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After an Episode of Acute Low Back Pain, Recurrence Is Unpredictable and Not as Common as Previously Thought

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Study Design. Inception cohort study.

Objective. To provide the first reliable estimate of the 1-year incidence of recurrence in subjects recently recovered from acute nonspecific low back pain (LBP) and to determine factors predictive of recurrence in 1 year.

Summary of Background Data. Previous studies provide potentially flawed estimates of recurrence of LBP because they do not restrict the cohort to those who have recovered and are therefore eligible for a recurrence.

Methods. We identified 1334 consecutive patients who presented to primary care with acute LBP; of these 353 subjects recovered before 6 weeks and entered the current study. The primary outcome measure was recurrence of LBP in the next year. Specifically, an episode of recurrence was defined in 2 ways: recall of recurrence at the 12-month follow-up and report of pain at the 3- or 12-month follow-up. Risk factors for recurrence were assessed at baseline. Pain intensity was assessed at 6 weeks, 3 months, and 12 months and recurrence at 12 months. Factors that could plausibly affect recurrence were chosen a priori and evaluated using a multivariable regression analysis.

Results. Recurrence of LBP was found to be much less common than previous estimates suggest, ranging from 24% (95% CI = 20%–28%) using "12-month recall" definition of recurrence, to 33% (95% CI = 28%–38%) using "pain at follow-up" definition of recurrence. However, only 1 factor, previous episode(s) of LBP, was consistently predictive of recurrence within the next 12 months (odds ratio = 1.8–2.0, $P = 0.00–0.05$).

Conclusion. This study challenges the assumption that the majority of subjects will have a recurrence of LBP in a 1-year period. After the resolution of an episode of acute LBP, about 25% of subjects will have a recurrence in the next year. It is difficult to predict who will have a recurrence within the next year.

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Effective management of low back pain (LBP) depends on both the delivery of appropriate interventions during the initial episode and the identification and treatment of patients at a higher risk of recurrence. Unfortunately many contemporary treatments have weak and/or unpredictable effects and it is difficult to identify patients more likely to have a recurrence of LBP. These factors contribute to the large societal costs of LBP, estimated to be a total of $90.8 billion per annum (USD).[1] An improved understanding of the course of LBP would permit more cost-effective allocation of resources to secondary prevention.

There is agreement that many patients with acute LBP will suffer a recurrence in the next 12 months.[2–5] Estimates of the 1-year incidence of a recurrence of an episode of pain vary however, from 47% to 84%,[2,6–10] with several studies likely to provide misleading estimates. Many previous studies do not follow a cohort of people eligible for a recurrence, that is, those recently recovered from an episode of acute LBP. Instead, the usual approach is to study a cohort of patients with LBP and survey them at a later point (*e.g.*, at 1 year), to establish what proportion of the cohort had a recurrence.[10–12] The error in this approach is that some subjects will never have recovered from the initial episode of LBP and so logically cannot have a recurrence. Others may have recovered quite late and so have only been at risk of recurrence for a short time. These 2 errors may seriously distort estimates of the 1-year incidence of recurrence.

The problem of not establishing that a person has recovered from LBP is related to another common error: not using a standardized definition of an episode of LBP. This makes interpretation of previous literature difficult. Recently, an important paper by de Vet *et al*[13] defined an episode of LBP as a period of pain in the lower back lasting for more than 24 hours, preceded and followed by a period of at least 1 month without LBP. Similar definitions are also given for episodes of care and episodes of work absence because of LBP.[13]

Therefore, the only meaningful way to study the incidence of recurrence is to enroll a cohort of patients at risk of recurrence, use a standardized definition of an episode of LBP, and follow all patients for the same length of time. To date, few studies have examined recurrence in this way resulting in potentially flawed estimates of the

incidence, and predictive factors, of recurrence. Furthermore, the results of many randomized controlled trials evaluating treatment for LBP where recurrence is an outcome may provide flawed information as well. This creates difficulties when trying to evaluate research to determine the best course of treatment for both patient outcome and cost savings.

Consequently, the purpose of this study was to determine the 1-year incidence of recurrence and predictive factors for a recurrence in a cohort of people recently recovered from an episode of acute LBP.

■ Materials and Methods

Parent Study

Participants. Participants for the current study were drawn from a cohort study investigating the prognosis and diagnosis of acute LBP in primary care. This project received ethical approval from the University of Sydney Human Research Ethics Committee. A detailed protocol of the primary study has been published previously.[14,15] In brief, an inception cohort of patients presenting to Sydney primary care clinicians with recent onset LBP (duration less than 6 weeks) was recruited (N = 1334). Subjects were recruited from general practitioners, physiotherapists, and chiropractors within the study area. In Australia, these clinicians are the main providers of primary care for LBP.[16]

Inclusion/Exclusion Criteria. An episode of acute LBP was defined as pain in the area bounded superiorly by T12 and inferiorly by the buttock crease,[13] lasting for more than 24 hours but less than 6 weeks, and preceded by a period of at least 1 month without back pain.[14,17] To be eligible, participants were at least 14-years old, provided written consent to participate in the study, and were able to speak and read English. Exclusion from the study occurred if a serious pathology (*e.g.*, cancer, spinal infection, spinal fracture, inflammatory arthritis) had already been diagnosed as the cause of this episode of LBP.

Procedure. A baseline assessment was conducted where factors related to the participants' current history, past history, presence of red flags (clinical features associated with serious spinal pathology), sociodemographics, general health, psychological status, and occupational status were assessed. LBP intensity and interference with function were also assessed using modified questions from the SF-36. Follow-up assessment of these same factors was conducted *via* telephone interview at 6 weeks, 3 months, and 12 months. The date of recovery was defined as the first day of a pain-free period of 1 month.[13] Participants were also questioned regarding recurrence of LBP at the 12-month follow-up.

Present Study

Participants. For the present study we included only participants who had recovered by the 6-week follow-up (*e.g.*, the start date of their pain-free month was before 6 weeks). In this way, only participants who were eligible to have a recurrence were included. This resulted in the inclusion of 353 subjects with a mean age of 43.1 years (±14.9). (See Table 1 for subject demographics.) A 100% follow-up rate was achieved over a 12-month period for these participants.

Table 1. Baseline Characteristics of the 353 Patients Who Had Recovered by the 6-Week Follow-up

Variable	Participants n = 353
Age (yrs)	
Mean (±SD)	43.1 (±14.9)
Gender	
Male (%)	201 (56.9%)
Primary care clinician	
General practitioner	58 (16.4%)
Physiotherapist	192 (54.4%)
Physiotherapist with advanced training	83 (23.5%)
Chiropractor	20 (5.7%)
Born in Australia	252 (71.4%)
Aboriginal/Torres Strait Islander	2 (0.6%)
Smoker	51 (14.4%)
Exercising regularly (at least 30 min/day)	206 (58.4%)
Self-rated health	
Poor	2 (0.6%)
Fair	12 (3.4%)
Good	108 (30.6%)
Very good	161 (45.6%)
Excellent	70 (19.8%)
Self-rated risk of persistent pain*	
Mean (±SD)	3.6 (±2.6)
Highest level of education	
Diploma or higher	159 (45.0%)
Previous episode(s) of LBP	239 (67.7%)
Previous sick leave due to LBP	127 (36.0%)
Previous surgery for LBP	6 (1.7%)
Sudden onset of LBP	287 (81.3%)
Compensable LBP	37 (10.5%)
Currently taking medication for LBP	117 (33.1%)
No. red flags†	
≤3	318 (90.1%)
≥3	35 (9.9%)
Days forced to cut down on usual activities because of LBP	
Mean (±SD)	3.1 (±3.1)
Interference with function because of LBP	
Not at all	27 (7.6%)
A little bit	72 (20.4%)
Moderately	96 (27.2%)
Quite a bit	117 (33.1%)
Extremely	41 (11.6%)
Leg pain	63 (17.8%)
LBP intensity	
Very mild	23 (2.3%)
Mild	86 (8.5%)
Moderate	360 (35.8%)
Severe	443 (44.0%)
Very severe	94 (9.3%)
Days off from work or school because of LBP (n = 292)	
Mean (±SD)	1.3 (±2.0)
Working pre-injury	278 (78.8%)

*Rated on a scale from 0 to 10, with higher scores indicating a higher perceived risk of persistent pain.
†No. positive of a total of 25 clinical red flags. No patient had more than 7.

Outcome Measures. Recurrence of LBP was the primary outcome measure examined in the present study. Recurrence was assessed in 2 ways: *via* 12-month recall alone and by supplementing this with pain measures taken at 3 and 12 months. The 12-month recall measure of recurrence was the participants' response at the 12-month follow-up phone interview when they were asked whether they had experienced a recurrence of LBP that lasted for more than 24 hours, since the date of recovery. The second measurement of recurrence also included participants who reported pain at the 3- or 12-month follow-up even if they failed to report a recurrence at 12 months (*e.g.*, they forgot that they had a recurrence of pain).

Factors That Predict Recurrence. Using the factors examined during the baseline assessment, items that could plausibly affect the recurrence of LBP were selected *a priori*. The factors chosen were:

- Smoking (yes/no),
- Participation in habitual physical activity (at least 30 minutes per day; yes/no),
- Perceived general health (1–5 numerical rating scale),
- Qualifications of practitioners (general practitioner, chiropractor, physiotherapist, or physiotherapist with specialization training),
- Previous episodes of LBP (yes/no),
- The patient's opinion of the risk of persistent pain (0–10 numerical rating scale),
- Number of red flags present (0–25).

Statistical Analysis

The 1-year incidence of recurrence of LBP was assessed *via* calculation of the proportion of people who had a recurrence divided by the total number of people eligible to have a recurrence.

A multivariable logistic regression analysis (method = enter) was used to determine the relationship between the selected baseline factors (independent variable) and recurrence of LBP (dependent variable) at 1 year. All independent variables were entered into the regression model in a single step.

Sensitivity analyses, using subjects with LBP duration of less than 2 weeks at baseline and removing subjects less than 18-years old, were performed for both the incidence and predictive factors of recurrence. All analyses were performed using SPSS for Windows version 14.0 (SPSS Inc., Chicago, IL).

■ Results

The 1-year incidence of recurrence of LBP based on recall at 12 months was 24% (95% CI = 20%–28%) for participants whose pain duration was less than 6 weeks at baseline. When recurrence was measured by additionally considering pain reports at 3 and 12 months, the 1-year incidence of recurrence of LBP increased to 33% (95% CI = 28%–38%).

Results of the multivariable regression analysis demonstrated that only one factor, previous episode(s) of LBP, was predictive of a recurrence of LBP within the next 12 months. This was statistically significant for both recurrence definitions (12 month recall: X^2_{LR} = 4.21, 1DF, $P = 0.04$; pain measures: $X^2_{LR} = 7.43$, 1DF, $P = 0.006$). See Table 2 for odds ratios and *P* values for all factors. Using a 12-month recall definition of recurrence, participants who had a previous episode of LBP had 1.8 times (95% CI = 1.0–3.2) the odds of having a recurrence of LBP within the next 12 months than those who did not have a previous episode of LBP. This increased to 2.0 times (95% CI = 1.2–3.4) the odds when using the pain measures over time definition of recurrence (Figure 1).

The results of the sensitivity analysis (participants with pain duration of less than 2 weeks at baseline) were comparable for both incidence of recurrence and predictive factors of recurrence. The results are therefore not presented separately. Similarly, when participants less than 18-years old were removed from the analysis, recurrence rates were unchanged and previous episode(s) of LBP remained the only statistically significant factor predictive of recurrence. However, the odds ratios for this factor were somewhat higher ($X^2_{LR} = 5.46$, 1DF, $P = 0.019$, OR = 2.2, 95% CI = 1.2–4.1; $X^2_{LR} = 8.62$, 1DF, $P = 0.003$, OR = 2.3, 95% CI = 1.4–4.1; for 12-month recall and pain measures over time recurrence definitions, respectively).

Table 2. Risk Factors for Recurrence

	Definition of Recurrence			
	12 mo Recall		Pain Measures	
Factors	Odds Ratio (95% CI)	Sig.	Odds Ratio (95% CI)	Sig.
Previous episodes of LBP	1.8 (1.0–3.2)	0.04	2.0 (1.2–3.4)	0.006
Smoking	1.7 (0.9–3.3)	0.11	1.3 (0.7–2.5)	0.44
Perceived health	1.0 (0.7–1.4)	0.99	1.1 (0.8–1.4)	0.68
Perceived risk of persistent pain	1.0 (0.9–1.1)	0.45	1.0 (0.9–1.1)	0.52
No. red flags	1.3 (0.9–1.3)	0.59	1.0 (0.8–1.2)	0.94
Regular exercise	1.1 (0.6–1.8)	0.80	1.1 (0.7–1.7)	0.82
Qualifications of practitioner	0.9 (0.7–1.1)	0.18	0.9 (0.7–1.0)	0.14

Results are odds ratios (95% CI) with *P* values from the multivariate analysis.

Because a previous episode of LBP is an unmodifiable risk factor we repeated the regression analyses with this factor removed. In these secondary analyses one factor, perceived risk of persistent pain, achieved statistical significance ($X^2_{LR} = 4.01$, 1DF, $P = 0.045$, odds ratio = 0.90, 95%CI = 0.8–1.0) in 1 of the 4 regression models (sensitivity analysis using the pain measures over time to define recurrence). As perceived risk of persistent pain is a continuous variable, we performed a median split (median = 3/10). The adjusted odds ratio for a high perceived risk of persistent pain score (≥3) was calculated to be 1.8 ($X^2_{LR} = 5.28$, 1DF, $P = 0.022$, 95% CI = 1.1–3.1). This means that subjects with a high score in this area have 1.8 times the odds of having a recurrence in the next year than those with a low perceived risk of persistent pain score.

We were surprised that there were so few significant predictors for recurrence at 1 year, so we performed *post hoc* univariate regression analyses for all baseline factors collected (n = 26). All factors with a $P \leq 0.20$ (n = 8) were put into a multivariable regression analysis using the most liberal definition of recurrence (pain measures over time). No factors achieved statistical significance. The only factor that came close to significance was previous episodes of low back pain ($X^2_{LR} = 3.07$, 1DF, $P = 0.08$).

■ Discussion

The present study found that the risk of a recurrence of an episode of pain is much lower than previous estimates suggest. Specifically, we found a recurrence rate of 24%

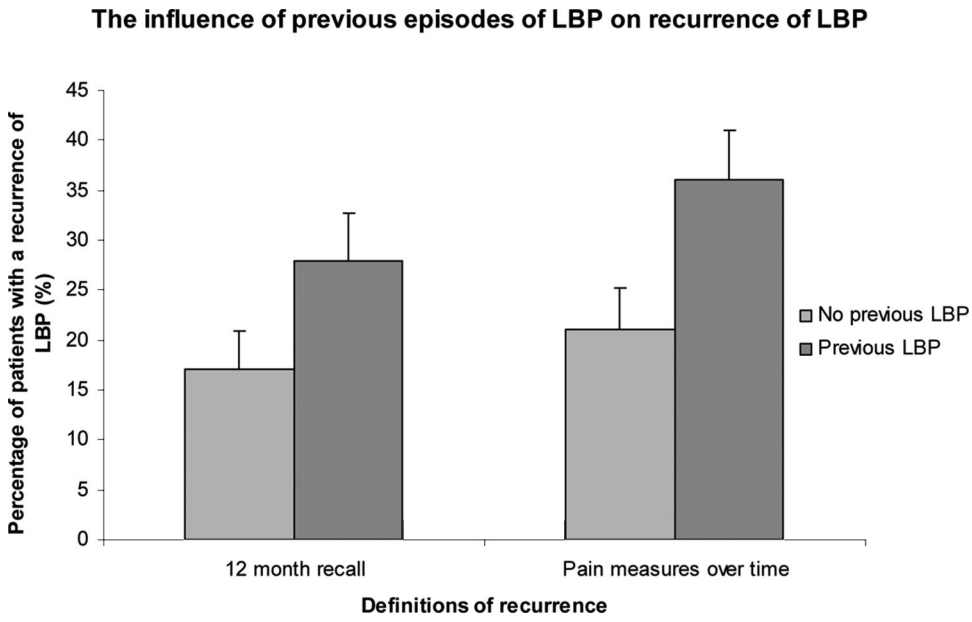

Figure 1. The percentage of subjects with a recurrence of LBP within 12 months of initial episode based on a history of previous episodes of LBP using 2 definitions of recurrence.

based upon 12-month recall, and a rate of 33% when pain measures over time were also considered. Previous estimates of recurrence of an episode of pain reported in the literature range from 47% to 84%.[2,6–10] Our findings challenge the assumption that the majority of patients with an episode of acute low back pain will have a recurrence of LBP within 1 year. We also found that only 1 factor, previous episode(s) of LBP, was consistently predictive of future recurrences of LBP across all regression models.

Factors Affecting Recurrence Rates of an Episode of Back Pain

Our finding of lower recurrence rates for an episode of back pain as compared to previous reports can likely be explained by our inclusion criteria. By restricting our subjects to those who have recovered from the initial episode of pain we have avoided labeling persisting episodes and/or flare ups of the original episode as recurrent episodes. Logically this approach would explain the lower recurrence rates found in our study compared to those previously reported.

One study, where recurrence was explicitly defined as both new episodes and flare-ups, found the rate of recurrence was 67% to 81% in a 1-year period,[9] a rate much higher than our upper estimate of 33%. Further, one of the few studies that used a cohort of recovered participants, demonstrated similar 1-year recurrence rates to our study (32% for people treated with a "Mesendieck" exercise program and 57% in the control group).[18] However, Soukup *et al*[18] measured the recurrence of episodes of health care utilization for LBP, which does not allow for direct comparison to our findings. We believe that because of the methods employed, our study and the Soukup *et al*[18] study are more likely to provide accurate estimates of recurrence.

It must be noted that when including all definitions of recurrence (episodes of pain using recovered subjects, episodes of health care, and episodes of work absence), recurrence rates in the literature range from 1.33% to 84% in a 1-year period.[2,6–10,19–23] However, estimates of recurrence differ depending on how recurrence is defined.[7] Specifically, recurrence rates for an episode of work absence are usually much lower than those for an episode of pain.[7,23]

It is clear that recurrence rates are substantially affected by the definition of recurrence and by the definition of an episode of pain (both onset and recovery). These factors have consequences for the usual method of measuring recurrence of an episode of pain where a participant is asked at follow-up (*e.g.*, 1 year, 3 years, 5 years) whether or not they had a recurrence.[10,11] The problems with this are that not all subjects are eligible for recurrence, and those who are at risk may have been at risk of recurrence for varying periods, and each patient personally defines what a recurrence is to them. These problems result in a large potential for error and may explain the large variation in estimates of recurrence in the literature. For future studies measuring recurrence we would recommend that researchers study a cohort of subjects eligible for a recurrence (those who have recovered), use an inception cohort with follow-up of all subjects for the same time period, and finally, use a standard definition of recurrence and recovery such as that provided by de Vet *et al*[13] to distinguish between new episodes and flare-ups.

Prediction of Recurrence

Although only one factor in our primary analysis, previous episodes of LBP, predicted increased risk of recurrence of LBP, this factor remains clinically important. Having a previous episode of LBP increased the odds of a recurrence of LBP within the next 12 months by 1.8 to 2.0 times, meaning that for participants who had a history of previous episodes of LBP, 28% to 38% would have a recurrence within the next 12 months (pain mea-

sures recurrence definition). In comparison, participants who did not have a history of previous episodes of LBP, 17% to 23% would have a recurrence within the next 12 months. Other studies have suggested a link between previous LBP and future recurrences and/or chronic LBP,[2,4,5] although none of these studies used inception cohorts. Our finding therefore, supports previous work in this area.

In our secondary analysis, perceived risk of persistent pain was also found to be a significant predictor of recurrence at 1 year. However, it was predictive in only 1 of the 4 regression models (sensitivity analysis; pain measures over time recurrence definition). Previous research has shown a relationship between perceived risk of persistent pain (pain permanence) and development of chronic neck pain and LBP,[24] although to our knowledge this has not been previously demonstrated for recurrence of LBP.

It is important to note that even with a comprehensive analysis on predictors of recurrence, only two factors reached statistical significance. In both the primary analysis that addressed factors that could plausibly affect recurrence of LBP and the *post hoc* analysis that examined all baseline factors and their effect on recurrence, no other significant predictors came up. Several factors that one might expect to be related to recurrence of LBP did not reach statistical significance, such as baseline pain intensity ($X^2_{LR} = 0.20$, 1DF, $P = 0.66$; *post hoc* univariate regression analysis), work status ($X^2_{LR} = 2.85$, 5DF, $P = 0.72$; *post hoc* multivariate regression analysis), anxiety levels at baseline ($X^2_{LR} = 0.16$, 1DF, $P = 0.69$; *post hoc* multivariate regression analysis), or depression levels at baseline ($X^2_{LR} = 0.083$, 1DF, $P = 0.77$; *post hoc* multivariate regression analysis). This highlights the difficulty in predicting recurrence of LBP within the next year.

Many factors may influence our findings of a single consistent predictive factor of recurrence of LBP. First, because of the large number of subjects enrolled in the primary study we were compelled to use brief measures of potential predictors. For example, habitual physical activity levels were assessed using a single item ("Do you participate in at least 30 minutes of moderate intensity physical activity each day?"). This single item measure of habitual physical activity may not be as sensitive as longer questionnaires such as the IPAQ.[25] Consequently, we may have missed a true effect of physical activity on recurrence as previous research has demonstrated a protective effect of physical activity on recurrences.[21] Another simple reason for a single predictive factor of recurrence may be that recurrence of LBP is a difficult event to predict. The predictive factors may be specific to an individual, thereby not achieving statistical significance in a heterogeneous population. Conversely, the predictive factors may be complex and require the presence of numerous levels of factors. It is likely that recurrence of LBP is a combination of both. Finally, the actual number of previous episodes of LBP may be an important factor to consider. In this study, history of previous episodes of LBP was dichotomized as either being present or absent. Future research into this area is necessary, using more comprehensive measures of recurrence risk factors and expanding the number of risk factors studied.

The primary strength of this study lies in the use of an inception cohort study design. This design allows for the investigation of participants that are at the same time period in the course of their disease and so provides more accurate estimates of recurrence and risk factors. This, in combination with a large, representative sample of primary care patients seeking care for their LBP and a minimal loss to follow-up, allows for a generalizable estimate of recurrence in the primary care setting for LBP patients recovering within 6 weeks. Further, recurrence is measured using standardized definitions of an episode of LBP, resulting in a comprehensive, accurate, 1-year recurrence rate and odds ratios that contribute to our knowledge of the course of LBP. Therefore, we provide key information on incident rates for recurrence and odds ratios for recurrence risk factors that can be applied in practice. Using these definitions that result in measurement of only true recurrences (*e.g.*, not flare-ups), recurrence of episodes of LBP is lower than previously thought and only one factor, previous episodes of LBP, remains consistently predictive of future recurrence.

■ Key Points

- To estimate recurrence after an episode of acute LBP it is necessary to assemble a group of recently recovered subjects and follow all subjects for a defined period of time using a standardized definition of LBP recurrence. Most back pain studies do not do this.
- We established that after the resolution of an acute episode of LBP, 1 in 4 patients have a recurrence within 12 months. This is much lower than previous estimates of recurrence.
- Recurrence of LBP within 12 months is difficult to predict with the only factor consistently predictive of future back pain episodes being previous episode(s) of LBP.

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