

# Epidemiological Differences Between Back Pain of Sudden and Gradual Onset

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**ABSTRACT.** *Objective.* To explore possible differences in risk factors for low back pain according to its speed of onset.

*Methods.* We analyzed longitudinal data from 1366 hospital nurses in England who initially had been free from low back pain for at least one month. Risk factors were ascertained from a self-administered baseline questionnaire, and outcomes from serial followup questionnaires. Hazard ratios (HR) for developing a first new episode of low back pain during followup were derived by Cox regression.

*Results.* Low back pain with gradual onset was significantly associated with psychological symptoms measured at baseline [HR 1.7 (95% CI 1.2, 2.4) and higher], but no such association was seen for sudden pain. Low back pain with sudden onset while at work was associated with exposure to specific patient-handling tasks [HR 1.8 (95% CI 1.1, 3.0) to 2.8 (95% CI 1.4, 5.5)]. However, symptoms that came on suddenly elsewhere were not related to occupational activity, and low back pain of gradual onset showed little relation to patient-handling.

*Conclusion.* These findings suggest that a useful distinction can be made according to the speed and circumstances of onset of low back pain. If confirmed, they have important implications for the evaluation of ergonomic interventions aimed at reducing back pain. (J Rheumatol 2005;32:528–32)

## Key Indexing Terms:

HEALTH PERSONNEL  
OCCUPATIONAL DISEASES

LIFTING

LOW BACK PAIN  
PSYCHOSOCIAL FACTORS

Low back pain is a common complaint in the adult population and a frequent cause of absence from work<sup>1–3</sup>. In 1994, the annual cost to the British economy in lost production, social security payments, and demand for healthcare was estimated as £5.9 billion<sup>3</sup>.

In some cases, the symptom is attributable to prolapse of an intervertebral disc, but in most patients the underlying pathology is unknown<sup>4–7</sup>. Therefore, in the absence of more objective diagnostic criteria, epidemiological studies have usually defined cases simply on the basis of reported symptoms<sup>1,2,8</sup>. Some investigators have subdivided cases according to whether their pain was localized to the back, buttocks, and thighs, or radiated down the leg to below the knee (sciatica)<sup>9–11</sup>. However, there is little evidence that sciatica differs in its risk factors from simple low back pain.

Another aspect of low back pain that might be relevant to its causation is whether the pain starts suddenly or gradually. This distinction has important implications for compensation. Under the UK social security system, back pain only qualifies for industrial injuries benefit if it arises in the context of a defined accident at work<sup>12</sup>. However, it is unclear how far such accidents account for the total excess of back pain that is associated with occupational activities such as lifting, bending, and twisting, and whether sudden onset of symptoms distinguishes a subset of cases with different causes from other low back pain.

To explore this question, we have combined data from 2 longitudinal studies of low back pain in nurses.

## MATERIALS AND METHODS

Data collection was undertaken at 3 acute hospitals in the south of England as part of 2 separate studies that used a similar prospective design<sup>13,14</sup>. The research protocols were approved by local research ethics committees. In each of the hospitals, all nurses were identified from personnel records. After exclusion of student nurses, mental health nurses, and those based in the community, the remainder (4605) were sent an initial postal questionnaire. This baseline questionnaire asked about personal characteristics, psychological symptoms, details of the current job, exposure to physical lifting tasks at work, and experience of low back pain. Low back pain was defined as pain lasting for longer than a day in a distribution (marked on a diagram) between the twelfth ribs and the gluteal folds. This definition was derived from the Nordic Musculoskeletal Questionnaire and has been used in studies of low back pain in the general population<sup>1,2</sup>. Nonresponders were sent a single reminder after 4 weeks. Nurses who agreed to take part in a longitudinal phase were followed up at 3-monthly intervals over a 2-year period using a shorter self-administered questionnaire. The followup questionnaire asked about new episodes of low back pain since the previous contact, and

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in particular whether the nurse considered the pain to have started suddenly or gradually, and if sudden, the circumstances in which it began. Nonresponders to a followup questionnaire were sent a reminder after 4 weeks and were included in the subsequent 3-monthly mailing. Those who failed to respond to 2 successive followups were regarded as defaulters. Data were double-entered into computer and analyzed using Stata software.

This analysis focused on female nurses who had been free of back pain for at least one month at baseline and who answered at least one followup while still in the same job. The risk factors for developing a new episode of low back pain during followup were analyzed according to whether the onset was sudden at work, sudden elsewhere, or gradual. Risk estimates were derived by Cox regression, and are presented as hazard ratios (HR) with 95% confidence intervals (CI).

# RESULTS

Baseline questionnaires were returned by 2901 (63%) of those mailed, of whom 22 were in non-nursing or community-based jobs, 286 were not available for followup, and 100 were men. Among the remaining 2493 women, 693 reported low back pain in the past month, leaving 1800 female nurses who met the entry criteria for the longitudinal investigation of incident symptoms. Of these, 1410 (78%) returned at least one followup questionnaire, including 585 who answered all 8 questionnaires. Forty-four of them had changed job before the first followup and were excluded. Table 1 summarizes the completeness of followup in the remaining 1366 nurses who returned at least one followup questionnaire while working in the same job. Of these, 514 (38%) reported a new episode of low back pain during the period of investigation. For a further 478 nurses, followup was censored, either because they changed their job (120) or because they ceased to return questionnaires. The remaining 374 nurses were still under followup and remained free from back pain at the end of the study. The mean duration of followup was similar at the 3 participating hospitals (12.9, 13.8, and 12.6 months), as was the cumulative incidence of reported low back pain (39%, 35%, and 38%).

Among the 514 nurses with new low back pain during followup, 70 (14%) said that it came on suddenly while they were at work, 142 (28%) that it began suddenly while they were away from work, and 302 (59%) that it had a gradual onset. When nurses with sudden onset of symptoms while at work were asked what they were doing at the time, the most frequently reported activity was lifting. Outside work, sud-

den onset of low back pain occurred most often when nurses were sitting, walking, or standing.

Low back pain with sudden onset, whether at work or elsewhere, was associated with greater short-term disability than pain that came on gradually. For example, inability to put on socks, stockings, or tights was reported by 7% of nurses with sudden onset at work and 10% of those with sudden onset outside work, as compared with 4% of those whose symptoms came on gradually. Similarly, nurses with sudden onset of low back pain more often required time off work as a consequence (39% and 32% as compared with 17%). During the interval between developing symptoms and completion of the next 3-monthly questionnaire, they were also more likely to have consulted their general practitioner about the back problem (29% and 26% as compared with 18%).

Low back pain of gradual onset tended to occur more frequently in taller nurses (HR 1.5, 95% CI 1.0, 2.1, for height  $\geq 170$  cm as compared with height  $< 160$  cm). Otherwise, none of the categories of low back pain was significantly related to age, height, weight, or body mass index. Nevertheless, all subsequent analyses were adjusted for age and height (each in 4 strata).

The risk of incident low back pain varied according to the prevalence of other (nonmusculoskeletal) symptoms reported at baseline. Low back pain with gradual onset was strongly associated with psychological symptoms such as frequently feeling tired (HR 1.8, 95% CI 1.4, 2.3), low in mood (HR 1.7, 95% CI 1.2, 2.4), or tense and under stress (HR 1.7, 95% CI 1.3, 2.2). In contrast, low back pain that came on suddenly (either at work or elsewhere) did not occur more frequently in nurses with these complaints. There was a weak association (HR 1.4) between all 3 symptom categories and frequent report of headaches, and between back pain that came on suddenly away from work or gradually and frequent period pains (HR 1.4), but these were not statistically significant. All further analyses were adjusted for the occurrence of frequent headaches, period pains, and constantly feeling tired, as well as for age and height.

Although all the women who entered followup had been free from low back pain for at least one month, many of

Table 1. Extent of followup among 1366 female nurses in England who were free of low back pain at baseline.

Followup Time Point	No. of Nurses Still Under Followup	No. Reporting Low Back Pain for the First Time	No. Who Changed Job Before Subsequent Followup	No. Who Returned No Further Followup Questionnaires
1	1366	193	16	131
2	1026	118	20	79
3	809	51	22	38
4	698	49	21	30
5	598	28	13	33
6	524	25	19	24
7	456	30	9	23
8	394	20		374

them had an earlier history of back trouble. Previous back symptoms were significantly associated with a higher incidence of low back pain during followup. The risk of new back pain increased with increasing duration of previous pain and decreasing interval since the last episode. A similar pattern was present for all 3 categories of symptom onset, with hazard ratios up to 6.3 (95% CI 4.0, 10.0) for the most prolonged and 3.5 (95% CI 2.3, 5.3) for the most recent previous pain.

Table 2 summarizes the relation of different categories of low back pain to occupational activities reported at baseline. Low back pain with sudden onset while at work was significantly more frequent in nurses whose work regularly involved transferring patients between bed and chair or commode without the use of lifting aids (HR 2.8, 95% CI 1.4, 5.5), moving patients around on the bed (HR 2.8, 95% CI 1.0, 7.7), and lifting patients in or out of a bath with the aid of a lifting device (HR 1.8, 95% CI 1.1, 3.0). Further, for the first and last of these tasks, risk increased progressively

with the frequency of the activity (Table 3). However, no associations were found between occupational activities and low back pain with sudden onset away from work, and only one association was found for back pain of gradual onset (with frequently lifting patients in or out of a bath using a hoist or other lifting device).

## DISCUSSION

Our findings suggest that in epidemiological studies of low back pain, a useful distinction can be made according to whether pain is sudden or gradual in onset. Low back pain with sudden onset was more disabling in the short term; its onset often coincided with an activity that placed increased physical stresses on the spine, such as lifting, and the risk of its occurrence was higher in nurses who regularly undertook such tasks in the course of their work. In contrast, low back pain with gradual onset showed little relation to physical activities, but a much stronger association with psychological symptoms at baseline.

**Table 2.** Risk of incident low back pain in 1366 female nurses in England according to patient-handling activities reported at baseline. Each risk factor was examined in separate proportional hazards models.

Risk Factor	No. of Nurses*	Sudden Onset While at Work			Sudden Onset Away from Work			Gradual Onset		
		Cases	HR	95% CI†	Cases	HR	95% CI†	Cases	HR	95% CI†
Transfer a patient on canvas and poles										
No	865	47	1		96	1		178	1	
Yes	428	20	0.9	0.5, 1.5	41	0.9	0.6, 1.3	106	1.2	0.9, 1.5
Transfer a patient between bed and chair or commode without use of hoist or other lifting device										
No	393	10	1		41	1		95	1	
Yes	893	59	2.8	1.4, 5.5	92	1.1	0.7, 1.5	186	0.9	0.7, 1.2
Transfer a patient between bed and chair or commode with hoist or other lifting device										
No	878	41	1		97	1		188	1	
Yes	401	27	1.5	0.9, 2.4	35	0.8	0.5, 1.1	90	1.0	0.8, 1.3
Move a patient around on the bed										
No	178	4	1		27	1		34	1	
Yes	1125	65	2.8	1.0, 7.7	110	0.7	0.5, 1.1	252	1.2	0.8, 1.7
Lift a patient up from floor without use of hoist or other lifting device										
No	951	46	1		94	1		208	1	
Yes	322	21	1.5	0.9, 2.5	36	1.2	0.8, 1.8	70	1.1	0.8, 1.4
Lift a patient up from floor with hoist or other lifting device										
No	1113	60	1		117	1		232	1	
Yes	163	7	0.8	0.4, 1.9	14	0.8	0.5, 1.5	43	1.3	0.9, 1.7
Lift a patient in or out of bath without use of hoist or lifting device										
No	1065	57	1		116	1		226	1	
Yes	215	10	0.9	0.5, 1.8	14	0.6	0.4, 1.1	52	1.2	0.9, 1.6
Lift a patient in or out of bath with use of hoist or other lifting device										
No	895	39	1		98	1		187	1	
Yes	379	28	1.8	1.1, 3.0	33	0.9	0.6, 1.3	89	1.2	0.9, 1.5

\* Data were missing for up to 93 nurses. † Adjusted for age, height, and frequency of headaches, period pain and constantly feeling tired. When age or height was missing (10 nurses), the variable was set to the median value for all nurses. A "missing" category was assigned for frequency of period pains when the question had not been answered. Missing responses for frequency of headaches and constantly feeling tired were classed as "never/occasionally." HR: hazard ratio; CI: confidence interval.

Table 3. Risk of incident low back pain in 1366 female nurses in England according to frequency of selected patient-handling activities reported at baseline. Each risk factor was examined in separate proportional hazards models.

Risk Factor	Frequency per Shift	No. of Nurses*	Sudden Onset While at Work			Sudden Onset Away from Work			Gradual Onset		
			Cases	HR	95% CI†	Cases	HR	95% CI†	Cases	HR	95% CI†
Transfer a patient between bed and chair or commode	0	393	10	1		41	1		95	1	
	1–4	430	20	1.9	0.9, 4.1	44	1.0	0.7, 1.6	83	0.8	0.6, 1.1
without use of hoist or other lifting device	5–9	191	11	2.6	1.1, 6.2	25	1.5	0.9, 2.4	40	1.0	0.7, 1.4
	10+	272	28	4.5	2.2, 9.3	23	0.9	0.5, 1.4	63	1.0	0.7, 1.4
Move a patient around on the bed	0	178	4	1		27	1		34	1	
	1–4	248	15	2.9	1.0, 8.7	24	0.7	0.4, 1.2	53	1.2	0.8, 1.8
	5–9	209	11	2.6	0.8, 8.1	22	0.8	0.5, 1.4	33	0.9	0.6, 1.5
	10+	668	39	2.8	1.0, 8.0	64	0.7	0.4, 1.1	166	1.3	0.9, 1.9
Lift a patient in or out of bath	0	895	39	1		98	1		187	1	
with hoist or other lifting device	1–4	313	22	1.6	1.0, 2.9	29	0.9	0.6, 1.4	66	1.0	0.8, 1.4
	5+	66	6	2.6	1.1, 6.1	4	0.7	0.2, 1.8	23	1.8	1.2, 2.8

\* Data were missing for up to 93 nurses. † Adjusted for age, height, and frequency of headaches, period pain and constantly feeling tired. When age or height was missing (10 nurses), the variable was set to the median value for all nurses. A “missing” category was assigned for frequency of period pains when the question had not been answered. Missing responses for frequency of headaches and constantly feeling tired were classes as “never/occasionally.” HR: hazard ratio.

A major strength of the investigation was its longitudinal design. Risk factors were ascertained at a time when participants had been free from low back pain for at least a month. This made it less likely that the reporting of risk factors would be biased by a nurse’s experience of back symptoms. The possibility remains that some nurses may have suffered from persistent low mood or been made more aware of physical exposures because of back trouble further in the past. However, if this had occurred on any scale, associations would have been expected with all 3 categories of low back pain, since all were more common among nurses with a history of back symptoms. It is notable, therefore, that sudden-onset low back pain was not associated with low mood, stress, or persistent tiredness, and that report of strenuous physical occupational activities did not carry an increased risk of low back pain with gradual onset or with sudden onset away from work.

A limitation of the study was the extent to which psychosocial factors were ascertained. Recent research has shown that factors such as perceived workload and job demands can be important influences on risk<sup>15</sup>. However, it seems unlikely that they would confound the differential associations observed with different categories of low back pain.

The distinction between pain that began suddenly or gradually depended on subjects’ recall, and the interpretation of what was meant by sudden may have varied between individuals. However, the fact that most of the nurses who reported sudden pain were able to identify the activity in which they were engaged at the time it began suggests that onset, if not instantaneous, was generally rapid. Further, the 3-monthly interval between questionnaires meant that the start of symptoms was still fairly recent at the time the history of onset was elicited. Also, the ascertainment of risk factors through a separate questionnaire that was completed

before the episode of low back pain occurred made it less likely that any misclassification of speed of onset would be differential with respect to exposures. The effect of non-differential misclassification would be to obscure differences between low back pain categories.

The association of sudden onset with greater short-term disability and use of healthcare is consistent with other studies<sup>16</sup>. Sudden onset has been found to predict early improvement<sup>17</sup>, whereas gradual onset has been associated with longer duration of symptoms<sup>11,18</sup> and higher risk of recurrence<sup>18</sup>.

Our finding that low back pain was associated with physical activities and psychological risk factors was in accord with the results of many other investigations. However, there have been few attempts previously to discriminate between back pain of sudden and that of gradual onset. In one cross-sectional survey of 2667 men and women, occupational lifting and bending or twisting did not appear to carry a higher risk for sudden low back pain than for low back pain overall<sup>2</sup>. However, the analysis depended on recall of exposures and symptoms over a lifetime, and no distinction was made between low back pain that came on suddenly while at work and in other circumstances.

The association that we found with strenuous occupational activities was restricted to low back pain that came on suddenly while nurses were at work, and did not extend to sudden onset in other circumstances or to pain that started gradually. This suggests that physical stresses can cause acute injury to spinal structures, but that they do not importantly predispose to low back pain through cumulative wear and tear over long periods. This is similar to the pattern that we have found for injuries to meniscal cartilage of the knee in sportsmen, where the risk associated with soccer was limited to cases whose symptoms were precipitated by acute trauma while playing, and did not apply to those with onset

at other times<sup>19</sup>. It provides support for the rule of the UK social security system whereby low back pain is only compensated as an industrial injury when it develops in relation to an identifiable accident at work.

The distinction between sudden and gradual low back pain that our findings suggest has important implications. For example, it means that in studies to assess ergonomic interventions in the workplace, a failure to focus specifically on low back pain beginning suddenly while subjects were at work could lead to beneficial effects being diluted and perhaps obscured. It could even be that such an intervention reduced the incidence risk of acute back injuries, but paradoxically increased the risk of back pain with gradual onset, by raising workers' awareness of the occupational hazard and rendering them more prone to nocebo effects. There is a need, therefore, to confirm our results in other studies.

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