	Disability		X				3[23,25,30] (*,%)	1[20] (F/C many)	Conflicting
	Work status	Pain		X				2[20] (C back pain), (F)[23]	1[20] (C leg pain)	Conflicting
		Disability		X				2[20] (C)[30] (*,%)	1[20] (F)	Conflicting
Physical	Physical job demands (lower)	Pain		X	1[26] (c, d)	1[20] (F/C leg pain)	1[26] (a, b, e, f)		1[20] (F/C back pain)	Conflicting
		Disability		X	1[26] (e)		1[26] (a, b, c, d, f)	1[20] (F/C)		Conflicting
		RTW		X	2[18,26] (a-f)			1[20] (F/C)		Limited
	ADL scores	RTW		X	2[18,26] (a, c, e)		1[26] (b, d, f)	1[20] (F/C)		Conflicting
	Mobility§	Disability		X				2[20] (F/C)[23]		Limited
		RTW		X		1[28]		2[20] (F/C)[21]		Conflicting
	Strength¶	RTW		X				2[20] (18) (F/C)[21] (19)		Limited

(Continued)

Table 4.
Continued

Group	Prognostic Factor	Outcome	Short Term	Long Term	+ High Quality	+ Low Quality	0 High Quality	0 Low Quality	− Low Quality	Evidence
Psychological health	TSK/FABQ-PA and FABQ-W)	Pain	X		1[22]		1[22]	1[31]		Conflicting
		Disability	X		1[22]	1[31]		1[30] (*,%)		Conflicting
		Disability		X			1[24]	1[30] (*,%)		Consistent
		Quality of life		X		1[30] (%) P		2[27,30] P/M, (%)		Conflicting
	Feelings of depression (SCL-90)	Disability		X				2[23,30] (*)	1[30] (%)	Conflicting
No data available		Disability	X[25]							
		RTW		X[19,23]						

[a] 0=not significant, +=significant positive, −=significant negative, RTW=return to work. Subgroups in the study by Hansson and Hansson[26]: a=Denmark, b=Germany, c=the Netherlands, d=Sweden, e=United States, f=Israel. Study by van der Hulst et al[30]: regardless of treatment (*), with interaction of treatment (%), P=Physical Component Scale of the 36-Item Short-Form Health Survey questionnaire (SF-36), M=Mental Component Scale of the SF-36; MPI-DLV=Multidimensional Pain Inventory–Dutch Language Version. Study by Bendix et al[20]: F=multidisciplinary treatment group, C=back school group. § mobility: Costa et al,[23] persisting limitation of spinal movements in all directions; Bendix et al,[20] mobility; Casso et al,[21] finger-to-floor distance; Koopman et al,[28] trunk flexibility. ¶ strength: Casso et al,[21] Biering-Sorensen test; Bendix et al,[20] isometric abdominal endurance and isometric back endurance. β visual analog scale, numeric rating scale, MPI-DLV, Tampa Scale for Kinesiophobia (TSK), Fear-Avoidance Beliefs Questionnaire for physical activity (FABQ-PA) and Fear-Avoidance Beliefs Questionnaire for work (FABQ=W), Coping Strategies Questionnaire, Hospital Anxiety and Depression Scale, and Symptom Checklist-90 (SCL-90).

Hansson[26] demonstrated that in 6 countries a lower age was associated with more improvement in disability scores over a longer follow-up period (>1 year). In 4 out of 6 countries, male sex showed a positive association with improvement in disability scores.[26] The high-quality study by Grotle et al[24] and the low-quality studies by Bendix et al[20] and Hagg et al,[25] however, demonstrated no associations with age or sex for the long-term follow-up. Also, at long-term follow-up, conflicting evidence was found for an association between physical job demands[20,26] and disability. There was consistent evidence that smoking,[20,23–25] pain intensity at baseline,[24,30] and fear-avoidance beliefs[24,30] were not associated with more improvement in disability scores on long-term follow-up.

Return to work. The work-related variables included work status,[23,25] work resumption,[26] return-to-work,[18,19,21,28] and ability to work.[20] Two studies were of high quality.[18,26] All studies reported on prognostic factors at long-term follow-up, but these factors were scored with different instruments. In 2 out of the 3 studies of high quality, lower pain intensity[18,21,26] and lower physical job demands[18,20,26] at baseline showed limited evidence of returning to work earlier. Conflicting evidence was found for age,[20,21,26,28] sex,[20,25,26,28] and daily activities,[18,20,26] with at least one high-quality study represented. Three studies reported that younger age predicted return to work.[20,26,28]

Quality of life. The low-quality studies by van der Hulst et al[30] and Keeley et al[27] used the Physical Component Scale of the 36-Item Short-Form Health Survey questionnaire (SF-36) but investigated different prognostic factors. Therefore, each factor was limited to no evidence (Tab. 3). For the factor fear-avoidance beliefs, both studies showed conflicting evidence for the long-term follow-up (Tab. 4).

Patient global assessment. Because only one study[25] of low quality included patient global assessment, the evidence was restricted (Tab. 3).

Discussion

This systematic review aimed to present potential prognostic factors that can influence relevant outcomes such as pain intensity, disability, return to work, quality of life, and global perceived effect in patients with CNLBP. The evidence for each association of a prognostic factor with any outcome variable was weak, and most studies were of poor methodological quality. Only 2 to 5 studies reported on the same prognostic factors. Moreover, the confidence intervals of the odds ratios (if reported) were generally widespread, indicating uncertainty in the estimation of association. Therefore,

caution is needed in the interpretation of these results.

Prognostic Factors and Outcomes

In the included studies, pain intensity, disability, and return to work were the most frequently reported outcomes, similar to the reviews on acute NLBP and the transition from acute NLBP to CNLBP.[4,5,15,32,33] Comparison with these studies is difficult because few studies are available and the clinical course of CNLBP can differ between acute and subacute NLBP.[9,15,34] However, criticisms of the use of different instruments for the same prognostic factors, the timing of follow-up measurements, and unclear definitions of outcomes were similar between the available systematic reviews[4,6,7,15,32] and the present review.

For the outcomes of pain and disability, several studies[20,22,24,25,30,31] implied that there can be a correlation or interaction between these 2 outcomes and the investigated prognostic factors. Different kinds of possible bias were present, including lack of a control group to reflect the natural course,[24,31] small sample size,[24,25,31] no blinded measurements,[23] and self-reporting by the patient.[23] Therefore, the possible relationship between pain and disability, the quality of the instruments, and the various biases in the studies indicated that the results should be interpreted as a direction for further research.

For the outcome of return to work, aspects such as small sample size[21,25] and self-reported sick leave absence[28] can reduce the validity of the results. The outcomes of quality of life and patient global assessment were not investigated in any studies of high quality. The available studies suffered from difficulties with the results due to a small percentage of patients at work (20%)[30] and the possible interaction with pain intensity and disability[27] that could influence the results. Therefore, future research needs to have a sufficiently large sample size, measure the potential prognostic factors with similar instruments, and use well-defined outcomes of interest.

Researchers should incorporate the quality assessments of the 6 bias domains into their synthesis of evidence about prognosis. The inclusion and exclusion criteria for patients with CNLBP should be clearly defined, and there should be several follow-up periods (at least 1 year). These suggestions will provide the opportunity to investigate the course of CNLBP and to identify modifiable prognostic factors on outcomes. To improve the quality of the prognostic studies, the following considerations are important: (1) precisely defining the study objectives, (2) presenting the study methods and data, and (3) interpreting and applying the results of the study.[35]

Limitations and Methodological Quality

An important strength of this review is that the evidence regarding prognostic factors in outcomes of CNLBP is now systematically summarized, showing evidence available and the areas in which further research is needed. In the present review, problems arose in identifying the prognostic factors and associations with outcomes and in reporting the predictive strength of associations due to: (1) searches made in different databases, (2) variation in the study design (heterogeneity), (3) inadequate description of the selection criteria, and (4) insufficient methodological quality of most of the studies.[1,4]

Hayden et al[4] suggested that at least MEDLINE and EMBASE should be used in a search for articles of prognostic value. Although we used MEDLINE, CINAHL, EMBASE, the Cochrane Library, and PEDro, some relevant studies may not have been included in these databases. Therefore, the possibility of publication bias cannot be ruled out.[1]

We chose to include randomized cohort study designs, which gave a large variety of prognostic factors and outcome measures. Some results were based on data from study designs (eg, randomized controlled trials) that initially were not designed to identify prognostic factors for CNLBP improvement. Another form of heterogeneity could lie with the definition of the study population; all 14 studies described their selection criteria, but no study provided a clear definition or diagnostic labeling of patients with CNLBP.

The criteria list we used for quality assessment was based on the QUIPS low back pain tool used by Hayden.[14] The main reasons for modifying the QUIPS list was the length of the list and the items we considered most relevant for the current topic; however, the 6 domains for risk of bias are presented. A specific cutoff point for high quality or low quality is difficult to define (even when based on theoretical considerations) and thus remains arbitrary. The most frequent topic of discussion among the present authors was whether the included studies clearly or completely described the reliability and validity of the method of measurement of the prognostic factors, outcomes, and confounders. A second major topic was which factors can be described as prognostic and which factors can be described as confounders, because they were seldom explicitly defined in the included studies. These matters may have influenced the quality scores and the interpretation of the results. Apart from the low methodological quality of most of the studies, it was

difficult to report the qualitative results of the studies due to problems with different measures of prognostic factors and confounders, poor statistical methods, and different ways of reporting the outcomes.

Implications for Clinical Practice

This systematic review revealed that there is little consistent evidence as to which prognostic factors are of value in the recovery from CNLBP. There is no consistent evidence that any positive prognostic factors are associated with one of the investigated outcomes. At short-term (≤6 months) follow-up, there was consistent evidence for no association regarding the prognostic factors of age[22,31] and sex[22,31] for pain intensity and disability. Smoking[20,23,24] had the same result at long-term (>6 months) follow-up. Pain intensity[24,30] and fear of movement[24,30] had no association in the long term with the outcome of disability.

Conflicting evidence was found for the association between the outcomes of pain intensity and disability at short-term follow-up for the prognostic factor of fear of movement.[22,30,31] At long-term follow-up, conflicting evidence was found for the factors of age,[20,24–26] sex,[20,24–26,29] and physical job demands.[20,26]

Conflicting evidence was found for the association between return to work and age,[20,21,26,28] sex,[20,25,26,28] and activities of daily living[18,20,26] at long-term follow-up. At baseline, limited evidence of a positive influence on return to work was found for lower pain intensity[18,21,26] and physical job demands.[18,20,26] No studies of high quality were found for the outcomes of quality of life and global perceived effect.[25,27,30]

This review provides evidence-based information that may be valuable to clinicians and policy makers in guiding their professional practice and suggests that more studies are needed to further clarify these unclear and conflicting results on prognostic variables in patients with CNLBP, especially those prognostic factors that can be influenced by the clinicians or the patients.

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Appendix 1.

Full Search Strategy for Prognostic Factors in Chronic Nonspecific Low Back Pain for Recovery in MEDLINE/PubMed (1966–March 2010)[a]

Phase 1: Sensitive search for low back pain

1. Back pain
2. Low back pain
3. Simple back pain
4. Nonspecific low back pain
5. #1 OR #2 OR #3 OR #4

Phase 2: Sensitive search for prognosis

6. Prognosis
7. Prediction
8. Course

Phase 3: Sensitive search for outcome

9. Outcome assessment
10. Outcome treatment
11. Recovery

Phase 4: Sensitive search for design

12. Cohort studies
13. Follow-up studies
14. Longitudinal studies
15. Prospective studies
16. Controlled clinical trials
17. Randomized controlled trials
18. Case-control studies
19. Retrospective studies
20. Case studies
21. Search #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20

(Continued)

Appendix 1.
Continued

Phase 5: Exclusion criteria and limits

22. Intervertebral disk displacement

23. Infection

24. Neoplasm

25. Neoplasm metastasis

26. Cancer

27. Arthritis

28. Arthritis, rheumatoid

29. Arthritis, juvenile rheumatoid

30. Fibromyalgia

31. Fracture

32. Osteoporosis

33. Pregnancy

34. Reiter disease

35. Diskectomy

36. #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35

37. #5 NOT #36

38. #37 AND #21

39. #38 AND chronic

40. #39 Limits: humans, English, Danish, Dutch, Norwegian, Swedish

MEDLINE: 2,529, CINAHL: 742, EMBASE: 2,984, Cochrane Library: 79, PEDro: 421

[a] Search strategies were modified appropriately by reviewer (K.V.) for EMBASE (1950–March 2010), CINAHL (1984–March 2010), Cochrane Library (Cochrane Central Register of Reviews, trials to March 2010), and PEDro (1929–March 2010).

Appendix 2.
Criteria List for Assessing Methodological Quality

1.1 Study participation

A. Description of study population

B. Description of inclusion and exclusion criteria

C. Description of baseline study population

1.2 Study attrition, follow-up (extent and length)

D. Information about nonresponders versus responders

E. Follow-up of at least ≥3 months

F. Dropouts/loss to follow-up ≤20%

G. Information completers versus loss to follow-up/dropouts

1.3 Prognostic factors measurement

H. Clearly defined constructs of what is measured was provided, standardized assessment of patient characteristics and potential clinical prognostic factors

1.4 Outcome measurement

I. Clearly defined and standardized assessment of relevant outcome criteria: pain, disability, quality of life, return to work, global perceived effect

1.5 Confounding measurement and account

J. Important confounders measured

K. Valid and reliable measurement of confounders

L. Appropriate accounting for confounding

1.6 Analysis

M. Appropriate analysis techniques

N. Prognostic model presented

O. Frequencies of most important prognostic factors

P. Frequencies of most important outcome