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Work Disability and Costs Caused by Recurrence of Low Back Pain: Longer and More Costly Than in First Episodes

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Study Design. Retrospective analysis of workers' compensation (WC) claims data for nonspecific low back injuries (LBI) in a single jurisdiction.

Objective. To examine whether recurrences, defined as post-initial episodes of work disability or medical care, substantially contribute to total medical and indemnity costs, and total duration of work disability.

Summary of Background Data. Previous studies have not measured the proportion of care seeking and work disability that are associated with recurrences in claims for work-related LBI.

Methods. All persons with new lost-time claims for nonspecific LBI reported in New Hampshire to a large WC provider from 1996 to 1999 were selected (N = 1867). Three years of follow-up data, starting at the beginning of the first episode, were collected. Previously validated definitions of recurrence were used identify new episodes of care and new episodes of lost work time (work disability). Total duration of work disability, total medical costs, and total indemnity costs were investigated. For individuals with recurrences, these variables were separated into first-episode and recurrent period duration and costs.

Results. The rate of recurrent work disability was 17.2%, and the rate of recurrent care seeking was 33.9%. Individuals with recurrence had significantly higher total length of work disability, and higher medical and indemnity costs. For those with recurrent work disability, 69% of total lost time from work, 71% of associated indemnity costs, and 84% of total medical costs occurred during the recurrent period. For those with recurrence of care, the respective values were 48%, 47%, and 42%.

Conclusions. Recurrences contributed disproportionately to the total burden of work-related nonspecific LBI, through both additional care seeking and work disability. Results imply that those who have recurrences may be an especially important target for secondary prevention efforts.

Key words: low back pain, recurrence, outcomes, work disability, health care utilization. **Spine 2006;31:219–225**

Studies of repeated episodes of injuries and illnesses are common in health services research.[1–6] The case of low back injuries (LBI) is particularly important, given the large percentage of the adult population with back disorders,[7] their costliness,[8] and the high frequency of recurrent episodes.[9] Recent studies suggest that acute low back pain evolves into a chronic or recurrent condition more often than previously suspected.[10] These post-initial episodes (*i.e.*, recurrences) may be associated with significant negative consequences, including additional suffering, additional medical costs, and losses in productivity for workers and employers.[4,11–15] Individuals can also lose confidence in their ability to function, which may compromise their ability to return to work.[16]

Although there is an understanding that low back pain is likely to recur and become episodic, questions remain regarding the extent to which these events lead to additional care seeking and/or work disability behavior.[17] Some patients with recurrent pain may not seek treatment and may adapt their working conditions so that they do not lose time from work.[18,19] Findings in occupational LBI studies suggest that this process often does not happen. In a prospective study of Canadian workers with a LBI-related disability episode, 36% had at least 1 more work absence during a 3-year follow-up.[12,13] Although most in this study had only 1 or 2 additional absences, these tended to last longer than the initial ones. Neither the Canadian study nor a similar British study[14] evaluated the extent of health care use nor did they compare the duration of the initial episode between recurrent and nonrecurrent groups. A US study found that costs for those with multiple occupational LBI claims was 48% lower than for those that had a single claim but was significantly biased by a few expensive cases without return to work.[20]

Health care use and costs of episodic LBI have been the focus of 1 study in a nonoccupational setting.[15] Using a prospective population-based cohort, Carey *et al*[15] reported that 40% of individuals with recurrent pain sought additional care when the pain recurred. Although this study provided the initial insight on medical care during the recurrent period, it relied on patient self-report and did not describe the intensity and costliness of visits during the recurrent period.

To advance the understanding of the consequences of recurrence, this study was conducted to determine the extent of medical care and work disability that occurs after apparent resolution of the initial episode. The current analysis did not focus on low back pain itself but

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rather on the behavior (care seeking or work disability) associated with work-related LBI. It was hypothesized that recurrent episodes of work disability or medical care disproportionately contribute to total disability duration and costs of occupational LBI. To address this hypothesis, we used a large administrative data set of work-related injuries. To our knowledge, such an analysis has not been performed using such data.

■ Methods

Data Selection and Elements. LBI claims with compensated lost-work time were selected from the total population of workers' compensation (WC) claims reported in New Hampshire to a large WC provider between January 1, 1996, and December 31, 1999. This state was selected because of a high rate of reporting of work-related injuries, because state law mandates reporting of all injuries (even those with no lost time), and the expectation that the insurer's high market share (more than 50%) would minimize loss to follow-up. The characteristics of this data source were previously described in Murphy *et al*.[21] Restricting LBI claims to lost-time claims implied that injured workers had both lost work time and medical visits, and that the analyzed LBI represented more serious manifestations (at least 3 days off work). Claims data were retrieved in April 2004, allowing a minimum 3-year window of follow-up. The local institutional review committee approved the study procedure and data security protocols.

Specific body part codes (multiple trunk, lower back area, and sacrum and coccyx) and nature of injury codes (contusion, inflammation, sprain, and strain) selected claims to create a cohort of claimants with nonspecific LBI, the most common manifestation in a working population. Trained insurance industry coders assigned these codes based on the injury description found on the form used to file a WC claim. Accident description text was checked to verify the nonspecific nature of a claim and minimize the possibility of misclassification. More detailed descriptive text information for a random sample of 100 claims was analyzed, confirming that the selection criteria accurately yielded claims restricted to nonspecific LBI.

Once the select cases were identified, the insurer's records for the period between January 1, 1995, and December 31, 1995, were searched to assess whether any claimants had filed a similar claim during in the calendar year 1995. Similarly, the New Hampshire First Report of Injury data set was searched for those with low back claims in 1995 but not in the insurer's data. These claimants were recognized as having identical social security numbers associated with different claim numbers and were excluded from further analysis to insure a panel of "new" cases.

For each claim, detailed medical and indemnity (compensated work loss) payment information was extracted. Each visit to a practitioner (*e.g.*, physician, physical therapist, or chiropractor), emergency room, and each hospital stay were incorporated to define episodes of medical care. Individual indemnity payments were analyzed to verify the beginning and end of work disability periods. Periods with temporary partial disability payments were classified as time at work as the focus was on episodes of total disability as separate from having returned to work in a partial capacity. Thus, reported indemnity costs consist of payments for temporary total disability only. Indemnity and medical care information for individuals with ≥1 WC LBI claim was merged, using claimant social security numbers.

Reliability of administrative data cannot be ensured completely, but in this study, it was checked in several ways. Demographic and injury information was matched with demographic information from the New Hampshire Department of Labor First Injury Report data set. Any differences between the 2 data sets were noted and corrected based on information in descriptive notes made by the claims personnel. Medical care data were subject to rigorous use and bill review at the insurer, as required by law to ensure that reimbursed treatment was related to the occupational injury. Work disability data were based on actual indemnity payments made; individual payments were then aggregated and compared with the reported overall duration of work disability, and any differences were reconciled.

Episode Definitions. There were 2 different definitions of recurrence used: recurrence of care and recurrence of work disability. *Via* health care use data, a recurrence of care was defined as any health care use, even a single visit, occurring after at least a 45-day gap in treatment. Previous research using a similar data set has shown that there are no significant differences in the number of individuals with new episodes when the gap was extended beyond 45 days (*i.e.*, recurrence rates were relatively insensitive to alternative specifications within an appropriate range).[11] A recurrence of work disability was defined as resumption of payments for total work disability after a minimum of a 3-day break in indemnity payments, implying a temporary return to work. A 1 or 2-day gap was deemed inappropriate as a recurrence marker because these shorter gaps often result from administrative adjustments, not actual return to work.[9]

Data Analysis. Distribution of total medical and indemnity costs, and duration of work disability were assessed for 4 groups of individuals: (1) those without a recurrence, (2) those with recurrence of care, (3) those with recurrence of work disability, and (4) those with both types of recurrence. For individuals with either type of recurrence, duration of work disability, medical and indemnity costs were divided between those that occurred during the first episode or during a recurrence. Comparisons of first-episode costs and work disability between all individuals with and those without recurrence were performed. Normality of cost and work disability variables was assessed using frequency tables for total costs and durations, and skewness and kurtosis statistics for first-episode costs and durations. If compared variables were non-normal, the Wilcoxon rank sum tests were used to compare first-episode costs and durations between individuals with and without recurrence.[22] Finally, for those with recurrence of care or work disability, the median percentage of total costs and work disability occurring during the recurrent period was reported.

■ Results

Study Population. A total of 1867 individuals met the specified selection criteria for nonspecific LBI with lost time (Figure 1). Average age was 37.2 years. At data extraction, only 1.9% of all eligible subjects had an open WC claim, implying that more days away from work and health care visits were possible. The nature of injury was described as strain for 91.7%, contusion for 7.1%, sprain for 1.1%, and inflammation for 0.1%. The part of the body was described as lower back area for 85.1%,

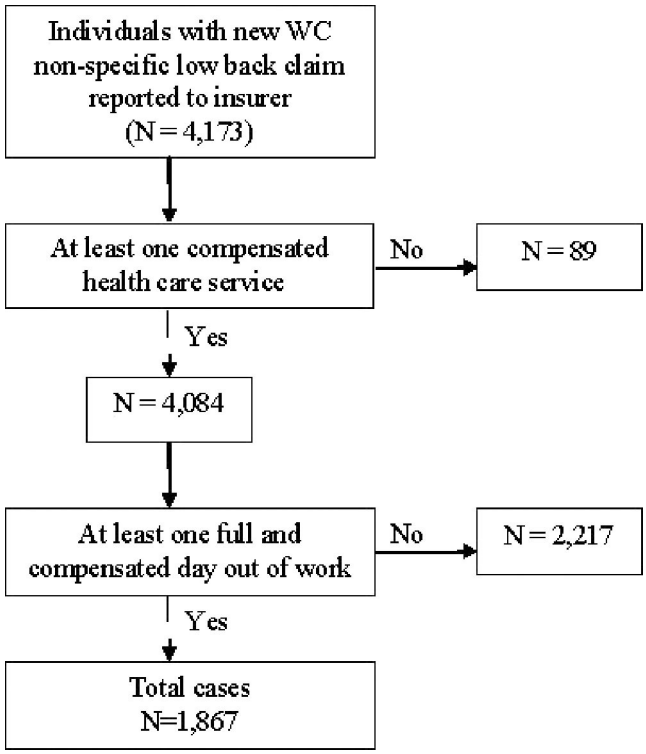

Figure 1. Flow diagram of identifications of cases included in the study.

multiple trunk for 11.3%, and sacrum and coccyx for 3.6%.

Recurrence rates varied depending on the definition of recurrence. The recurrence rate for work disability was 17.2% (n = 321), whereas for recurrence of care, the rate was 33.9% (n = 632). In total, 245 (13.1%) individuals had both recurrence of care and work disability, 387 (20.7%) recurrence of care only, 76 (4.1%) recurrence of work disability only, and 1159 (62.1%) as having no recurrence.

Cost and Work Disability Analysis. Table 1 presents the distribution of total indemnity and medical costs, and duration of work disability for individuals in the recurrent and nonrecurrent groups. A substantially higher percentage of individuals with no recurrence had relatively low costs and short work disability than those with either type of recurrence. Compared with the nonrecurrent group, the work disability duration and costs were much higher for those with either or both types of recurrence. For those with recurrence of care only or with both types of recurrences, a significant proportion of individuals were in the highest total costs and disability days' category. This result suggests that some of the individuals in recurrence of care only group might have not returned to work at all but had a significant gap in treatment.

Measures of central tendency revealed similar differences. Median total duration of work disability was 141 days for those with both types of recurrences, 52 days for those with only recurrence of work disability, 26 days for individuals with recurrence of care only, compared to 10 days for those without recurrence. It is also noteworthy that in all groups, mean values were close to or exceeding the 75th percentile.

The distribution of first-episode costs and work disability was non-normal (Table 2). Non-normality of variables was also found when first-episode variables were analyzed separately for individuals with and without recurrence. Table 2 compares the duration of work disability and costs during the initial episode between those with and without recurrence. For recurrence of care, indemnity costs ($\chi^2 = 63.2$, $P < 0.01$), medical costs ($\chi^2 = 176.0$, $P < 0.01$), and work disability ($\chi^2 = 56.8$, $P < 0.01$) were all higher for those with recurrence. For recurrence of work disability, indemnity costs ($\chi^2 = 54.5$, $P < 0.01$), medical costs ($\chi^2 = 49.5$, $P < 0.01$), and

Table 1. Distribution of Total Costs and Work Disability for Individuals With Nonspecific Work-related Low Back Injuries (N = 1867)

	No Recurrence (n = 1159)	Recurrence of Care Only (n = 387)	Recurrence of Work Disability Only (n = 76)	Recurrence of Care and Work Disability (n = 245)
Total Indemnity Costs ($)				
0–1000	82.2%	52.5%	34.2%	19.6%
1001–2000	9.3%	12.4%	23.7%	11.4%
2001–5000	5.7%	9.6%	25.0%	14.7%
5001–10000	1.7%	7.2%	13.2%	16.7%
10001+	1.0%	18.4%	4.0%	37.6%
Total Medical Costs ($)				
0–2000	87.3%	40.1%	38.2%	11.8%
2001–4000	6.4%	15.5%	21.1%	13.1%
4001–8000	3.8%	17.3%	18.4%	19.2%
8001–14000	1.6%	11.6%	9.2%	21.6%
14001+	0.9%	15.5%	13.2%	34.3%
Duration of Work Disability (days)				
1–20	74.3%	45.5%	21.1%	10.2%
21–40	11.8%	12.7%	18.4%	14.7%
41–100	9.4%	13.2%	40.8%	18.0%
101–200	2.8%	7.5%	7.9%	14.3%
201+	1.7%	21.2%	11.8%	42.9%

Table 2. Comparison of First-episode Costs and Work Disability Between Individuals With and Without Recurrence (N = 1867)

	Recurrence of Care					
	Yes (N = 632)			No (N = 1235)		
	Mean (SD)	Median	IQR§	Mean (SD)	Median	IQR§
Indemnity costs ($)*	2987.9 (5381.5)	728.4¶	65.1–3525.6	904.6 (3389.1)	216.0	69.9–669.6
Medical costs ($)†	5223.1 (9008.4)	1807.7¶	468.3–6119.5	1545.1 (3987.3)	545.0	223.1–1312.1
Duration of work disability (days)‡	74.2 (120.2)	23.0¶	4.0–94.0	26.2 (68.5)	9.0	4.0–22.0
	Recurrence of Work Disability					
	Yes (N = 321)			No (N = 1546)		
Indemnity costs ($)*	2895.4 (10173.1)	676.4¶	237.4–2172.3	2774.7 (11447.9)	284.6	105.6–1008.0
Medical costs ($)†	2681.6 (5496.2)	823.1¶	312.0–2581.8	2161.0 (6938.4)	391.7	153.0–1055.4
Duration of work disability (days)‡	69.7 (174.4)	23.0¶	8.0–49.0	67.6 (213.8)	11.0	6.0–32.0

Costs and work disability are compared according to whether an individual had a recurrence of care or work disability.
P-values are based upon non-parametric analyses using the Wilcoxon rank sum test.
*Skewness = 7.1, Kurtosis = 80.2 for recurrence of care, 8.9 and 101.6 for recurrence of work disability, respectively.
†Skewness = 6.1, Kurtosis = 52.0 for recurrence of care, 7.5 and 75.7 for recurrence of work disability, respectively.
‡Skewness = 4.9, Kurtosis = 33.9 for recurrence of care, 6.0 and 41.7 for recurrence of work disability, respectively.
§IQR is the interquartile range, and represents the middle 50% of the study population.
¶P-value <0.01.

work disability $\chi^2 = 31.8$, $P < 0.01$) were also higher for individuals with recurrence, although mean values were relatively similar.

Table 3 shows the percentage of total disability days, indemnity, and medical care costs that occurred during the recurrent period. More than two thirds of all work absence and medical or indemnity costs occurred after the beginning of the recurrence for recurrence of work disability in comparison to less than 50% in the case of recurrence of care. To examine the sensitivity of this difference, we computed the percentages for individuals with both types of recurrence only. For that subset (n = 245), using the recurrences of work disability definition yielded percentages that were virtually identical to those reported in Table 1. For recurrences of care, the percentage of work disability and indemnity costs occurring during the recurrent period was 58%, substantially higher than for all individuals with medical care recurrence, suggesting that individuals with both recurrence types have more severe and prolonged injuries requiring even more care and work disability. However, for the cost of medical care, that percentage was 46%, relatively close to values for all individuals with recurrence of care.

Table 3. Percentage of Total Costs and Work Disability Occurring During the Recurrent Period for Individuals With Recurrent Work-related Low Back Injuries (Percentage for a Median Individual Reported)

	Recurrence of Work Disability* (N = 321)	Recurrence of Medical Care† (N = 632)
Indemnity costs	71%	47%
Medical costs	84%	42%
Duration of disability	69%	48%

*Values indicate the median percentage of a given variable that occurred after the end of the first episode of work disability.
†Values indicate the median percentage of a given variable that occurred after the end of the first episode of health care utilization.

■ Discussion

The main objective of this research was to determine if recurrent events, measured using repeated episodes of work disability or medical care associated with work-related LBI, disproportionately contribute to total costs and duration of work disability over an extended period of follow-up. Contrary to one previous study,[20] individuals with recurrence had substantially higher total medical and indemnity costs, and longer duration of work disability than those without recurrence. Their first episode costs and lost time were also worse. Furthermore, recurrent episodes contributed a disproportionate share of total work disability duration, medical and indemnity costs for individuals with these events. More than two thirds of all work disability occurred after the end of the first lost-time episode in those with recurrent work disability. For cases defined by a recurrence of medical care, lost-time days, and medical and indemnity costs during the first episode were about half of the total burden in each of these categories.

It has been argued that when pain becomes episodic and/or chronic, patients usually learn how to deal with pain and tend not to seek as much care or lose as much time off work as during the first episode of pain.[18,19,23–25] Similar to prior studies of occupational LBI,[12–14] our findings suggest that this is not always the case; repeated episodes of work disability and care were usually longer and more costly. Indeed over one third of all those with a low back injury seek additional care after the apparent resolution of their condition, with significant medical costs being accrued during the recurrent period. Obviously, it may be the case that few or many others might have had

recurrent pain but did not seek care or lose time from work.

One might argue that the study findings represent a higher clinical severity of cases with several episodes of work disability and medical care. The comparison of total and first-episode medical and indemnity costs, and disability days showed that all were higher for individuals with recurrence. Nonetheless, this result does not necessarily imply more severe injury. Two individuals with a similar level of pain might have very different work disability and health care use, including the occurrence of repeated episodes of time off work or care seeking. On the other hand, this finding may also suggest that cases with longer durations and higher costs have, on average, a more episodic than continuous nature.[26]

Work disability and care seeking related to occupational LBI might have different determinants. Using a medical care-based definition of recurrence, the first episodes of care were associated with a higher percentage of total costs and work disability than first episodes of work disability. This finding has held up in the analysis of a subset of individuals with both recurrence types examined here. As shown in prior research, work disability following work-related LBI is the consequence of a complex interaction of medical condition, physical capabilities, workplace demands, and a variety of psychosocial factors.[27] It has been argued that the biopsychosocial model has the best explanatory power because it considers these interactions.[16,28] Recurrence of work disability associated with work-related LBI may depend on several factors related to the injured worker's experience during the initial episode.[29] These factors, such as the nature and duration of medical care, and the duration of the initial episode of work disability, are likely to be correlated with psychosocial variables influencing the return-to-work process (*i.e.*, the attitude toward return to work, the locus of control,[30] workplace support, and personal stress[31]).

Other issues may be of more importance for individuals seeking care for work-related LBI. One way of conceptualizing the role of medical care in determining outcomes is through a multifactorial model of work outcomes and related factors.[16] Pre-injury job and demographic characteristics, injury attributes, and post-injury factors can determine short-term outcomes (*e.g.*, work absence or re-injury), which in turn determine long-term outcomes (*e.g.*, the total length of disability or permanent impairment). In this framework, medical care for work-related LBI is an intermediate outcome, dependent not only on pre-injury and injury characteristics but also on factors contributing to long-term outcome states, such as pain, function, and duration of disability. For instance, the type of treating provider may influence medical use and costs more than the timing and sustainability of return to work, and, thus, contribute to the difference between medical care and work disability recurrence patterns.

There are several important limitations to this study. First, the use of an administrative data source did not permit a direct validation of measures of work absence or recurrence of care seeking. Adjustment of indemnity payments caused by overpayment, vacation, and work stoppage may be interpreted as a recurrence of work disability in administrative data. Unless detailed medical chart data are available, decisions regarding which health care services are part of a particular episode may also seem arbitrary. Furthermore, without documented information from medical reports, it is almost impossible to determine if a single visit to a provider, preceded and followed by a specified gap, was a new episode or a flare-up related to the previous one or the result of a routine follow-up. Validating how well administrative data relate to self-reported recurrence or number of days away from work should be a priority in research focusing on recurrence of medical conditions.[32,33] However, recent research suggests that WC administrative databases can have substantial use for epidemiologic studies of work injuries.[34]

Other shortcomings are related to the characteristics of WC data sets. Actual work disability is not recorded if it does not exceed a waiting period (*i.e.*, the number of work disability days that must occur before initiation of compensation payments) or disability does not extend beyond the retroactive period (*i.e.*, the number of disability days that must occur before payment is made for the waiting period days). This implies that recurrence rate of work disability may be underestimated in this or any other WC data set. Actual medical services might not have been recorded if they were paid out of pocket or using one's group health insurance. However, the reliability of health care use data from an administrative WC data set is likely to be high because all WC jurisdictions require insurers to cover all medical expenditures related to an individual's occupational injury or illness for accepted claims. Furthermore, most group health insurers inquire about work-related conditions, and if such conditions are recognized, related bills are referred to a WC insurer because reimbursement rates are usually higher in WC.[35]

Our findings may not be generalizable. Work-related LBI constitute a unique subset of LBI. Occupational LBI are more acute, and the reported impact on function is higher and more persistent than in nonoccupational cases.[36,37] Significantly more care is received for work-related LBI than in comparable non-WC cases, with substantial geographic variation in care received.[38,39] Furthermore, the unique nature of the New Hampshire population and economy during the study period may impact the recurrence rates and behavior associated with LBI. However, the insurer's large market share in that state implies a certain level of generalizability.

For studies using administrative data, loss to follow-up is typically a concern. Recurrence might not be "observable" for reasons associated with a change in employment or insurance status. In this study, recur-

rences would be missed if the employee changed jobs to a new employer with a different WC insurer. However, if the employer switched WC insurers during the study period, recurrences related to the initial injury would typically be referred back to the original insurer. The extent to which these factors contribute to loss to follow-up on an individual basis is impossible to estimate, given the data available in this study. Loss to follow-up was estimated at less than 11% for a subset of individuals in this study,[11] which is most likely lower than in other studies using WC data. In addition, despite our attempts to create a cohort of "new" cases, it is possible that some "new" cases are actually secondary events, with individuals having the original WC claim with another insurer, or before 1995.

Despite these limitations, this study has several features that render the results noteworthy. The nature of WC data allows for full capture of medical care and almost complete information on compensated time off work associated with a particular injury, regardless of provider or health care system. Therefore, findings from this study may better represent the distribution of total outcomes across episodes than findings from studies using health insurance data. The applied definitions of recurrence have been based on previous research using this data set, and recurrence rates remained at the same level when the study period was extended by 2 years.[11] Finally, the results have been consistent across the range of specifications used, ensuring that our main finding of the high burden of recurrent episodes of LBI is robust.

■ Conclusions

The study provided evidence that significant recurrent events associated with work-related nonspecific LBI often constitute a higher proportion of work disability, and medical and indemnity costs than the initial episode of treatment or work disability over an extended period of follow-up. This study focused on significant recurrences, as identified by alterations in normal function sufficient to cause a temporary cessation of work. Study findings suggest that there is a substantial proportion of persons with LBI who are not able to deal with their injuries to the extent that they do not require additional care and time off work.

There are several potentially important clinical implications of these results. Because recurrences of work disability are relatively frequent, and usually associated with more medical care and time out of work than the first episode, efforts to avoid these events should be a priority. Prior investigations suggest that patients who are older, in poorer health, have protracted initial work absences and who have low decision latitude on return to work are at higher risk for recurrence.[29,40,41] The impact of work accommodations on recurrence is debatable, with some suggestion that inadequate accommodations may increase the rate of recurrence.[16] Simply providing more access to providers that are associated in some way with the workplace or higher adherence to evidence-based medical care does not seem to impact recurrence rates.[42–44] Worker education and an active exercise program may be effective in decreasing recurrences,[45,46] with evidence suggesting that intensive application of these approaches being especially well suited to high-risk cases.[47] We still do not know whether recurrent disability occurs suddenly or whether it represents a progressive failure of function in the workplace. If the latter is true, employers might make a significant contribution through careful surveillance of those who have recently returned to work and rapid intervention to alter work requirements to prevent progression to complete inability to work.

Possible directions for future research can be implied by study findings. Although we have investigated the distribution of costs and disability days between the first episode and recurrent period, we have not disaggregated the latter into a sequence of separate episodes. Factors contributing to the most costly or prolonged recurrences should be identified because these would be the highest priority for preventive interventions. For instance, the type of health care provider in charge of care during the first episode may determine subsequent outcomes. Finally, an analysis evaluating the extent to which severity of condition impacts work disability and care-seeking behaviors is necessary to paint a complete picture of LBI recurrence in WC.

■ Key Points

- Recurrences contribute substantially to the total burden of work-related nonspecific LBI, through both additional care seeking and work disability.
- More than one third of individuals have at least 1 more episode of care; more than 17% had a failed return to work attempt.
- For those with recurrent work disability, 69% of total lost time from work, 71% of associated indemnity costs, and 84% of total medical costs occurred during the recurrent period.
- For those with recurrence of care, the respective values were 48%, 47%, and 42%.

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