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A prospective cohort study comparing clinicians' predictions with those of the Start Back Tool

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Introduction

A large number of prognostic factors have been identified in non-specific low back pain (LBP), but these generally have rather weak associations with outcome [1], and most investigated predictive models have not demonstrated adequate predictive value to be useful in relation to individual patients [2]. Still, clinicians need to make decisions about treatment plans every day and are repeatedly faced with patients wanting to know their most likely prognosis.

Lacking convincingly helpful predictive models, clinicians rely on experience and subjective judgement when establishing a patient's prognosis. The LBP prognosis established by general practitioners (GPs) has been consistently associated with outcome in studies investigating this, but although comparable to that of validated questionnaires [3] the predictive accuracy of clinicians' prognostic estimation was quite low [3, 4]. Also, chiropractors were not able to accurately predict poor treatment outcomes when asked to register "whether they thought patients were less likely than average to report a good outcome following a course of care"[5]. In addition, there is evidence suggesting that the prediction differs substantially between clinicians [6].

In elderly patients with musculoskeletal pain, GPs' prediction of outcome has been shown to improve if combining their subjective judgments with just three factors obtained from the patient history [7]. In non-specific LBP, the STarT Back Screening Tool (SBT) is an easily completed scale that combines potentially modifiable prognostic factors. It has shown promising for assisting GPs' decision about the treatment plan [8, 9], and it may provide a simple tool to improve clinicians' prediction of outcome.

Clinicians' estimation of prognosis potentially differs from that of standardised screening if clinicians value other factors than those typically registered. It is not investigated to what extent clinicians' estimation of prognosis is based on established prognostic factors, but in one study factors such as pain intensity, level of disability, and number of previous episodes were associated with clinicians' prediction [10]. In a consensus process it was recognised that clinicians found issues such as 'generally difficult life circumstances' of importance for the prognosis and this construct is most likely not easily captured by screening tools [6].

More accurate prognoses are essential to inform patients about their condition and to guide treatment, for instance by early identification of patients with more extensive treatment needs. Therefore, this study aimed to increase the understanding of clinicians' expectations of patient outcome in LBP.

This study comprised a cross-sectional and a longitudinal part. The objectives of the cross-sectional part were to determine: (1) which individual patient characteristics were associated with chiropractors' expectations of outcome from a LBP episode, and (2) how closely the chiropractors' expectations could be predicted by a combination of these patient characteristics. Since no empirical data could support the choice of investigated patient characteristics this part should be considered hypothesis generating. The objectives of the longitudinal part were to determine: (1) the association between chiropractors' expectations of clinical course and outcome after 2 weeks, 3 months, and 12 months, (2) how clinicians' expectations (3-level subjective judgment) performed compared to that of the SBT (3-level standardised

tool), and (3) to what extent combining clinicians' expectations with the SBT increased the amount of variation explained in outcome.

Method

The study is based on a cohort study which has previously been described [11] and consisted of patients visiting one of 40 chiropractors at 17 Danish chiropractic clinics due to a new episode of LBP. In Denmark, chiropractors belong to the public primary health care sector, patients can consult without referral and the expenses are partly covered (approximately 20%) by national health insurance. The participating clinics were members of a group of research clinics affiliated with the Nordic Institute of Chiropractic and Clinical Biomechanics. The chiropractors attended a one day course introducing study procedures and a research assistant visited all clinics prior to study start to repeat general information and ensure that clinical examination procedures (relevant for the main study) were adequately standardised. Collection of data on clinicians' expectations was not introduced from the beginning of patient recruitment and the present study therefore concerns a slightly smaller cohort than reported on before. According to the local ethical committee the study did not require ethical approval [12].

Procedures

Baseline questionnaires were completed in the reception area prior to the first consultation. Completed questionnaires were returned to the receptionist in a closed envelope and were not available to the chiropractor. There were no specific instructions to patients whether they could discuss the content of the questionnaire with the chiropractor. Clinicians obtained a patient history as they found appropriate and did a standardised clinical examination [11]. Results from the clinical examination and the clinician's expectations were registered in a web based registration form. Treatment was unaffected by study participation and the chiropractors had no access to questionnaire data. Follow-up questionnaires were mailed to participants after 2 weeks, 3 months, and 12 months. Participants not responding were contacted by a research assistant to make sure they had received the questionnaire. All questionnaires were sent directly to the research department and patients were informed that their responses would not be revealed to the chiropractors and only reported in an anonymous form.

Participants

Consulters with non-specific LBP or lumbar nerve root involvement (based on usual clinical practice for diagnostic triage) aged 18-65 years who could read Danish and were able to respond to SMS-questions on a mobile phone (for reasons unrelated to this part of the study) were potential participants. Patient were not eligible if pregnant, if acute surgical referral was needed, or if having had more than one contact to a health care provider due to LBP within the preceding three months. In addition participants were excluded from the analyses if the clinician's expectation was missing.

Clinicians' expectations of clinical course

The final question of the clinical examination form was (translated from Danish) 'What outcome do you expect for this patient?' with four response options: 1) Short/uncomplicated course, 2) Prolonged but

without lasting consequences, 3) Long-lasting/sustained consequences (high risk of chronicity), or 4) Don't know. The expectation categories are hereafter referred to as short/uncomplicated, prolonged, and long-lasting/chronic.

Baseline information

Patient-reported baseline variables and their categorization are listed in Table 1. Body mass index was collected as weight and height. LBP and leg pain intensity were measured on 0-10 Numeric Rating Scales [13], and activity limitation on the Roland Morris disability questionnaire (RMDQ) as a proportional score 0-100 [14]. Fear avoidance was measured by the physical activity section of the Fear Avoidance Beliefs Questionnaire (FABQ) (0-24) [15], depression by the Major Depression Inventory (MDI) 0-50 [16], and general health using the health thermometer of EQ-5D (0-100) [17].

The SBT was scored and categorised as recommended by the developers of the tool [8]. Items on aspects that were not considered covered by other questionnaires (item 2: Shoulder or neck pain, item 7: catastrophising, and item 9: bothersome pain) were separately included in the cross-sectional analysis of factors associated with clinicians' expectations.

The Quebec classification [18] was registered as part of the examination form completed by the clinician, and nerve root involvement and spinal stenosis were combined due to few observations.

Outcome measures

LBP intensity (NRS 0-10) and activity limitation (RMDQ 0-100) at 2-weeks, 3-months, and 12-months follow-up were outcome measures. The scales were used in their original forms and dichotomised to define poor outcome as LBP>0 and RMDQ >8 (RMDQ>8 corresponded to >2 on the original 0-24 RMDQ [19]).

Data analysis [can be omitted without loss of continuity]

Data were double entered into Epidata [20] and analyses conducted in STATA SE/12.1.

To explore which patient characteristics were related to the clinicians' expectations of outcome, univariate associations were first tested by Kruskal-Wallis rank test (continuous variables) or Pearson's chi-squared test (dichotomous and categorical). We then did a multinomial multivariable regression with clinicians' expectations (4-level categorical) as the dependent variable to investigate which of the patient characteristics were associated with the clinicians' expectations of outcome independently of other measured factors. In this model all measured baseline factors were introduced simultaneously, and independent variables with p>.2 at all outcome levels were removed manually in a stepwise fashion without eliminating factors with a risk ratio above 1.5 or below 0.66.

Next, we calculated what the clinicians' expectation of outcome would be if this had been simply a product of the patient baseline characteristics. This was to understand how closely clinicians' judgments relate to measurable patient characteristics. To do that, we calculated the probability of belonging to each of the categories short/uncomplicated, prolonged and long-lasting when based on the full multinomial model described above. These predictions were compared to the actual expectations of the clinicians. If the expectations predicted from patient characteristics perfectly matched the clinicians' expectations of outcome, the predicted probability would be 100%, indicating that the clinicians' prediction was entirely

based on the included characteristics. If, on the other hand, there was no match between predicted outcomes for a given category and the clinicians' expectations of outcome, the predicted probability would be 0%.

In the longitudinal part of the study patients in the 'don't know' category were excluded since we were interested in the predictive accuracy of clinicians' expectations only when they were able to come to a conclusion. Linear and logistic univariate regressions were performed to test for associations between prediction (clinicians' as well as prediction by the SBT) and outcome. Potential dependency between observations from the same clinics was taken into account using STATA's cluster option for robust variance estimation with clinics as cluster level.

The discriminative ability calculated as area under the curve (AUC) was compared between the clinicians' expectations and the SBT. Positive likelihood ratios (LH^+) for a poor outcome were calculated for each category of the clinicians' expectations and the SBT. The positive predictive value (PPV) for the short/uncomplicated category predicting a good 2-weeks outcome and for long-lasting/chronic predicting a poor 12-months outcome were calculated to represent the outcome that seemed to correspond best to the expectation categories provided to the clinicians. Similar PPVs were calculated for the SBT model. Finally, the amount of explained variance in continuous outcome measures (adjusted R-squared) was compared between the models and also used to quantify the effect of combining clinicians' expectations and the SBT.

For the multivariable analysis missing values on baseline factors were imputed by multiple imputations based on fully conditional specifications with five chained iterations without replacing missing values on outcome measures [21]. No item had more than 7% missing values.

Results

Participants

Baseline information was available from 890 participants of which 31 (3%) were excluded from the analyses because there was no registration of the clinician's expectations. Characteristics of the study cohort (n=859) and those excluded appear from Table 1. Patients with missing information had statistically significant less leg pain than the study cohort but otherwise no differences were detected. Follow-up questionnaires after 2 weeks, 3 months and 12 months were available from respectively 83%, 79%, and 74% of participants (Figure 1). Non-responders at the 12-months follow-up did not differ from responders regarding baseline LBP intensity, leg pain intensity, activity limitation, duration of LBP, sick leave, SBT risk group, or the clinician's expectations. However, non-responders were on average 5.5 years younger and a larger proportion was male (63% vs. 54%), smoker (27% vs. 17%), and reported heavy physical workload (31% vs. 19%).

Cross-sectional part investigating clinicians' expectations

The chiropractors expected a short/uncomplicated course in 54% of the cohort, a prolonged course in 36%, a long-lasting/chronic course in 7%, and did not know what to expect in 3%. Patient characteristics are compared between these groups in Table 1. Gender, education, number of previous episodes, LBP last year, duration of the present episode, leg pain, activity limitation, SBT items, depression, general health, the

Quebec classification, and whether the patient had previously visited a chiropractor were all associated with the expected prognosis in the univariate analyses ($p<.05$) (Table 1).

A multivariable model demonstrated that independently of other measured factors, clinicians more often expected a prolonged or a long-lasting course than a short/uncomplicated in patients with higher BMI, more previous LBP, long duration of the present episode, more disability, radiating pain, and neurological signs and of female sex (Table 2). Having more than five years of education after finishing public school was associated with the clinicians predicting a short/uncomplicated course. Clinicians felt more often unable to predict the clinical course in patients with long duration, shoulder/neck pain or nerve root involvement whereas a long education, having light physical workloads, and age between 35 and 45 years reduced the likelihood of the clinician choosing the 'don't know' option (Table 2).

We used information from the baseline questionnaire to calculate which category (short/uncomplicated, prolonged or long-lasting) the clinicians would be expected to assign each patient to if that decision could be explained as a product of just the factors registered in the questionnaire. When averaging across all categories, the probability that the outcome predicted by the combination of patient-reported baseline factors matched the clinicians' expectation of outcome was 62% (95% CI: 60-65%). The outcome category with the lowest probability for matching between the prediction from patient-reported baseline factors and the clinicians' expectation of outcome was for the long-lasting/chronic group at 18% (95% CI: 8-34%). These results imply that clinicians' expectations were likely based on other, and possibly more complex, factors than those registered in the baseline questionnaire.

Longitudinal part

Associations between chiropractors' expectations and outcome

Clinicians' expectations were significantly associated with all outcome measures at all follow-up points. Table 3 shows the differences in mean LBP intensity and RMDQ scores between the short/uncomplicated group and the other groups (β-values), and the odds ratios for poor outcome in the prolonged and long-lasting/chronic groups as compared to the short/uncomplicated group. LBP intensity and activity limitation in the expectation groups during the follow-up period are illustrated in Figure 2.

Clinicians' expectations compared to the STarT Back Tool

The abilities of the clinicians' expectations and the SBT to discriminate patients with a poor outcome from others are presented in Tables 4 and 5. AUC values quantify the ability to discriminate between patients with good and poor outcome and range from 0.5 (no better than tossing a coin) to 1 (perfect discrimination). The discriminative ability of the clinicians' expectations (AUCs 0.58 to 0.63) and the SBT (AUCs 0.50 to 0.61) were of similar magnitudes and generally low. Because the number of patients in some categories was low some of the estimated likelihood ratios in Tables 4 and 5 are subject to uncertainty as apparent from the wide confidence intervals.

In the group expected by the clinicians to have a short/uncomplicated course, 11% were pain free (LBP=0) after two weeks (PPV =0.11; 95% CI: 8-15%), and similarly in the group predicted to be in low risk of poor prognosis by the SBT, 10% (95% CI: 6-14%) were pain free. The group expected to have long-lasting LBP by

clinicians, 83% (95% CI: 67-93%) actually had a poor 12-months outcome, whereas this was only true for 60% (95% CI: 44-74%) in the high risk SBT group.

The clinicians' expectations as well as the prediction of outcome by SBT explained only little of the variation in the continuous outcomes, meaning that patient outcomes differed substantially within each prediction category. Clinicians' expectations and the SBT combined were slightly better than each of the two by themselves when predicting activity limitation after 3 and 12 months, but the proportions explained remained low (Table 6).

Discussion

Chiropractors expected a short uncomplicated course for about half of their LBP patients and a severe long-lasting course for less than 10% when asked to choose one of three prognostic categories. The clinicians' expected outcomes were associated with a number of previously identified prognostic factors. Long duration, radiating pain, and nerve root involvement were factors strongly associated with clinicians' expectations of a severe long-lasting course, whereas the registered psychological factors had no independent association with the expected prognosis. This is in contrast to the SBT in which identification of the 'high risk' category is based on psychological factors. Long duration and nerve root involvement also increased the probability of the clinician stating that he/she did not know which prognosis to expect. Despite individual associations with previously identified prognostic factors, combining the patient-reported baseline characteristics mathematically in a regression model did not accurately predict clinicians' expectations, especially when considering the long-lasting/chronic outcome category. These findings suggest that the clinicians' may have used other pieces of information to make their prognostic estimates. The clinical process of establishing a prognosis ought to be further elucidated in qualitative or mixed methods studies which may inform future development of prediction models.

The prognosis expected by the clinicians was significantly associated with the observed clinical course. The mean outcome in the expectation groups differed by a sufficient magnitude that we believe the groups were truly clinically different. However, prediction on an individual level was not accurate (as discrimination between patients with good and poor outcome was low), at least not when the clinical course was defined by the applied outcome measures. Compared to these outcome measures the expectations about outcome were generally overoptimistic as observed also in a recent study investigating GPs' prediction of outcome in musculoskeletal pain [7]. One possible explanation for the lack of accurate prediction is that the clinicians may have thought of expected 'course' as for instance expected number of treatments, whereas we tested if their predictions were in line with recovery from pain and activity limitation. The SBT was not helpful as a tool for increasing the accuracy of the prediction. That finding was in line with a previous study that did not find the SBT very useful as a prognostic tool in chiropractic practice [22].It seems that the relatively low prognostic ability of the SBT in this cohort is related to many patients presenting with short duration of LBP [23], and it can be speculated that psychological factors may not be very influential in chiropractic patients as indicated by the only prospective study that we know of investigating this [24], conceivably because psychological distress appears to be infrequent in chiropractic patients [24-26].

The main limitation of this study was that the measure of clinicians' expectations was not validated and it is uncertain to what extent the expectation question could be anticipated to match the outcome measures. It

is possible that clinicians define 'short and uncomplicated' differently than being pain free and likewise it is unknown what clinicians would define as 'prolonged' or 'long-lasting' since this was not specifically defined in the question. It may not be problematic that the positive predictive value was low if clinicians' definition of the prognostic categories is different from what was captured by our outcome measures; as long as they make sure that their patients have the same understanding when informed about prognosis. Future studies should use an expectation question that aligns closely with outcome as demonstrated by Mallen et al. [7].

Still, the study provided new insights based on a large study sample with quite complete data and an acceptable drop-out rate that we did not suspect to influence conclusions. A further strength was the relatively large number of participating chiropractors which increased the generalizability of the results. The number of patients included by each clinician was not sufficient to investigate potential individual differences between clinicians.

In summary, chiropractors' expectations of the clinical course was associated with well-established prognostic factors but was not simply a product of these. Chiropractors were able to predict differences in outcome up to one year after the initial visit on a group level but did not predict individual patients' outcome precisely although as well as the SBT. Therefore it is worth investigating if more accurate tools can be developed to assist clinicians in prediction of outcome. Although subject to uncertainty, chiropractors identified a group with markedly increased risk of a poor outcome more precisely than the SBT and the development of prediction rules may benefit from understanding better how clinicians predict poor long-term outcome. In short, chiropractors cannot rely solely on their gut feeling when telling LBP patients what to expect, but they have an insight that may help researchers in the development of improved prediction tools.

References

1. Kent PM, Keating JL: **Can we predict poor recovery from recent-onset nonspecific low back pain? A systematic review**. *ManTher* 2008, **13**(1):12-28.
2. Hayden JA, Dunn KM, van der Windt DA, Shaw WS: **What is the prognosis of back pain?** *Best practice & research Clinical rheumatology* 2010, **24**(2):167-179.
3. Jellema P, van der Windt DA, van der Horst HE, Stalman WA, Bouter LM: **Prediction of an unfavourable course of low back pain in general practice: comparison of four instruments**. *The British journal of general practice : the journal of the Royal College of General Practitioners* 2007, **57**(534):15-22.
4. Schiottz-Christensen B, Nielsen GL, Hansen VK, Schodt T, Sorensen HT, Olesen F: **Long-term prognosis of acute low back pain in patients seen in general practice: a 1-year prospective follow-up study**. *Fam Pract* 1999, **16**(3):223-232.
5. Newell D, Field J, Visnes N: **Prognostic accuracy of clinicians for back, neck and shoulder patients in routine practice**. *Chiropractic & manual therapies* 2013, **21**(1):42.
6. Hill JC, Vohora K, Dunn KM, Main CJ, Hay EM: **Comparing the STarT back screening tool's subgroup allocation of individual patients with that of independent clinical experts**. *Clin J Pain* 2010, **26**(9):783-787.
7. Mallen CD, Thomas E, Belcher J, Rathod T, Croft P, Peat G: **Point-of-care prognosis for common musculoskeletal pain in older adults**. *JAMA internal medicine* 2013, **173**(12):1119-1125.
8. Hill JC, Dunn KM, Lewis M, Mullis R, Main CJ, Foster NE, Hay EM: **A primary care back pain screening tool: identifying patient subgroups for initial treatment**. *Arthritis Rheum* 2008, **59**(5):632-641.

9. Hill JC, Whitehurst DG, Lewis M, Bryan S, Dunn KM, Foster NE, Konstantinou K, Main CJ, Mason E, Somerville S *et al*: **Comparison of stratified primary care management for low back pain with current best practice (STarT Back): a randomised controlled trial**. *Lancet* 2011, **378**(9802):1560-1571.
10. Perrot S, Allaert FA, Concas V, Laroche F: **"When will I recover?" A national survey on patients' and physicians' expectations concerning the recovery time for acute back pain**. *Eur Spine J* 2009, **18**(3):419-429.
11. Eirikstoft H, Kongsted A: **Patient characteristics in low back pain subgroups based on an existing classification system. A descriptive cohort study in chiropractic practice**. *Man Ther* 2014, **19**(1):65-71.
12. **Danish National Commitee on Biomedical Research Ethics. Guidelines about Notification. http://www.cvk.sum.dk/English/guidelinesaboutnotification.aspx**
13. Jensen MP, Miller L, Fisher LD: **Assessment of pain during medical procedures: a comparison of three scales**. *ClinJ Pain* 1998, **14**(4):343-349.
14. Kent P, Lauridsen HH: **Managing missing scores on the Roland Morris Disability Questionnaire**. *Spine (Phila Pa 1976)* 2011, **36**(22):1878-1884.
15. Waddell G, Newton M, Henderson I, Somerville D, Main CJ: **A Fear-Avoidance Beliefs Questionnaire (FABQ) and the role of fear- avoidance beliefs in chronic low back pain and disability**. *Pain* 1993, **52**(2):157-168.
16. Bech P, Rasmussen NA, Olsen LR, Noerholm V, Abildgaard W: **The sensitivity and specificity of the Major Depression Inventory, using the Present State Examination as the index of diagnostic validity**. *JAffectDisord* 2001, **66**(2-3):159-164.
17. Rabin R, de Charro F: **EQ-5D: a measure of health status from the EuroQol Group**. *AnnMed* 2001, **33**(5):337-343.
18. Spitzer WO, LeBlanc FE, Dupuis M: **Scientific approach to the assessment and management of activity-related spinal disorders. A monograph for clinicians. Report of the Quebec Task Force on Spinal Disorders**. *Spine* 1987, **12**(7 Suppl):S1-59.
19. Kamper SJ, Maher CG, Herbert RD, Hancock MJ, Hush JM, Smeets RJ: **How little pain and disability do patients with low back pain have to experience to feel that they have recovered?** *Eur Spine J* 2010, **19**(9):1495-1501.
20. Lauritsen JM: **EpiData Data Entry. Data Management and basic Statistical Analysis System**. In. Odense, Denmark; 2008.
21. Moons KG, Donders RA, Stijnen T, Harrell FE, Jr.: **Using the outcome for imputation of missing predictor values was preferred**. *Journal of clinical epidemiology* 2006, **59**(10):1092-1101.
22. Field J, Newell D: **Relationship between STarT Back Screening Tool and prognosis for low back pain patients receiving spinal manipulative therapy**. *Chiropractic & manual therapies* 2012, **20**(1):17.
23. Morso L, Kongsted A, Hestbaek L, Kent P: **The prognostic ability of the STarT Back Tool was affected by episode duration**. *Eur Spine J* 2015.
24. Leboeuf-Yde C, Rosenbaum A, Axen I, Lovgren PW, Jorgensen K, Halasz L, Eklund A, Wedderkopp N: **The Nordic Subpopulation Research Programme: prediction of treatment outcome in patients with low back pain treated by chiropractors--does the psychological profile matter?** *Chiropractic & osteopathy* 2009, **17**:14.
25. Bolton JE: **Psychological distress and disability in back pain patients: evidence of sex differences**. *J Psychosom Res* 1994, **38**(8):849-858.
26. Kongsted A, Johannesen E, Leboeuf-Yde C: **Feasibility of the STarT back screening tool in chiropractic clinics: a cross-sectional study of patients with low back pain**. *Chiropractic & manual therapies* 2011, **19**:10.

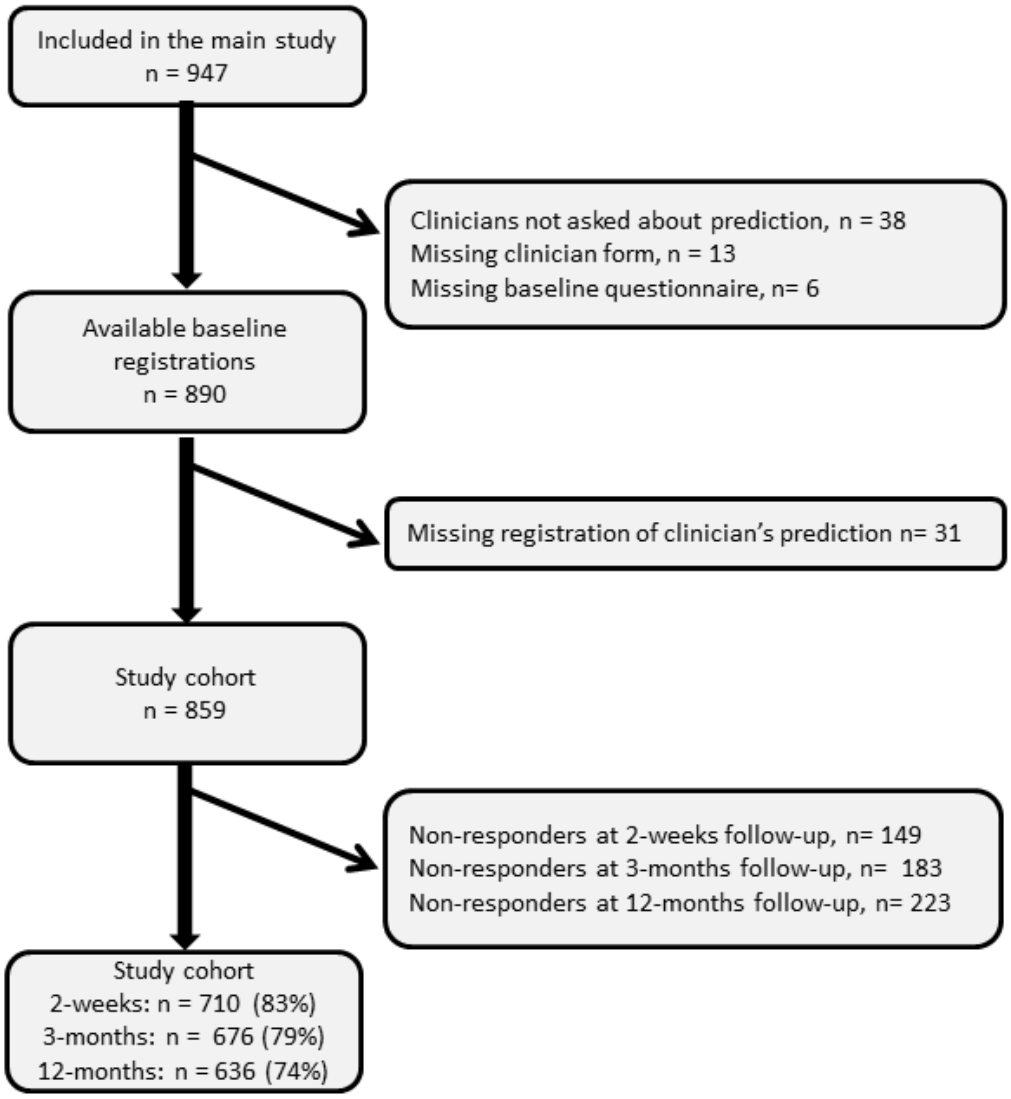

Figure 1. Flow of study participants. The study is a secondary analysis of data from a cohort study (main study).

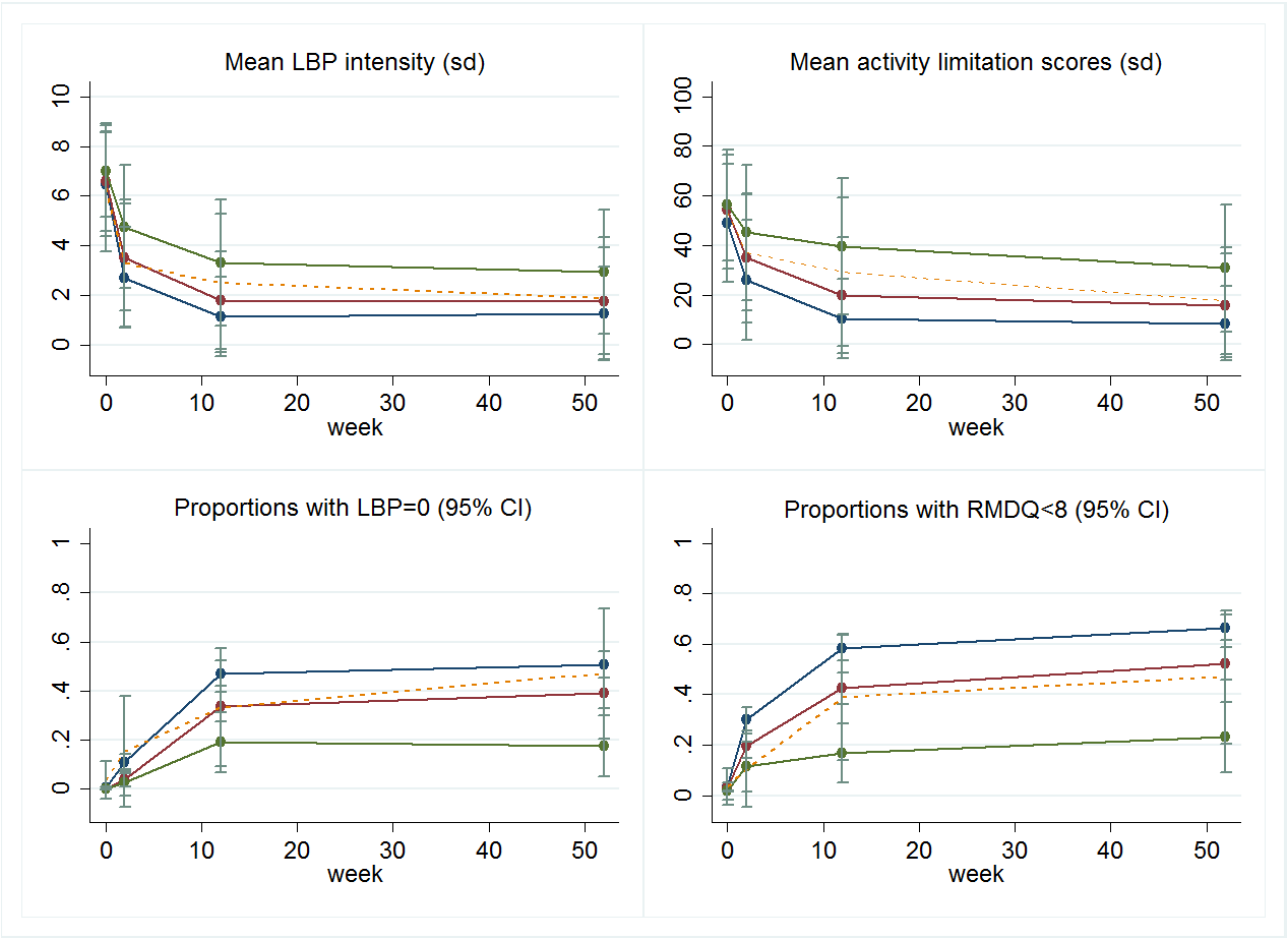

Figure 2. LBP and activity limitation at 2-weeks, 3-months, and 12-months follow-up in the clinician prediction groups.

Blue: Short/uncomplicated; Red: Prolonged; Green: Long-lasting/chronic, Yellow: Don't know.

Table 1. Patient characteristics in the clinicians' expectations categories

	Clinicians' expectations of LBP course			
	Short / uncomplicated (n = 460)	**Prolonged** (n= 313)	**Long-lasting / chronic** (n= 57)	**Don't k** (n = 29)
Female[a]	37%	52%	47%	55%
Age, mean (sd)	43 (11)	43 (12)	44 (13)	44 (12)
BMI, mean (sd)	26 (4)	27 (5)	27 (12)	25 (4)
Smoking				
Smoker	19%	20%	23%	26%
Ex-smoker	20%	30%	15%	15%
Never smoker	61%	46%	59%	59%
Education[a]				
No qualifying	6%	10%	19%	15%
<5 years	76%	74%	79%	73%
≥ 5 years	18%	16%	2%	12%
Work load				
Sitting	25%	22%	10%	30%
Sitting – walking	33%	35%	45%	15%
Light physical	22%	19%	22%	19%
Heavy physical	20%	23%	22%	37%
LBP sick leave[b]	20%	28%	16%	27%
Previous episodes [a]				
0	16%	17%	14%	19%
1-3	39%	36%	13%	26%
> 3	45%	48%	73%	56%
>30 days LBP last year [a]	12%	38%	59%	50%
Duration of LBP[a]				
0-2 weeks	75%	52%	36%	33%
2-4 weeks	15%	12%	7%	15%
1-3 months	7%	16%	7%	7%
>3 months	3%	20%	50%	44%
LBP (0-10), mean (sd)	6.5 (2)	6.6 (2)	7.0 (2)	6.3 (3)
Leg pain (0-10), mean (sd)[a]	1.9 (2)	3.1 (3)	3.7 (3)	3.2 (3)
RMDQ (0-100), mean (sd) [a]	49 (24)	54 (24)	56 (22)	53 (23)
START back tool				
Item 2: shoulder or neck pain[a]	43%	47%	64%	67%
Item 7: catastrophizing [a]	4%	8%	19%	19%
Item 9: bothersome pain[a]	62%	74%	75%	59%
FABQ activity (0-24), mean (sd)	12 (5)	13 (5)	14 (5)	13 (6)
MDI (0-50), mean (sd)[a]	7 (6)	9 (8)	13 (9)	10 (8)
General Health (0-100), mean (sd)[a]	70 (19)	64 (21)	62 (23)	62 (21)

Quebec classification[a]				
Local LBP	75%	56%	49%	52%
LBP + pain above the knee	22%	27%	21%	38%
LBP + pain below the knee	3%	13%	19%	3%
Nerve root involvement /stenosis	0%	4%	11%	7%
Previously visited a chiropractor [a]	67%	57%	59%	46%

RMDQ = Roland Morris Disability Questionnaire, FABQ = Fear Avoidance Beliefs Questionnaire, MDI = Major Depression Inventory

[a] Factor statistically significantly associated with clinicians' predictions in univariate analyses. Tests of group differences did not include 'missing prediction'.

[b] Sick leave includes 765 responding to 'sick leave' of 779 working or studying

Table 2. The relative risks of belonging to another expectation category than 'short uncomplicated LBP' Short/uncomplicated LBP was used as the reference category.

	Prolonged (n= 313) RRR(95% CI)	**Long-lasting / Chronic** (n= 57) RRR(95% CI)	**Don't know** (n = 29) RRR(95% CI)
Female	1.52 (1.20-1.96)		
Age 35-45 years			.45 (.20-.98)
BMI (observed range 18-58)	1.05 (1.01-1.09)	1.06 (1.00-1.13)	
≥5years education	.54 (.35-.84)	.27 (.09-.84)	.16 (.04-.64)
Light physical work load			.34 (.14-.85)
>30 days LBP last year	2.10 (1.35-3.27)	2.38 (1.34-4.22)	
1-2 previous episodes		.37 (.20-.67)	
Duration			
1-3 months	2.53 (1.24-5.16)		
>3 months	8.97 (5.03-16.0)	33.3 (10.7-103)	31.5 (9.59-103)
RMDQ 0-100 (observed range 0-100)	1.02 (1.01-1.03)	1.03 (1.00-1.04)	1.03 (1.01-1.05)
SBT item 2: Shoulder or neck pain			2.05 (1.13-3.72)
Quebec classification			
LBP + pain below the knee	5.87 (2.84-12.2)	8.76 (3.67-20.9)	
Nerve root involvement/stenosis	14.2 (1.47-138)	55.1 (4.90-319)	21.9 (4.93-97.1)

The table presents estimated relative risk ratios for associations with p<.05 in a multivariable multinomial logistic regression model with clinicians' expectation as the dependent variable.

Table 3. Associations between clinicians' expectations and outcome

		Outcome measure		
	Clinicians' expectations	**LBP (0-10)** β[a] (95% CI)	**LBP>0** OR[b] (95% CI)	**RMDQ (0** β (95%
2-weeks follow-up		p=.004	p<.001	p<.00
	Short (reference cat.)			
	Prolonged	.83 (.32 – 1.34)	3.1 (1.7-5.6)	8.98 (.44
	Long-lasting/chronic	2.06 (.77-3.34)	4.5 (.6-35.0)	19.3 (11.2
3-months follow-up		p<.001	p<.001	p<.00
	Short (reference cat.)			
	Prolonged	.64 (.37 - .91)	1.8 (1.3-2.3)	9.39 (4.58-
	Long-lasting/chronic	2.15 (1.17 – 3.12)	3.8 (1.9-7.4)	29.1 (21.1
12-months follow-up		p<.001	p<.001	p<.00
	Short (reference cat.)			
	Prolonged	.52 (.12-.91)	1.6 (1.1-2.3)	7.25 (4.42
	Long-lasting/chronic	1.68 (.98-2.39)	4.9 (2.6-9.1)	22.3 (13.9

Outcome LBP: n=551 2-weeks; n=653 3-months; n=609 12-months. Outcome RMDQ: n=690 2-weeks; n=656 3-months; n=610 12-months

[a] β- values are differences in mean LBP and RMDQ scores. E.g. β = .83 for the 'Prolonged group' at 2-weeks follow-up, means that the mean LBP intensity in the prolonged group was 0.83 points higher than in the short/uncomplicated group.

[b] Odds Ratios. E.g. OR= 3.1 at 2-weeks follow-up means that the odds of poor outcome was 3.1 times as high in the prolonged group as in the short/uncomplicated group

Table 4. Predictive abilities for the prediction of a persistent pain after 2-weeks, 3-months, and 12-months

		LBP>0			
		AUC (95% CI)	**Positive likelihood ratio** **Negative likelihood ratio**		
			GRP I[a] (95% CI)	**GRP II**[a] (95% CI)	**GRP III**[a] (95% CI)
2-weeks follow-up	Clinicians' expectations	.63 (.56-.70)	LR^+= .68 (.57-.81) LR^-= 2.2 (1.2-3.9)	LR^+=2.1 (1.1-3.9) LR^-= .75 (.64-.88)	LR^+=3.1 (.43-21.7) LR^-= .95 (.90-1.0)
	SBT[c]	.58 (.50-.65)	LR^+= .81 (.64-1.0) LR^-= 1.4 (.88-2.1)	LR^+= 1.1 (.71-1.7) LR^-= .95 (.75-1.2)	LR^+= [b] LR^-= .91 (.89-.94)
3-months follow-up	Clinicians' expectations	.59 (.55-.63)	LR^+= .76 (.66-86) LR^-= 1.5 (1.2-1.8)	LR^+= 1.3 (1.1-1.7) LR^-= .85 (.76-.96)	LR^+= 2.9 (1.4-6.1) LR^-= .94 (.91-.98)
	SBT[c]	.50 (.46-.55)	LR^+= 1.0 (.88-1.2) LR^-= .99 (.82-1.2)	LR^+= .90 (.73-1.1) LR^-= 1.1 (.94-1.2)	LR^+= 1.5 (.8-2.8) LR^-= .97 (.92-1.0)
12-months follow-up	Clinicians' expectations	.58 (.55-.62)	LR^+= .77 (.67-.88) LR^-= 1.4 (1.2-1.7)	LR^+= 1.2 (1.0-1.5) LR^-= .88 (.78-1.0)	LR^+= 3.7 (1.7-8.3) LR^-= .93 (.89-.97)
	SBT[c]	.51 (.47-.55)	LR^+= .98 (.85-1.1) LR^-= 1.0 (.85-1.2)	LR^+= .99 (.80-1.2) LR^-= 1.0 (.88-1.1)	LR^+= 1.2 (.66-2.1) LR^-= .99 (.94-1.0)

Prevalence of LBP>0: 92% 2-weeks, 60% 3-months, 56% 12-months.

[a] Clinicians' expectations of outcome: GRP I (short) n=460 (55%), GRP II (prolonged) n=313(38%), GRP III (long-lasting) n=57(7%).

[a] SBT: GRP I (low risk) n=412 (54%), GRP II (medium risk) n=291 (38%), GRP III (high risk) n=62(8%).

[b] all poor outcome, [c] association with LBP outcome non-significant (p>.1)

Table 5. Predictive abilities for the prediction of a persistent disability after 2-weeks, 3-months, and 12-months

		RMDQ>8			
		AUC (95% CI)	**Positive likelihood ratio** **Negative likelihood ratio**		
			GRP I[a]	**GRP II**[a]	**GRP III**[a]
2-weeks follow-up	Clinicians' expectations	.58 (.54-.63)	LR^+= .77 (.67-.88) LR^-= 1.5 (1.2-1.9)	LR^+= 1.4 (1.1-1.8) LR^-= .84 (.75-.95)	LR^+= 2.6 (1.0-6.5) LR^-= .95 (.92-.99)
	SBT	.61 (.57-.65)	LR^+= .70 (.61-.80) LR^-= 1.7 (1.4-2.3)	LR^+= 1.5 (1.2-2.0) LR^-= .81 (.72-.91)	LR^+= 3.9 (1.4-10.8) LR^-= .92 (.89-.96)

3-months follow-up	Clinicians' expectations	.61 (.57-.65)	LR^+= .70 (.61-.81) LR^-= 1.6 (1.3-1.9)	LR^+= 1.4 (1.1-1.7) LR^-= .84 (.74-.94)	LR^+= 5.0 (2.2-11.0) LR^-= .91 (.88-.95)
	SBT	.59 (.55-.63)	LR^+= .73 (.63-.84) LR^-= 1.5 (1.3-1.8)	LR^+= 1.4 (1.1-1.7) LR^-= .83 (.73-.93)	LR^+= 2.0 (1.1-3.6) LR^-= .94 (.90-.99)
12-months follow-up	Clinicians' expectations	.61 (.57-.65)	LR^+= .71 (.61-.83) LR^-= 1.5 (1.3-1.8)	LR^+= 1.3 (1.0-1.6) LR^-= .86 (.76-.98)	LR^+= 4.7 (2.3-9.7) LR^-= .90 (.86-.95)
	SBT	.60 (.56-.64)	LR^+= .70 (.59-.82) LR^-= 1.5 (1.3-1.8)	LR^+= 1.4 (1.2-1.8) LR^-= .81 (.71-.92)	LR^+= 2.0 (1.2-3.6) LR^-= .94 (.89-.99)

Prevalence RMDQ>8: 79% 2-weeks, 61% 3-months, 57% 12-months

[a] Clinicians' expectations of outcome: GRP I (short) n=460 (55%), GRP II (prolonged) n=313(38%), GRP III (long-lasting) n=57(7%).

[a] SBT: GRP I (low risk) n=412 (54%), GRP II (medium risk) n=291 (38%), GRP III (high risk) n=62(8%).

Table 6. Variance explained (R^2) in continuous outcomes by clinicians' expectations categories, by SBT groups and by combining the two

		LBP intensity		RMDQ	
		p	Adj. R^2	p	Adj. R^2
2-weeks follow-up	Clinicians' expectations	.004	.07	<.001	.05
	SBT	<.001	.04	<.001	.12
	CE + SBT[a]	<.001	.09	<.001	.14
3-months follow-up	Clinicians' expectations	<.001	.08	<.001	.13
	SBT	.3	.01	<.001	.07
	CE + SBT[a]	.001	.08	<.001	.20
12-months follow-up	Clinicians' expectations	<.001	.04	<.001	.09
	SBT	.02	.02	.001	.03
	CE + SBT[a]	.001	.05	<.001	.12

[a] The model includes clinicians' expectations of outcome (CE), SBT risk groups and an interaction between the two if p<.1 for the latter