Risk of recurrence of occupational back pain over three year follow up

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ABSTRACT A random sample including 2342 cases representative of all occupational back injuries in Quebec (1981) was followed up prospectively over three years to assess the recurrence rate of back problems (lumbar, thoracic, and cervical). Each medical and accident report was reviewed to obtain the site of symptoms and occupation. Age, sex, industrial sector, and number of episodes of absence from work were abstracted from the computerised Quebec Compensation Board files. The recurrence rate was 20.0% at one year follow up and 36.3% at three years. A multivariate analysis using a Poisson regression, was performed to model the risk of recurrence over time. Men had a higher chance of recurrence (risk ratio = 1.85, 95% CI = 1.50-2.27) but among recurrent cases, the average total number of episodes was comparable between men and women. Age showed a protective effect on the probability of recurrence (10 years: RR = 0.93, 95% CI = 0.88-0.98) due to the lower recurrence rate in the 45-64 year old group (31.8%). Cervical and lumbar symptoms had identical recurrence profiles whereas thoracic symptoms had a significantly lower recurrence rate. Drivers had the highest recurrence rate (42.1%) and nurses had the highest average number of recurrences (2.03) among recurrent cases. Both occupations had statistically significant excesses after controlling for the other variables.

The term "recurrence" has been closely associated with back pain.¹ Troup *et al* have reported recurrence rates of absence from work of 44% in the first year and 31% in the second year follow up of 802 colliery and manufacturing workers (north west England) after an episode of absence for back pain.² Bergquist-Ullman and Larsson followed up 217 back injured workers at Volvo (Gothenberg, Sweden) and found recurrence rates, after one year, of 31% when considering episodes of absence from work and 62% when considering all episodes of pain.³ In a retrospective study, Horal found that 92% of patients with back pain had had at least one previous episode.⁴

Four different uses of the term recurrence may be found in published reports. It has been referred to as the occurrence of relapsing symptoms reported as being related to a previous injury or to any further episode reported as being related or not to a previous back injury. Both of these definitions have been used interchangeably in epidemiological publications and it is often unclear as to which definition an author is referring when reporting recurrence rates. Surgical publications suggest a third definition in terms of therapeutic failure after surgery. For example, failure

rates of 30%⁵ and 44%⁶ after lumbar spine fusion have been reported. A fourth definition of recurrence, used by workmen's compensation boards, relies on administrative decisions that generally have little or nothing to do with the health problem itself. In Quebec, for instance, a recurrence is a case for which the current episode is added to an existing file of a previous episode, as opposed to the opening of a new file that would make it a new episode. The introduction of new legislation in Quebec makes it much easier for a worker (both in terms of waiting time and acceptance of the claim for compensation) to file a claim for a new health problem than for an old one. Therefore most injuries are reported as new occurrences.

The great confusion in the use of the term recurrence warrants cautious interpretation and makes comparisons between published data difficult. At present there is no standardised medical definition for recurrence of back pain, nor is there a diagnostic tool that allows objective discrimination between a true recurrence resulting from a previous episode and a new episode. Therefore, the term recurrence should be understood broadly without the contingencies of the arbitrary definitions it has been given. The present paper reports recurrence rates in a cohort of 2342 compensated

workers followed up for over three years and analyses the socio-occupational factors associated with such recurrences. Recurrence was defined here as any episode of compensated back pain, without questions about the existence of a relation with a previous episode or not.

Method

To study occupational back injuries in Quebec, the Quebec Workers' Compensation Board (QWCB) provides data that are representative of all injuries in the workplace because the compensation system is well developed and has, like health insurance, a universal coverage.

The Quebec cohort of compensated workers for back pain has been described in detail elsewhere.⁷ It was assembled by taking a representative sample of all workers who had been compensated in 1981 for a problem of back pain. Sample size calculation was based on being able to estimate with a precision of $\pm 1.5\%$ the proportion of compensated workers that would have an absence from work of three months or more. Back pain was defined as all musculoskeletal complaints relating to the entire spine (cervical, thoracic, lumbar, and sacral). Compensation was defined as payment for the loss of at least one working day. Workers who had been reimbursed for medical care only without an absence from work were excluded from this study.

The criteria for entry in the cohort (being compensated for a back problem in 1981) were defined cross sectionally. In that sense the episode in 1981 (the first in that year if more than one) was referred as the starting point for the three year follow up but was not necessarily the first episode in a worker's life. A recurrence was defined as any episode of compensated absence from work subsequent to the first episode in 1981. Periods of absence separated by at least one day of work, were considered separate episodes. The number of recurrences was counted over the three years after the first episode in 1981. A worker with only one episode during the whole study period was labelled as a "non-recurrent case" and a worker with a total of two or more episodes (including the initial episode) was counted as a "recurrent case." Recurrence rate was defined as the proportion of workers with at least one recurrence in the three year period.

The site of symptoms and occupation were obtained by two physicians and a nurse specialised in occupational health who reviewed each original medical and accident report. The site of symptoms was coded as cervical and cervicodorsal, thoracic, lumbar and lumbosacral, and occupation as miner/lumber, manual worker, driver, nurse, white collar worker,

and other.

Information about age, sex, and number of compensated episodes over three years follow up was abstracted from the computerised QWCB files.

A Poisson regression was used to model the instantaneous risk of recurrence(s) in individuals over three years follow up in terms of age, sex, site of symptoms, and occupation.⁸

Results

Of the 2342 compensated back injuries included in the study, 84.3% were men, 50.0% were between 25 and 44, and 70.1% suffered from a lumbar problem. Over the three year follow up 36.3% had at least one recurrence (table 1), which was 14.3% more than the 22.0% recurrence rate recorded in the first year of follow up. The distribution of the workers by number of recurrence was heavily skewed, most recurrent cases having only one recurrence in three years. The maximum total number of episodes in the first year of follow up was six and after three years nine.

Men had a recurrence rate at three years of 38.0% and women 27.5% (table 2). Among recurrent cases, however, the two sexes had a similar total number of episodes (men = 2.63, SE = 0.04; women = 2.66, SE = 0.10).

The 25-44 age group had the highest recurrence rate (38.3%). In that group recurrent cases also averaged the largest number of episodes (2.71, SE = 0.05) in the three year follow up. The older age group had the lowest rate of recurrence with 31.8% and the smallest number of episodes on average (2.41, SE = 0.07).

The lumbar and cervical symptoms had almost identical recurrence profiles with recurrence rates of 37.1% and 38.5% respectively, and an average of 2.65 (SE = 0.04) and 2.58 (SE = 0.13) episodes among recurrent cases (table 2). Thoracic symptoms had the lowest recurrence rate (31.5%) and smallest number of

Table 1 Number of episodes of absence from work over one and three years follow up

No of episodes	Proportion % (n)	
	One year follow up	Three years follow up
1	78.0 (1826)	63.7 (1492)
2	17.0 (397)	22.6 (529)
3	4.1 (98)	8.2 (193)
4	0.6 (15)	3.3 (77)
5	0.3 (6)*	1.1 (25)
6		0.6 (15)
7		0.5 (11)†
Recurrence rate	22.0 (516)	36.5 (850)
Total	100.0 (2342)	100.0 (2342)

*Five or more episodes.

†Seven or more episodes.

Table 2 Recurrence over three years follow up by age, sex, site of symptoms, and occupation

	No	Proportion (%) of recurrent cases*	Mean (SE) No of episodes among recurrent cases
Total	2342	36.3	2.63 (0.04)
Sex:			
Male	1975	38.0	2.63 (0.04)
Female (14 missing)	353	27.5	2.66 (1.10)
Age:			
15-24	654	35.0	2.58 (0.06)
25-44	1280	38.3	2.71 (0.05)
45-64 (15 missing)	393	31.8	2.41 (0.07)
Site of symptoms:			
Cervical	161	38.5	2.58 (0.13)
Thoracic	267	31.5	2.50 (0.11)
Lumbar	1641	37.1	2.65 (0.04)
Unspecified	273	34.8	2.64 (0.11)
Occupation:			
Driver	252	42.1	2.68 (0.10)
Nurse	164	39.6	3.03 (0.18)
Manual worker	1327	36.6	2.62 (0.05)
Miner/lumber	55	36.4	2.40 (0.15)
White collar	91	28.6	2.27 (0.14)
Other (173 missing)	280	33.2	2.56 (0.09)

*Recurrent case is defined as an individual who had at least one subsequent compensated episode of back pain in the three years after an episode in 1981.

episodes among recurrent cases (2.50, SE = 0.11).

Drivers and nurses were the two occupations with the highest recurrence rates, 42.1% and 39.6% respectively (table 2). Recurrent cases among nurses had the largest number of episodes, averaging 3.03 (SE = 0.18) followed by drivers with 2.68 episodes (SE = 0.10). Manual workers and miners/lumbers followed closely in terms of recurrence rates and number of episodes. White collar workers had the lowest recurrence rate (28.6%), which was over 10% lower than the driver and nurse categories, and had the smallest number of episodes among recurrent cases.

Table 3 Risk of recurrence(s) in three years follow up. (Estimated from a Poisson regression model*)

	Risk ratio	95% CI
Sex: (men)	1.85	1.50-2.27
Age: (10 years)	0.93	0.88-0.98
Site of symptoms:		
Lumbar	1.00	— —
Cervical	1.00	0.81-2.23
Thoracic	0.73	0.60-0.88
Unspecified	0.87	0.87-1.05
Occupation:		
White collar	1.00	— —
Miner/lumber	1.14	0.69-1.88
Manual worker	1.26	0.89-1.78
Driver	1.64	1.13-2.37
Nurse	2.62	1.80-3.82

*Model including all variables shown in the table.

MULTIVARIATE ANALYSIS

The instantaneous risk of recurrence of back pain was modelled using a Poisson regression that controlled for age, sex, site of symptoms, and occupation (table 3). The results in essence confirmed what has been described thus far in the univariate analysis.

The effect of sex was stronger after controlling for all other variables. Men had almost twice the risk of having a recurrence as women in the three years after the initial episode (risk ratio (RR) = 1.85, 95% CI = 1.50 - 2.27).

The protective effect of age on the risk of recurrence (RR = 0.93, 95% CI = 0.88 - 0.98) was explained by the lower rate in the older age group (45-65) as described above. The thoracic symptoms had a lower risk of recurrence than the lumbar (RR = 0.73, 95% CI = 0.60 - 0.88). The latter did not differ from cervical symptoms.

Nurses had over twice the risk of having a recurrence compared with white collar workers (RR = 2.62, 95% CI = 1.80 - 3.82). Drivers also had a higher risk of recurrence (RR = 1.64, 95% CI = 1.13 - 2.37). The other occupations, manual worker and miner/lumber, in decreasing order of risk, did not statistically differ from the white collar category.

Discussion

The main limitation of this study was in the definition of the "initial episode" for the follow up. The study population was derived from a cross sectional sample of all compensated cases of back injuries in 1981. The initial episode was not necessarily the first one in a worker's life. Even though each case was recorded as a new episode at the QWCB (new compensation file), we know that it meant nothing for the classification of cases as "new" or "recurrent." So the initial episodes were a mixture of both and the results cannot be inferred to incident cases only. Given Horat's report that most injured workers have had a previous episode of back pain in their life,⁴ however, and that there is no objective way to determine if a given episode of back symptoms is independent or not from a previous injury, the composition and the large size of our cohort seem appropriate to provide the best estimate of recurrence rates of back injuries in the workforce in Quebec.

Reasons for dropping out of the cohort during the three years follow up are unemployment and any other reason for work cessation aside from a compensated health problem. Other potential reasons such as change of job or geographical movements probably have small impact because compensation in Quebec has universal coverage. Overall, the quality of the follow up is considered excellent and a potential bias

from drop outs negligible.

The definition given to the term recurrence has received little attention.^{1-3,9} The dictionary definition refers to the return of symptoms, occurring as a phenomenon in the natural history of diseases. Presumably, the episodes of symptoms are linked to a common physiopathological process. With back pain, there is, in most cases, no objective evidence of any pathological process other than pain. In the absence of such evidence it would be equally appropriate to consider every episode of back pain as a recurrence (relapsing symptoms from a previous injury) or as a new episode (independent from any previous medical history). The decreasing recurrence rates over the three years follow up and the distribution of workers by number of episodes are patterns that suggest the existence of a link between the episodes. Such a link could lie in the increased susceptibility of a spine that has already suffered an injury but could also be in the maintenance of an individual in a risky environment for repeat injury to the spine.

Whereas the definition used in the present study (any subsequent episode of back pain reported as related or not to a previous one) was somewhat arbitrary, it had the advantage of being more conservative in not assuming independence between the episodes.

Nearly two fifths of the recurrences of compensated back injuries reported in three years follow up occurred in the past two years. In other words, 14.3% (n = 334) of the whole study population had a first recurrence after the first year of follow up. This indicates that even though most (three fifths) occurred in the first year, the risk of a first recurrence after that time is not negligible. These observations have two important implications. The first concerns the inclusion criteria used in randomised controlled trials for the evaluation of treatment of back injury. It is common practice in such studies to define a case as "new" by determining a certain period during which the patient must be free of symptoms before entry in the trial—for example, Bergquist-Ullman and Larsson have used one year.³ The results of the present study indicate that such an approach does not eliminate recurrent cases from the study population and may change the interpretation of the results, especially if the symptom free period is short.

The second implication of our results concerns the therapeutic area and supports the recommendation that rehabilitation efforts and the patient's alertness should be maintained beyond the first year after an episode, even in the absence of a recurrence at that time.

The recurrence rates presented here are well below those reported by Troup *et al*² and by Bergquist-Ullman and Larsson.³ The populations studied were,

however, in the first case a mixture of mining and manufacturing industry workers and in the second car industry workers. The difficulty in comparing recurrence rates can arise from: (1) differences in sources of information (WCB v company files v surveys), (2) differences in the definition of a case, (3) differences in the definition of a recurrence, and (4) differences in the representativeness of the study population. In the present study the QWCB files were used to locate the cases. Given the universality in coverage for compensation in Quebec, that source of information is probably representative of back injuries experienced by all workers in Quebec, although reporting patterns may vary between occupations and sectors of activity resulting in under or over representation of some groups.

In the Poisson regression, controlling for age, site of symptom, and occupations, men had almost twice the chance of having a recurrence as women. Occupational factors possibly associated with onset and mechanism of spinal injury, and strongly segregated between sexes, could account for the differences observed. Examples are: types of job and task, working shifts, or injury reporting pattern between industries or sectors of activity that employ predominantly either men or women. Among recurrent cases, however, men and women had on average the same number of episodes. This suggests that the difference between sexes takes place early in the evolution of a back condition, before the onset of a first recurrence.

Surprisingly, older workers (45–64) were found to have fewer recurrences than all other age groups, resulting in a protective effect in the multivariate analysis. This observation contrasts with that of Magora who found increasing frequency of back pain with age.¹⁰ One possible explanation for lower recurrence rate at older ages could be the "healthy" or "unhealthy" worker effect. In the healthy worker effect workers are more resistant to back injury or are selected out of hazardous jobs as their seniority increases, which in turn reduces the rate of back injury in that age group. The unhealthy worker effect would refer to individuals who are lost to follow up because of permanent disability or early retirement for health problems. In both cases the reduction in the rate of back injury in that age group is an effect of either drop outs in the numerator of the rate or differences in the exposure to risk in the population in the denominator as compared with earlier age groups. The findings of this study for the 25–44 year old category showing the peak prevalence agree with other studies.^{7,11}

Lumbar and cervical sites of symptoms had identical recurrence profiles. This contrasts greatly with the large differences observed in the frequency of the two conditions. Although specific risk factors have

been identified for lumbar and cervical symptoms,¹² our data suggest that the evolution of the clinical syndrome, after its onset, is similar in the two spinal segments.

Among occupations, nurses had the highest number of recurrences. Previous published figures on the frequency of back problem have ranked nurses second only to heavy industry workers in terms of frequency.¹³ In the present study 67% of the total number of episodes reported for nurses (197/296 episodes) during the study period were recurrences. This finding illustrates the importance of defining a case in terms of recurrence when reporting incidence or prevalence rates. The fact that nurses have had more recurrences of back problems than those in occupations such as manual workers and miners may reflect a specific disease of the spine. Nurses are exposed to very specific task related risk factors for back injury, such as the movement of patients.¹⁴ Lesions to the back resulting from such activities could have a specific natural history with a high recurrence rate. These results could also reflect specific injury reporting patterns in hospitals compared with other occupations.

Drivers ranked first in terms of recurrence rate. The importance of back problems in that occupation has been substantiated.¹⁵ Our data show, however, that 66% (284/430) of the reported episodes of back pain among drivers were recurrences.

Troup *et al* suggested in their prognostic factors for recurrence a higher probability of recurrence after a third episode.² The data presented here do not substantiate this hypothesis since the rate of recurrence was steadily decreasing with the number of episodes. If the hypothesis was true the recurrence rate would remain more constant after the third episode than as observed in our data. It is suspected that the previous study suffered an attrition bias that gave a better chance for more severe cases to be kept at follow up. At three years follow up, we found a steady decrease in the proportion of workers with one to seven or more episodes of pain. Only 5.5% had more than three episodes over three years.

High recurrence rates could indicate that rehabilitation efforts, especially in terms of return to work, have failed. Our results illustrate the urgent need for evaluating the rehabilitation care offered to injured

workers, not only in terms of time to return to work but also of prevention of recurrences, and with longer follow up than presently done.

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