ORIGINAL ARTICLE

Prognostic factors for duration of sick leave in patients sick listed with acute low back pain: a systematic review of the literature

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Background: The percentages of patients with acute low back pain (LBP) that go on to a chronic state varies between studies from 2% to 34%. In some of these cases low back pain leads to great costs.
Aims: To evaluate the evidence for prognostic factors for return to work among workers sick listed with acute LBP.
Methods: Systematic literature search with a quality assessment of studies, assessment of levels of evidence for all factors, and pooling of effect sizes.
Results: Inclusion of studies in the review was restricted to inception cohort studies of workers with LBP on sick leave for less than six weeks, with the outcome measured in absolute terms, relative terms, survival curve, or duration of sick leave. Of the studies, 18 publications (14 cohorts) fulfilled all inclusion criteria. One low quality study, four moderate quality studies, and nine high quality studies were identified; 79 prognostic factors were studied and grouped in eight categories for which the evidence was assessed.
Conclusions: Specific LBP, higher disability levels, older age, female gender, more social dysfunction and more social isolation, heavier work, and receiving higher compensation were identified as predictors for a longer duration of sick leave. A history of LBP, job satisfaction, educational level, marital status, number of dependants, smoking, working more than 8 hour shifts, occupation, and size of industry or company do not influence duration of sick leave due to LBP. Many different constructs were measured to identify psychosocial predictors of long term sick leave, which made it impossible to determine the role of these factors.

The percentage of patients with acute low back pain (LBP) that go on to a chronic state varies from 2% to 33%.[1 2] A delay in return to work (RTW) results in high compensation and treatment costs. In the United States, indirect costs of LBP were estimated to be more than US$50 billion per year,[3] in the UK, US$11 billion,[4] and in the Netherlands, almost US$5 billion.[5] To prevent costs and personal suffering from long term sick leave and disability we need to assess prognostic factors that can be influenced by intervention and identify which high risk patients should be focused on.

Interpretation of the body of studies on prognostic factors for delayed RTW is difficult.[6] Results can easily be biased if studies are not based on an inception cohort.[7] In an inception cohort, patients are included in the study at the same point in the course of their disease. In many studies on RTW the study population consists of a mixture of workers on sick leave and workers still at work at inception point. The number of patients at work during follow up depends on both this mixture and on the presence of prognostic factors. Making inferences about the prognosis of RTW from such mixed studies is difficult and this has led to much confusion. Furthermore, the quality of a study should be considered; therefore we provide a quality assessment of all studies and a rating of the evidence based on levels of evidence. It is unclear what the importance of each factor is in prognosis; therefore we also provide pooled effect sizes.

There have been a few reviews on LBP in recent years. A review by Pincus *et al*[8] on LBP is exemplary in method but deals with psychological predictors of long duration of complaints and not of work absenteeism. Inclusion and exclusion criteria in a review with a similar objective to that of our study by Shaw *et al*[9] were not very strict and did not seem to exclude studies with a mixed population. Furthermore, the quality of the included studies was not considered, their conclusions were not based on levels of evidence, and they did not provide information on the magnitude of the effect.

Pengel *et al*[10] reviewed prognosis for low back pain, but restricted the inclusion of studies on participants with low back pain for less than three weeks, which leaves out much meaningful evidence with regard to duration of sick leave.

To our knowledge no systematic review on prognostic factors for duration of sick leave for patients with acute LBP performed in this way has been published. Moreover there has been a considerable amount of new inception cohort studies in the last few years that have not been included in the previous reviews on LBP.

The objective of our study is to assess the evidence on factors that predict duration of sick leave in workers in the beginning of a LBP related sick leave episode. Our hypothesis is that there are factors related to LBP, to the worker, to the job, and to the psychosocial environment that influence duration of an episode of sick leave.

METHODS

Identification of studies

We searched the Medline database from 1966 to December 2003 for studies on LBP, prognosis,[11] and work. The search strategies were those advocated by the Cochrane Collaboration and the Cochrane Collaboration Back Review Group[12 13] (see Appendix 1) for studies on prognosis and for studies on back pain. The references of all selected articles and recently published review articles[9 10] were screened for additional publications.

Abbreviations: ES, effect size; LBP, low back pain; RTW, return to work

Selection of studies
Two reviewers (IS, MH) selected studies meeting the following criteria:

- Subjects with LBP and sick leave with duration of more than one day but less than six weeks at inclusion in cohort
- Relation studied between at least one prognostic factor and return to work as outcome
- Outcome measured in absolute terms (rate), relative terms (odds ratio, rate ratio, hazard ratio), survival curve, or duration of sick leave.

If the publication was not clear about these criteria, authors were contacted. If consensus between the two reviewers could not be reached, a third reviewer (JV) resolved disagreements.

Quality assessment
Two blinded researchers (IS, MH) scored the quality of included studies using a quality assessment list based on existing lists,[14 15] consisting of items in three categories: (1) methodological quality; (2) quality of measurement of prognostic factors; and (3) statistical quality.

The items were: adequate description of the study population (3 points), description of response (2 points), the extent and length of follow up (4 points), an explicit definition of time to return to work (1 point),[16] the number of prognostic factors measured (2 points), and the quality of data presentation (5 points) (for further details see Appendix 2).

In case consensus between the two reviewers was not met, JV again decided the matter.

Summed scores of all items resulted in an overall quality score (maximum = 17). Studies were classified as high quality (12–17 points), moderate quality (9–11 points), or low quality (less than 9 points).

Levels of evidence
Levels of evidence were determined using a rating system similar to that used by van Hoogendoorn *et al*:[14]

- *Strong evidence*: consistent findings in multiple high quality studies
- *Moderate evidence*: consistent findings in one high quality study and one or more lower quality studies, or in multiple lower quality studies
- *Insufficient evidence*: only one study available or inconsistent findings in multiple studies.

The significant effect of a factor in one study and a non-significant effect in another were still considered as consistent findings. A negative effect of a factor in one study and a positive effect of this factor in another were considered as inconsistent findings. Evidence could concern both the presence and the absence of an effect.

Pooling of data
Based on the International Classification of Functioning, Disability, and Health,[17] we distinguished between factors related to the disease (LBP), to the worker (worker and workers' health, psychosocial factors), and to the environment (work, work organisation, and work related psychology) that influence duration of an episode of sick leave.

Results were pooled to provide insight in the impact of a prognostic factor, only in case factors were considered sufficiently similar and effect sizes and confidence intervals were given by the authors or could be calculated from the crude data. The effect sizes from multivariate analysis were used if available. Odds ratios, relative risks, and hazard ratios were interpreted to reflect relative risks (RRs). Natural logarithms of the RR estimates for each factor were used to normalise the data. Standard errors were calculated from the natural logarithms of confidence intervals. Variance weighted pooled proportions were calculated using a random effects model.[18 19]

We defined the outcome as the risk of no RTW. Risk of RTW was recalculated to the risk of no RTW. In case the reference category for the exposed category differed between studies, we recalculated the risks, taking the lowest risk category as reference.

Sensitivity analysis
We assessed sensitivity of the levels of evidence findings by pooling available effect sizes. We assessed sensitivity of the pooled effect size to quality of the study in a separate pooling. We divided the quality score of each individual study by the average quality score of all studies that reported on a factor. Subsequently we multiplied this weight with the effect size and the weight standard error of the factor in each study. We assessed sensitivity to non-report of non-significant outcomes by performing an additional pooling of all effect sizes, estimating the effect size of non-reported outcomes as 1 with a 95% confidence interval ranging from 0.5 to 2.

RESULTS
Selection
The database search yielded 1063 articles on prognosis, work, and back pain. Based on article title, 760 publications did not fit the inclusion criteria. Another 240 articles were excluded based on the abstracts. Reasons for exclusion were: pregnancy related back pain, back pain and surgery, reviews, letters to the editor, chronic pain, case history, fusion or other operations, no back pain, risk factors for getting back pain, and no return to work used as outcome. Screening of the remaining 63 articles and recent reviews[8–10] resulted in 7 possibly relevant publications. Screening of all 70 articles resulted in 18 publications from 14 studies that fulfilled all three inclusion criteria (table 1). Information from all papers was used in the quality assessment of studies. In these 14 studies, 79 prognostic factors were studied.

Quality assessment
The two reviewers were in concordance 84% (95% CI 0.54 to 0.94) of the time after the first assessment. Consensus was reached in a meeting or after consulting JV (see table 2).

Factors related to back pain
Table 3 gives an overall impression of the effect sizes of prognostic factors related to back pain.

Three high quality studies[24–26 35 36] and two lower quality studies[33 34] reported a history of LBP as being not predictive for duration of sick leave. There is strong evidence that a history of LBP is not a prognostic factor for duration of sick leave due to LBP.

Three high quality studies[24–26 35 36] and two lower quality studies[33 34] reported disability as a prognostic factor for longer duration of sick leave. No studies reported non-significance or shorter sick leave associated with raised scores of disability. There is strong evidence for a relation between disability at inception point and longer duration of sick leave. The pooled effect size (2.39, 95% CI 1.33 to 4.29) is substantial.

One high quality[24] and two lower quality studies[33 34] reported pain intensity as non-significant; one high quality study reported a small (HR = 1.11, 95% CI 1.00 to 1.22) but significant effect of pain intensity on duration of sick leave.[35 36] There is insufficient evidence for pain intensity as a prognostic factor for duration of sick leave. The overall

Table 1 Summary information on the 14 studies that fulfilled all three inclusion criteria[20–37]

Reference	Country	Setting	Outcome definition	n	Inclusion time	Follow up time	Analysis	No. of factors	Study design
Abenhaim *et al*[20]	CAN	Workers' comp	⩾180 days off work	1848	Sickness absence <1 week	2 years	Multivariate logistic regression	6	Retrospective
Andersson *et al*[21]	SWE	General population	Sickness absence	940	Start sickness absence	22 years	Kaplan-Meier curves	2	Retrospective
Burdorf *et al*[22]	NL	Occupational	Sickness absence	222	Start sickness absence	2 years	Multivariate Cox regression	1	Prospective
Butterfield *et al*[23]	USA	Workers' comp	Absenteeism days	340	Claim opening, >6 physician visits	3 years max.	Multiple linear regression	7	Retrospective
Fransen *et al*[24]	NZ	Insurance setting	Compensation status at 3 months	854	After file claim and <2 weeks	3 months	Multivariate logistic regression	35	Prospective
Gatchel *et al*[25 26]	USA	Occupational/ orthopaedic clinic	Return to work	421	<6 weeks since injury	1 year	Stepwise logistic regression	14	Prospective
Gluck *et al* and Oleinick *et al*[27 28]	USA	Work injury database	Return to work	8628	Start of claim	8 weeks	Multivariate Cox regression	9	Retrospective
Goertz[29]	USA	Work comp/occ physician	Time loss from work	207	<30 days of onset	6 months	ANOVA Multivariate regression	9	Retrospective
Hagen and Thune[30]	NOR	Insurance setting	Duration of work incapacity	89190	After 2 weeks	1 year	Wilcoxon rank sum test/Kruskal Wallis	3	Retrospective
Dasinger *et al* and Krause *et al*[31 32]	USA	Workers' comp	Duration of work disability	433	1 day of temporary disability within 14 days of injury	1–4 years	Multivariate Cox regression	18	Retrospective
Nordin *et al*[33]	USA	Clinical setting	Return to work	162	Within 1 week of onset of pain	?	Multiple logistic regression	13	Prospective
Schultz *et al*[34]	CAN	Workers' comp	Occupational disability	192	Sub acute phase (4–6 weeks)	3 months	Stepwise logistic regression	33	Prospective
van der Weide *et al*[35 36]	NL	Workers/occ physician	Time to RTW	120	>10 days of sickness absence	12 months	Multivariate Cox regression	25	Prospective
van Doorn[37]	NL	Insurance setting	Time loss from work	1119	<72 hours after onset of disability	13 years	Multivariate Cox regression	5	Retrospective

pooled effect of pain intensity on duration of sick leave was minor but significant.

The effect of physical examination on duration of sick leave was only minor in one lower quality study[34] but not significant after multivariate analysis in another lower quality study.[29] There is insufficient evidence for physical examination as a predictor for duration of sick leave.

Radiating pain was reported in four high quality studies[20 24 31 32 35 36] and five lower quality studies[21 23 29 30 34] as predictive for duration of sick leave. Higher quality studies found smaller effects than lower quality studies. Radiating pain was not significant after multivariate analysis in one lower quality study.[34] There is strong evidence for the influence of radiating pain in prognosis for duration of sick leave.

The cause of LBP was reported as a non-significant factor in one high quality[27 28] and in one lower quality study.[29] One lower quality study[33] reported improved prognosis in case of a work related injury. There is insufficient evidence for cause of low back pain because of inconsistent findings in multiple studies. Factors were insufficiently similar for pooling of effect sizes. Prognosis deteriorated in case the course of LBP differed from the expected course in one lower quality study.[34] There is insufficient evidence for the effect of this factor on duration of sick leave due to LBP.

Factors related to the worker and the workers' health

Table 4 gives an overall impression of the effect sizes of factors related to the worker and the workers' health.

Strong evidence exists for age as a prognostic factor for longer duration of sick leave since six high quality studies[20 22 24 31 32 35–37] reported a significant effect. Two lower quality studies[29 30] confirmed this finding. The effect of age was especially larger in those over 51 years. Two high quality studies[25–28] and three lower quality studies[23 33 34] found no association with age. Pooling of effect sizes[20 22 24–26 30–32 35 36] resulted in an overall significant negative effect of older age on duration of sick leave.

Two high quality studies[25–28] and a lower quality study[30] found women returning to work significantly slower than men. Four high quality[20 24 31 32 35 36] and four lower quality[23 29 33 34] studies found no significant effect of gender. Three studies in predominantly male populations did not report the effect of gender.[21 22 37] Based on the levels of evidence we conclude that there is strong evidence for gender as a prognostic factor for duration of sick leave. After pooling of ESs,[20 24–26 30–32] after pooling while adjusting for quality, and after pooling with adjustment for non-reported ESs[23 29 33–36] (excluding the studies in predominantly male populations) it seems that men are returning to work significantly faster.

There is strong evidence that educational level does not predict duration of sick leave as it was reported as non-significant in two high quality studies[24–26] and one lower quality study.[34]

There is strong evidence that marital status is not a prognostic factor for duration of sick leave due to LBP. It was reported as non-significant in three high quality studies[24–28] and one lower quality study.[34]

There is moderate evidence that income is not related to duration of sick leave since it was not significant in two lower quality studies.[23 34] The same conclusion must be reached for race since it was reported as non-significant in one high quality study[25 26] and one low quality study.[33]

There is moderate evidence that the number of dependants is not a prognostic factor for duration of sick leave since it was reported as not significant in one high[27 28] and one lower quality study.[34]

Height and weight were not reported in two high quality studies.[22 24] These two factors are probably only meaningful

Table 2 Quality assessment of all studies

Reference	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	Overall rating (see appendix 1)
Abenhaim *et al*[20]	+	+	+	+	+	+	+	+	+	+	+	−	−	+	+	+	+	15
Andersson *et al*[21]	+	+	+	+	−	+	+	+	−	−	−	−	−	+	?	−	+	9
Burdorf *et al*[22]	+	+	+	+	−	+	+	−	+	+	−	−	+	+	−	+	+	12
Butterfield *et al*[23]	+	+	+	−	+	+	+	?	?	+	+	−	+	−	+	−	+	11
Fransen *et al*[24]	+	−	+	−	−	+	+	+	−	+	+	+	+	+	+	+	+	13
Gatchel *et al*[25 26]	+	+	+	−	−	+	+	+	−	+	+	+	−	−	+	+	+	12
Gluck *et al* and Oleinick *et al*[27 28]	+	+	+	+	+	+	+	+	−	+	−	−	−	+	+	−	+	12
Goertz[29]	+	−	+	+	−	+	+	?	−	+	−	−	+	−	−	−	+	8
Hagen and Thune[30]	+	−	+	+	?	+	+	+	?	+	−	−	+	−	?	−	+	9
Dasinger *et al* and Krause *et al*[31 32]	+	−	+	+	+	+	+	−	+	+	+	+	?	+	+	?	+	13
Nordin *et al*[33]	+	−	+	?	?	+	?	?	−	−	+	−	−	+	+	+	+	8
Schultz *et al*[34]	+	+	+	−	−	+	+	+	+	+	+	+	−	−	+	−	−	11
van der Weide *et al*[35 36]	+	−	+	+	+	+	+	+	−	+	+	+	+	+	+	+	−	14
van Doorn[37]	+	+	+	+−	+	+	+	−	+	+	+	−	+	+	+	−	+	14

Results A–Q are quality criteria (see Appendix 1).

Table 3 Prognostic factors for duration of sick leave due to low back pain related to characteristics of current episode

Prognostic factor	Pooled ES (95% CI)	+ adjusted for quality	+ adjusted for non-report of ES
History of LBP[24–26 33–36]	1.08 (0.87 to 1.34)	1.05 (0.84 to 1.30)	0.89 (0.70 to 1.12)
Disability[24–26 33–36]	2.39 (1.33 to 4.29)	2.40 (1.34 to 4.31)	–
Pain intensity[24 33–36]	1.10 (1.01 to 1.20)	1.10 (1.01 to 1.20)	1.10 (1.01 to 1.20)
Physical examination[29 34]	1.10 (1.03 to 1.18)	–	1.10 (1.01 to 1.20)
Radiating pain[20 21 23 24 29–32 34–36]	2.52 (1.76 to 3.63)	2.49 (1.42 to 4.36)	2.08 (1.48 to 2.92)
Accident type (ref: overexposure)		–	–
Impact	1.00 (0.77 to 1.31)		
Fall same level	1.08 (0.84 to 1.39)		
Fall from elevation[27 28]	1.16 (0.90 to 1.51)		
Work related injury[33]	0.36 (0.15 to 0.87)	–	–

–, pooling not possible; ES, effect size.

when recalculated into body mass index (BMI). Fransen *et al*[24] reported BMI as a predictor of duration of sick leave. BMI would not have remained significant after pooling in case of non-significance in the study by Burdorf *et al*.[22] Overall there is moderate evidence for BMI as a prognostic factor for duration of sick leave.

Two high quality studies[24 35 36] and one lower quality study[23] reported that smoking was not associated with duration of sick leave. This means that there is strong evidence that smoking is not a prognostic factor for duration of sick leave.

One high quality study[24] reported physical fitness as not being a prognostic factor for duration of sick leave. Being active in sporting activities was reported as not being prognostic in another high quality study,[35 36] and discontinuing physical activities as not being prognostic in a study of lower quality.[23] Despite the variety of constructs, physical fitness or being active in sporting activities does not seem to be a prognostic factor for this outcome.

General health was reported as an important prognostic factor in one high quality study,[24] but reported as non-significant in a lower quality study.[23] Co-morbidity was reported as non-significant in a multivariate analysis in one lower quality study.[33] Other health related items (vitality and health transition) as measured by the SF-36 were reported as being prognostic factors in one lower quality study;[34] the

Table 4 Prognostic factors for duration of sick leave due to low back pain related to worker and the workers' health

Prognostic factor	Pooled ES (95% CI)	+ adjusted for quality	+ adjusted for non-report of ES
Age (10 y interval)[20 22 24–26 30–32 35 36]	1.30 (1.17 to 1.44)	1.31 (1.18 to 1.45)	–
Gender (ref: male)[20 23–26 29–36]	1.18 (1.04 to 1.34)	1.18 (1.04 to 1.35)	1.16 (1.10 to 1.23)
Educational level[24–26 34]	1.17 (0.84 to 1.62)	–	1.12 (0.88 to 1.42)
Marital status[24–28 34]	1.05 (0.85 to 1.31)	1.05 (0.86 to 1.29)	1.00 (0.61 to 1.65)
No. of dependants[27 28 34]	1.11 (0.99 to 1.24)	–	–
BMI (ref: normal weight)[22 24]	1.68 (1.01 to 2.81)	–	1.38 (0.84 to 2.26)
Smoking[23 24 35 36]	1.12 (0.83 to 1.50)	1.10 (0.90 to 1.34)	–
Physical fitness[23 24 35 36]	1.30 (0.80 to 2.09)	–	1.10 (0.90 to 1.34)
General health question (GHQ (ref: <6)[23 24]	2.78 (2.00 to 3.87)	1.76 (0.65 to 4.79)	–
Vitality[34]	1.03 (1.00 to 1.05)	–	–
Health transition[34]	2.30 (1.12 to 4.72)	–	–

–, pooling not possible; ES, effect size.

Table 5 Prognostic psychosocial factors for duration of sick leave due to low back pain

Prognostic factor	Pooled ES (95% CI)	+ adjusted for quality	+ adjusted for non-report of ES
External locus of control (ref: 4–7)[24]	1.10 (0.74 to 1.63)	–	–
Hysteria[25 26]	1.52 (0.98 to 2.37)	–	–
Lack of energy[35 36]	1.96 (1.15 to 3.33)	–	–
Social isolation/dysfunction[24 34–36]	2.13 (1.23 to 3.70)	2.13 (1.23 to 3.69)	1.76 (1.01 to 3.06)
Axis II personality disorder[25 26]	1.96 (0.93 to 7.85)	–	–
Life events (ref: no)[24]	0.77 (0.54 to 1.08)	–	–
Illness	1.12 (0.77 to 1.62)		
Accident	1.29 (0.86 to 1.94)		
New family member	0.60 (0.39 to 0.91)		
Relationship broken	1.03 (0.66 to 1.62)		
Financial crisis	1.23 (0.86 to 1.75)		
Depression[25 26 34]	1.00 (0.59 to 1.70)	–	–
Severe depression[24]	2.47 (1.66 to 3.67)		

–, pooling not possible; ES, effect size.

other subscales did not remain significant. There is moderate evidence for poor general health as being a negative predictor for prognosis of sick leave. Results were not pooled since items differed too much. Overall general health might be an important prognostic factor because of the size of the effect as measured by Fransen *et al*.[24]

Psychosocial prognostic factors in the worker

Table 5 gives an overall impression of the effect sizes of psychosocial factors on duration of sick leave. Only social dysfunction/isolation was eligible for pooling.

Psychosocial factors have been measured in very different ways in the studies in this review, which makes it difficult to reach conclusions.

There is insufficient evidence for external locus of control,[24] hysteria,[25 26] and lack of energy[35 36] since all were reported only once as non-significant.

Two high quality studies reported social dysfunction[24] and social isolation[35 36] as a prognostic factor, and a lower quality study[34] reported non-significance for functional social support in a multivariate model, which leads to the conclusion that there is strong evidence that this factor prolongs duration of sick leave. The overall pooled effect remained significant if corrected for quality of the study and non-significant outcomes.

Anxiety did not remain significant in multivariate analysis in one high quality study[24] and a lower quality study.[34] There is moderate evidence for anxiety not being a prognostic factor for duration of sick leave. One high quality study[25 26] reported an axis 2 personality disorder as predictive for being on a disability pension at 6 months. However, the 95% confidence interval ranged from 0.9 to 7.8, leading to the conclusion that this factor was not significant.

One high quality study[24] looked into life events as a possible prognostic factor and found that only a new family member had a (positive) effect on prognosis. There is insufficient evidence for life events as a prognostic factor for duration of sick leave due to LBP.

Severe depression was a prognostic factor in one high quality study.[24] One high quality[25 26] and one lower quality study[34] found no effect of depression. There seems insufficient evidence for an effect of depression on duration of sick leave.

Factors related to work

Table 6 gives an overall impression of the effect sizes of factors related to work on duration of sick leave.

There is strong evidence for heavy work as a predictor for longer duration of sick leave since two high quality studies[24 31 32] and one lower quality study[23] found significant effect sizes for this factor. Two high[25 26 35 36] and one lower quality study[33] found no significant effect. After pooling of results,[23 24 31–33] a significant effect of heavy work on duration of sick leave remained, even after adjusting for quality[23 24 31–33] and non-report of effect sizes.[23–26 31–33 35 36]

There is strong evidence from two high quality studies[24 35 36] that working more than 8 hour shifts regularly does not predict prognosis. Fransen *et al*[24] also reported that working unsociable hours was not a prognostic factor; this might support that working hours do not influence prognosis.

One high quality study[24] reported sitting and walking as not predicting prolonged work absenteeism. One high quality

Table 6 Prognostic factors for duration of sick leave due to low back pain related to work

Prognostic factor	Pooled ES (95% CI)	+ adjusted for quality	+ adjusted for non-report of ES
Heavy work (ref: light)[23–26 31–33 35 36]	1.40 (1.26 to 1.56)	1.40 (1.27 to 1.55)	1.39 (1.25 to 1.55)
Regularly work more than 8 hour shifts[24 35 36]	1.36 (0.97 to 1.92)	–	–
Work unsociable hours (ref: no)[24]	1.13 (0.82 to 1.56)	–	–
Time sitting per day (ref: no)[24]		–	–
<50%	0.96 (0.68 to 1.34)		
>75%	1.38 (0.75 to 2.19)		
Posture index[31 32]	1.16 (0.93 to 1.45)	–	–
Vibration perceived[24 31–33]	1.67 (0.99 to 2.81)	1.98 (0.89 to 4.43)	–
Time driving per day (ref: no)[24]		–	–
<50%	0.85 (0.60 to 1.21)		
>75%	1.82 (1.03 to 3.22)		
Work tempo and quantity[35 36]	1.11 (1.00 to 1.37)		

–, pooling not possible; ES, effect size.

Table 7 Prognostic factors for duration of sick leave due to low back pain related to work organisation and work related psychosocial factors

Prognostic factor	Pooled ES (95% CI)	+ adjusted for quality	+ adjusted for non-report of ES
Duration of employment (ref: <1 year)[31 32]	0.73 (0.60 to 0.90)	–	–
Light duties available[24]	1.66 (1.12 to 2.46)	–	–
Supervisor support (ref: high)[31 32 35 36]	1.26 (1.01 to 1.58)	–	1.22 (0.99 to 1.50)
Co-worker support (ref: high)[31 32 35 36]	1.20 (1.04 to 1.38)	1.23 (1.09 to 1.40)	1.23 (1.08 to 1.38)
Work APGAR (ref: high)		–	–
10–12	1.24 (0.78 to 1.97)		
13–21	0.80 (0.50 to 1.28)		
Job satisfaction[24 31 32–34]	0.98 (0.69 to 1.38)	0.98 (0.69 to 1.38)	0.99 (0.80 to 1.24)
Job demands (ref: low)	1.35 (1.09 to 1,67)	–	–
Job control (ref: high)[31 32]	1.35 (1.11 to 1.64)	–	
Job strain (ref: low)[31 32]	1.45 (1.18 to 1.79)	–	–
Work flexibility (ref: high)[31 32]	1.41 (1.15 to 1.72)	–	–
Work events (ref: no)[24]		–	–
Retired	1.47 (0.96 to 2.24)		
No job/other job/retired	0.68 (0.45 to 1.03)		
On income support	1.61 (0.96 to 2.71)		

–, pooling not possible; ES, effect size.

study[31 32] found no influence from a posture index, measuring awkward postures during work, on duration of sick leave. One lower quality study[29] found an effect of job difficulty on duration of sick leave, but it did not remain significant in multivariate analysis. There seems insufficient evidence for all factors in this last paragraph as a prognostic factor in duration of sick leave due to LBP.

There is insufficient evidence for vibration as a predictive factor since only one lower quality study[33] found a significant effect of this factor for duration of sick leave; two high quality studies[24 31 32] did not find an effect. After pooling of results,[24 31–33] vibration does not seem predictive for duration of sick leave. Driving a vehicle might be correlated with this factor, but was only a predictive factor if driving took more than 75% of the working day in one high quality study,[24] which might also be the case in the low quality study[33] since most subjects worked in public transport.

There is insufficient evidence for high work tempo and quantity as a prognostic factor for duration of sick leave since one high quality study[35 36] reported non-significance for this factor.

Factors related to work organisation and psychosocial factors in work

Table 7 gives an overall impression of the effect sizes of factors related to work organisation on duration of sick leave.

There seems insufficient evidence for duration of employment as a prognostic factor for duration of sick leave, since only one high quality study[31 32] found a positive effect of this factor. One high quality[35 36] and one moderate quality study[34] did not include this factor in a multivariate model. Work experience was reported as non-significant in a multivariate model in a high quality study.[22] Status of employment and total tenure were reported as not significant in a multivariate model in a lower quality study.[34] Results could not be pooled since no standard error could be calculated.

There is moderate evidence that the availability of light duties prolongs sick leave from one high quality study.[24] The effect of assignment to alternative duty did not remain significant in a multivariate analysis in one low quality study[29] when using time to return to the jobsite as an outcome. Return to previous job without restrictions however was reported in the discussion section as being 1.68 times delayed by the assignment to alternative duty. Results could not be pooled since no standard error could be calculated.

A high quality study[31 32] found a significant effect of supervisor support but not of co-worker support. Another high quality study[35 36] reported no significant effect of problematic relations with supervisor, but found a small effect of problematic relations with co-workers in a multivariate analysis. One study of moderate quality[34] reported a non-significant effect from neither co-worker support nor supervisory support. Based on the levels of evidence, there is moderate support for these factors in prognosis of duration of sick leave. Pooling of effect sizes however results in a significant but small influence of the co-worker on duration of sick leave. One high quality study[24] found scores on the Work APGAR, with higher scores representing greater dissatisfaction with workplace relations in general as not being predictive for duration of sick leave.

There is strong evidence for job satisfaction not being a prognostic factor for duration of sick leave since two high quality,[24 31 32] and two lower quality studies[33 34] found no effect.

One high quality study[31 32] found significant effects of job demands, job control, job strain, and work flexibility on duration of work absenteeism. One lower quality study[34] reported no effect for all items of the job content questionnaire (skill discretion, decision authority, job security, co-worker support, supervisory support, psychological demands, physical demands) either in a univariate or in a multivariate analysis. Another high quality study[35 36] did not find a significant effect of lack of variation in work, emotional effort, lack of participation, and lack of independence in work. One high quality study[24] looked into work related life events; they did not predict prolonged work absenteeism. There is insufficient evidence for an effect of all the items in this paragraph on duration of sick leave.

Organisational prognostic factors

There is strong evidence that occupation is not predictive for duration of work absenteeism, since it was not predictive in three high quality studies[20 27 28 35 36] and one lower quality study.[21] The low quality study of Anderssons *et al*,[21] however, found associations of worse prognosis in blue-collar professions in the first 20 days of sick leave and of better prognosis after 20 days of sick leave.

There is strong evidence that size of industry or company does not matter in prognosis of sick leave, since three high quality studies[20 27 28 31 32] did not find an effect of this factor on duration of sick leave.

One high quality study[25 26] found a substantial effect of receipt of compensation on prolonged work absenteeism; another high quality study[20] found a tendency towards this

Main messages

- In patients with acute low back pain, time to return to work is longer if they are older, more disabled, female, are doing heavy work, are diagnosed as having specific back pain, suffer from social dysfunction and social isolation, and receive higher compensation.
- More univocal evidence on the prognostic value of psychosocial factors is needed.
- Prognosis of return to work in patients with back pain should be inferred from inception cohort studies.

effect in increasing amounts of compensation. Another high quality study[27 28] found an effect of this factor on duration of sick leave in workers of work for more than 8 weeks. Although the evidence is not straightforward, there seems to be strong evidence for a negative effect of receipt of high compensation on duration of sick leave. There is insufficient evidence for attorney involvement as a prognostic factor, since only a lower quality study[23] found a significant negative effect on prognosis. All factors in this section could not be pooled because studies categorised factors differently.

Policy related prognostic factors

There is moderate evidence from one high quality[24] and one lower quality study[34] that absenteeism policy made in companies to get a grip on sick leave does not shorten duration of sick leave. It seems to deteriorate prognosis if reporting a claim is actively discouraged.[24] There is moderate evidence that union membership has no influence on duration of sick leave from one high quality[31 32] and one lower quality study.[34] There is insufficient evidence for claim duration as a predictor of duration of sick leave since only one lower quality study[23] found this factor to be predictive for longer duration of sick leave. There is moderate evidence for the quality of the process of care as a predictor for longer duration of sick leave from one high quality study.[35 36] All factors in this section could not be pooled because studies categorised factors differently or because only one study reported a factor.

DISCUSSION

In our review we found that patients with low back pain at the highest risk for long term absence are older females characterised by radiating pain, high levels of disability and social isolation, doing heavy physical work, and receiving a high level of compensation. Radiating pain, higher levels of disability and social dysfunction, and social isolation had an effect size of more than two. Age reached an effect size of more than two in case of a 31 year age difference between groups.

The strength of our review is that we used clear inclusion and exclusion criteria for an inception cohort and for being on sick leave. This prevents bias from a mixed population that is chronic and acute and that is on sick leave and at work. The use of an appropriate statistical technique to combine study results allowed for the appropriate influence of study size on the results.

A weak point is that we were not able to adequately combine the results for psychological factors. Inherent to prognostic research, it was also difficult to combine non-significant results because authors report only on significant prognostic factors. However, by assigning an estimated effect size to these factors, we hope to have taken this effect into account.

Policy implications

- Efforts to prevent long term disability as a result from low back pain can be focused on high risk patients.
- Patients with low back pain at the highest risk for long term absence are older females with radiating pain, high levels of disability and social isolation, doing heavy physical work, and receiving a high level of compensation.
- Based on the prognostic factors amenable to change, promising interventions can be therapy directed at changing disability perceptions and workplace accommodation for older workers.
- Assignment to light duties should not be advised too early in the course of sick leave due to low back pain.
- More high quality prognostic studies for RTW after an episode of back pain are needed in which multiple factors are measured and analysed at the same time.
- The effectiveness of the application of a clinical prediction rule for longer duration of sick leave should be evaluated in high quality randomised controlled trials.

Comparison with other reviews

The review by Shaw *et al*[9] identified low workplace support, personal stress, shorter job tenure, prior episodes, heavier occupations with no modified duty, delayed reporting, severity of pain and functional impact, radicular findings, and extreme symptom report as prognostic factors. We could not identify which studies were used in reviewing each factor, which makes comparing results difficult. Findings on history of LBP were described as inconsistent (43% found no or a protective influence of prior LBP), yet it was concluded that it had an influence on prognosis. We did not include radicular-like pain in reviewing the factor pain, but only self-report of pain from questionnaires. We agree on heavier occupations, functional disability, and radicular findings. We disagree on low workplace support and gender because of stricter inclusion criteria. The other factors were not included in our review since the studies that looked into these factors were on mixed populations of workers on sick leave and of workers still at work.

The review by Pincus *et al*[8] found distress, depressive mood, and somatisation as psychological predictors for chronicity of LBP in general practice. There is insufficient evidence for most psychosocial prognostic factors for duration of sick leave since most factors were not studied or were studied in one study only. So far only one study in our review provided evidence for severe depression as a prognostic factor for longer duration of sick leave.[24]

Implications for occupational health care

Based on the results of our review we would suggest that intervention strategies for workers on sick leave because of acute low back pain can become more (cost) effective by focusing on the workers at risk and by focusing interventions on the relevant changeable prognostic factors. The intervention strategy by Gatchel *et al*,[41] focusing on high risk individuals, seems promising. The application of an algorithm predicting longer duration of sick leave should be evaluated in high quality randomised controlled trials.

However, there could be a biological explanation for differences in prognosis that is less sensitive to intervention. Prognosis for subjects with radiating pain might be worse, although it is a matter of opinion whether intervention in

these cases should differ from cases without radiating pain.[42] In most of these patients the message should be that staying active is beneficial and that hurt does not mean harm.[43] Factors such as the level of disability seem to be inherent to a somatic problem, but a high level of disability might also be subject to change since all studies report perceived disability. Perception of disability can be faced in therapy.[44] In case the effects of age are considered unchangeable factors, age might be reason for a more intensive workplace accommodation or even change of job for older workers in an early stage of sick leave due to low back pain. Heavy work might be altered by ergonomic intervention leading to faster RTW in workers on sick leave due to LBP,[45 46] although effectiveness of these interventions has not been established in multiple randomised controlled trials.[47]

The effect of gender might be caused by biological differences between men and women, but might also be caused by interaction between gender and social roles or the perception of the female worker's physician. The factor might be considered as clinically less relevant since the ES is small (ES = 1.18 and 1.23 if adjusted for quality). The effect is statistically significant because of the total number of workers in all studies, leading to a narrow confidence interval.

In spite of the well known effect of history of low back pain on recurrences of back pain,[10 48] history of LBP does not influence duration of sick leave due to LBP. Krause *et al*[32] reported even a shorter duration of sick leave with previous lost time back injury in the subacute phase. History of LBP was reported as prognostic for a more frequent drop out from work by Wasiak *et al*.[49] It might be that a history of LBP results in a more frequent drop out from work with shorter duration, which leads to the conclusion that it is not predictive for longer duration. In future research the distinction should be made between duration of a sick leave episode and the frequency of sick leave episodes.

Assignment to light duties is a commonly used tool aimed at a safe and rapid return to work. However, according to our review there is moderate evidence that it prolongs sick leave in workers on sick leave due to acute LBP,[24 29] which seems contradictory to the perceived beneficial effect of staying active with LBP and the effect of modified work as found in the review by Krause *et al*.[50] It might indicate that assignment to light duties should not be used too early in the course of sick leave due to low back pain.

There is no need to focus interventions on job satisfaction, educational level, marital status, number of dependants, smoking, occupation, and size of industry or company to shorten duration of sick leave since these factors are not risk factors for this outcome.

Implications for research

The reason for finding limited evidence for many factors was that they were measured in one study only. All prognostic factors from this review should be considered in research on prognosis or in studies on interventions aimed at improving prognosis. Promising factors for further research from our review are: expectations of workers,[34 51] general health,[24 34] high work tempo and quantity,[35 36] job demands, job control, job strain, work flexibility,[31 32] attorney involvement,[23] continuity of care,[35 36] BMI,[24] lack of energy, lack of variation in work,[35 36] life events,[24] and quality of management of LBP in occupational care.[35 36] They should be considered in high quality prognostic studies.

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APPENDIX 1

(prognosis [MH:NOEXP] OR ''survival analysis'' [MH:NOEXP] OR ''incidence'' [MESH] OR ''mortality'' [MESH] OR ''follow-up studies'' [MESH] OR ''mortality'' [SH] OR prognos* [WORD] OR predict* [WORD] OR course [WORD]) AND (back OR back pain OR low back pain OR backache OR ''back pain''[MESH] OR ''low back pain''[MESH]) AND (sick leave OR return to work OR ''workers' compensation''[MESH] OR ''occupational diseases''[MESH] OR ''rehabilitation, vocational''[MESH] OR ''employment''[MESH] OR ''absenteeism''[MESH] OR ''disability evaluation''[MESH] OR ''work''[MESH] OR ''occupations''[MESH] OR ''sick leave''[MESH]).

APPENDIX 2

Quality assessment criteria list: see table A1.

Table A1 Systematic review of prognostic cohort studies on duration of sick leave due to LBP in the acute phase

Prognostic cohort studies on duration of sick leave due to LBP in the acute phase		
Study population		
a	Inception cohort: *positive if patients were identified at an early uniform point (inception cohort) in the course of their sick leave due to low back pain). In this review <6 weeks after start of sick leave.*	+/−/?
b	Description of inclusion and exclusion criteria: *positive if criteria were formulated for: age, duration of symptoms, duration of sick leave, co-morbidity*	+/−/?
c	Description of study population: *positive if described in what setting the patients are recruited (i.e. general practice, hospital, occupational setting)*	+/−/?
Response		
d	Response: *positive if the response ⩾75%*	+/−/?
e	Information on non-responders versus responders: *positive if information presented about patient/disease characteristics of responders/non-responders or no selective response* *+ = no selective response, information given; − = selective response, information given; ? = not clear*	+/−/?
Follow up (extent and length)		
f	*Positive if prospective design was used, also positive in case of a retrospective cohort and determinants are measured before outcome.*	+/−/?
g	*Positive if the follow up period was at least 12 months*	+/−/?
h	*Positive if total number of drop-outs/loss to follow up <20% on the last moment of follow up*	+/−/?
i	Information completers versus loss to follow-up/drop-outs: *positive if demographic/clinical information (patient/disease characteristics such as age, sex, and other potential prognostic predictors) was presented for completers and those lost to follow up/drop-outs at the main moment of outcome measurement, or no drop-outs/loss to follow up* Loss to follow-up/drop-outs: *all patients of the assembled cohort minus the number of patients at the main health status measurement for the main outcome measure, divided by all patients of the assembled cohort* *+ = no selective follow up, information given; − = selective follow up, information given; ? = not clear*	+/−/?
Outcome		
j	Definition of main outcome: return to work	+/−/?
Prognostic factors		
k	Standardised assessment of patient characteristics and potential clinical prognostic factor(s): *positive if standardised questionnaires or objective measurements were used at baseline of at least 4 of the following 7 potential prognostic factors: (a) age; (b) sex; (c) pain; (d) functional status; (e) duration of complaints; (f) back complaints; (g) physical workload*	+/−/?
l	Standardised assessment of potential psychosocial prognostic factor(s): *positive if standardised questionnaires or objective measurements were used at baseline of at least 1 of the following 6 potential prognostic factors:* *(a) depression; (b) somatisation; (c) distress; (d) fear and avoidance; (e) coping strategies; (f) psychosocial work related factors (social support, job decision latitude)*	+/−/?
Data presentation		
m	Frequencies given of main outcome measure (return to work): *positive if frequency, percentage or mean, median (interquartile range) and standard deviation/CI are reported of the outcome measures*	+/−/?
n	Frequencies of all prognostic factors: *positive if frequency, percentage or mean, median (interquartile range) and standard deviation/CI are reported of all prognostic factors*	+/−/?
o	Appropriate analysis techniques: *positive if univariate crude estimates are provided* *Positive in case hazard ratios, odds ratios, relative risks, or relative risk ratios are presented* *Negative in case correlations are reported*	+/−/?
p	Multivariate prognostic model is presented: *positive if attempt is made to determine a set of prognostic factors with the highest prognostic value.* *Positive if a manual forward stepwise procedure was used (p_{in} <0.05; p_{out} ⩾0.10)* *Negative in case of an analysis based on an automated forward or stepwise procedure*	+/−/?
q	Sufficient numbers: *positive if the number of cases in the multivariate analysis was at least ten times the number of independent variables in the analysis*	+/−/?

+, positive; −, negative; ?, not clear.

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