

Treatment Duration and Cost of Work-related Low Back Pain in Korea

The purpose of this study is to present the information on the duration of treatment and the cost of work-related low back pain. Using the compensation-database for 1997 work-related low back pain ($n=9,277$), this study estimated the duration of treatment, the cost of work-related low back pain, the relationship between them, and probability of being off treatment at different intervals. The mean and the median of the treatment duration are 252.6 days and 175 days. The mean and the median of the cost of total insurance benefit are 37,700,000 won and 14,400,000 won. The treatment duration of 51% of the study subjects was less than 6 months and their cost accounted for 10.2% of the total insurance benefit. The subjects who were treated more than 24 months were 5.8% but it accounted for 29.2% of the cost. It was found that approximately 50% of the subjects who will remain on treatment at the end of n months would be off treatment at the end of $n+5$ months. This study presents the point in time when the low back pain (LBP) workers need to prepare to return to work by forecasting their off-treatment period. From the treatment duration and cost perspectives, this study may be utilized as evidence for active management of work-related LBP.

Key Words : Low Back Pain; Treatment; Therapy; Health Care Costs

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INTRODUCTION

About two-thirds of the adult population suffer from low back pain (LBP) at some time (1). Although up to 85% of LBP has no known cause, scientific evidence indicates that non-specific LBP is basically an age-related disorder that is affected by differences in occupation, genetics, and personal behaviour (2).

From the viewpoint of disorder's incidence, labor loss, and cost, work-related LBP is a very important occupational health area. In the U.S.A., LBP claims are the most common category of workers' compensation losses, accounting for 15% to 25% of all claims and up to 40% of costs (3, 4). In Korea, work-related LBP was reported about 15% of all work-related disorders for which worker's compensation is claimed, since the mid-1990s (5). Most work-related disorders including work-related LBP generally have a longer treatment duration and cost more than non-work-related diseases (6). There is an imbalance between treatment duration and cost of work-related LBP: a disproportionately small percentage of the costliest LBP claims (10%) is responsible for the largest percentage of the total cost (86%) and the distribution of length of disability is also skewed with an average of 102 days and a median of zero (7).

Using the worker's compensation insurance data, this study will estimate the treatment duration and cost, the relationship between them and the remaining treatment period for

work-related LBP in Korea. So, it will present the point in time when a LBP workers can prepare to return to work, by predicting the off-treatment period, and presents evidence for active management of work-related LBP.

MATERIALS AND METHODS

Study subjects

This study targets 9,277 cases reported by Korea Labor Welfare Corporation as having occurred in 1997, in which worker's compensation benefits were paid due to a work-related LBP. The open cases were 418 (4.5%) of the above cases as of the end of March 2002, and the total period tracked was from 51 months to 63 months. The major diseases classified as work-related LBP are lumbar spine, lumbar herniated nucleus pulposus (HNP), lumbar fracture, and others.

Methods

Korea Labor Welfare Corporation is the sole government agency that handles all work-related compensation in Korea, and it has records of insurance benefits paid to workers due to work-related diseases from the onset of care to the completion of care or death.

From these data, the accumulated insurance benefits that

are paid from the beginning of care to the completion of care can be calculated. In open cases (4.5%), because the cost expenditure arising from continuous care and compensation is forecast, only the cost paid until that time has been calculated. The insurance benefit consisted of medical costs (care benefits) and indemnity costs. The indemnity costs comprise disability benefit, shutdown benefit, survivor benefit, funeral expense, injury-disease compensation annuity etc.

The treatment duration has been defined as the period from the onset of the disease to the completion of care, and includes the admission and outpatient department period.

To estimate the remaining treatment period, Bayes' rule was used. Bayes' rule is a method of getting the conditional probability that A may develop based on the probability of B through new information. The probability (A) that a person (B) who has been under care for a certain period of time can be completely cured after a certain period of time. In other words, conditional probability $P(A|B)$ can be calculated as follows:

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

Here, A is an event of being off treatment at a particular time period, and B is an event of being on treatment for a certain time period.

Through conditional-probability calculation, we may see a probability distribution regarding how long the care of a person currently under treatment can be continued.

Data analysis

A statistical package, Statistical Analysis System (SAS; 6.12 Version), was used to analyze the data. The distribution of the treatment duration and cost spent for the study subjects

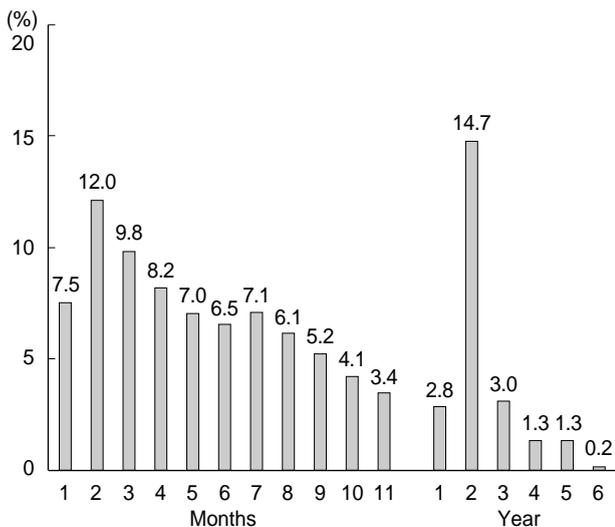


Fig. 1. Distribution of treatment duration of all work-related low back pain in 1997.

was described, and the remaining treatment period was estimated using Bayes' rule.

RESULTS

Distribution of treatment duration and cost

The mean and median of the treatment duration were 252.6 days and 175 days, respectively, showing a left-tailed skewed shape. Regarding the distribution of the treatment duration, 79.5% was less than a year, 20.5% was a year or more, and 29.3% was less than 3 months (Fig. 1).

The mean and median of the treatment cost were 37.7 million won and 14.4 million won, respectively, showing a left-tailed skewed shape. With regard to the distribution of the cost, 43.0% was less than 10 million won, 21.8% was more than 50 million won, and 30.3% was less than 5 million won (Fig. 2).

When considering the treatment duration and cost together, 51.0% of all the study subjects registered a treatment duration of less than 6 months, but the corresponding cost spent accounted for 10.2% of the total cost of the work-related LBP. The cost for the work-related LBP cases with more than 24 months of treatment accounted for 29.2% of the total cost, although they took up only 5.8% of all the study subjects (Fig. 3).

Estimation of remaining treatment period

Table 1 shows various distributions of the work-related LBP cases according to Bayes' rule.

The bottom row shows the unconditional probability of being off treatment, assuming a claim has been filed. For example, 51% of all the claims had a treatment length of 6 months

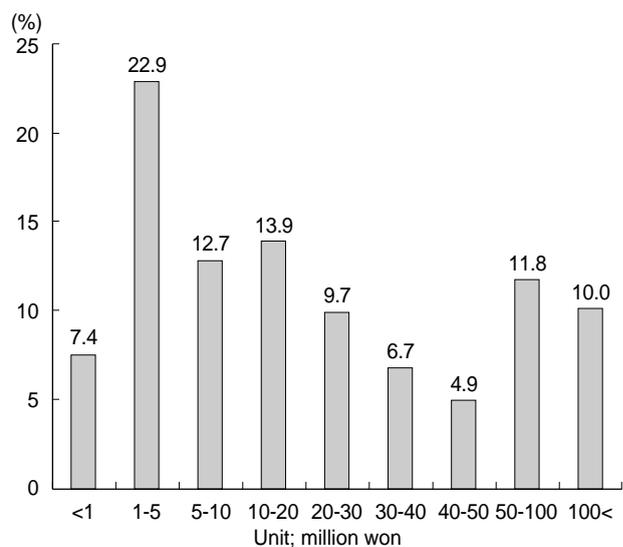


Fig. 2. Cost distribution of all work-related low back pain in 1997.

or less, and 79.6% had a treatment length of 12 months or less. The top row shows the conditional probability of being off treatment, given that the claimant has been on treatment for a certain period of time. For example, if a claimant has been on treatment for one month, the Table 1 shows that the chance of his/her being off treatment at the end of 6 months (5 months later) is 0.47 (47% chance of being off treatment). Alternatively, it could be expressed that this claimant has a 53% chance of remaining on treatment at the end of 6 months.

To examine the relationship between how long a typical claimant remains on treatment, given that the claimant is currently being treated, this study examined the time inter-

val from when the claimants started being on treatment to when 50% of them came off treatment. For example, the Table 1 shows that 50% of the people who were on treatment for 1 month came off treatment in 6 months (time interval: 5 months), and 50% who were on treatment for 6 months were free from the disability in 11 months (time interval: 5 months). This time interval was found to be similar for different treatment durations, with a majority of the time intervals being 5 months. When the treatment duration was a year or more, however, the time interval was longer than when the duration was less than a year.

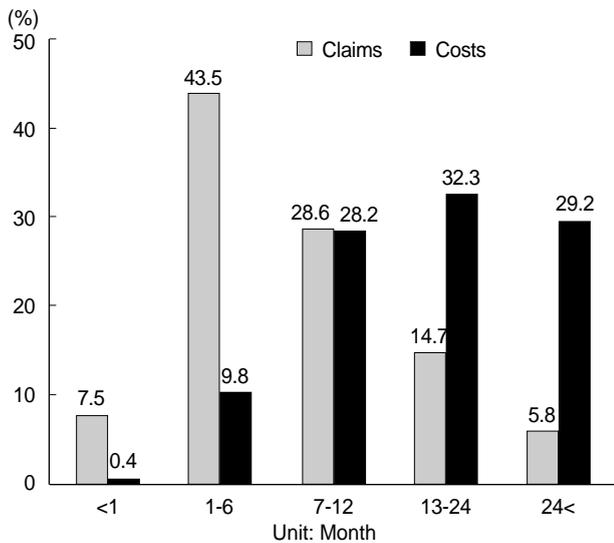


Fig. 3. The relationship between treatment duration and cost of all work-related low back pain in 1997.

DISCUSSION

Looking into labor loss and cost arising from work-related LBP, 2% of all workers in the U.S.A. have been absent from work due to LBP, and about half of these absences are acknowledged as labor losses (8). The days accounting for labor loss are 6 million hours annually, and about US\$50 billion are spent annually for diagnosis and treatment (9). When work-related LBP is not adequately managed, lowered productivity due to labor loss and the pain experienced by the worker can be considered a socio-economic problem in our society (10). Therefore, preventive management for work-related LBP, that is, pro-active measures, should be carried out. Then, as re-active measure, an active treatment, rehabilitation program, and proper compensation which would allow workers to return to work earlier after the onset of the disease, should be conducted.

This study estimates the treatment duration and cost, the relationship between them, and the remaining treatment

Table 1. Probability of being OFF treatment different of time intervals, given that the claimant has been on treatment in 1997

(1a) If on treatment at the end of	(2) Then the probability of being off treatment at the end of:															
	Month											Year				
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	
Month 1		0.13	0.24	0.32	0.40	0.47	0.55	0.61	0.67	0.71	0.75	0.78	0.94	0.97	0.98	
2			0.12	0.22	0.31	0.39	0.48	0.55	0.62	0.67	0.71	0.75	0.93	0.97	0.98	
3				0.12	0.21	0.31	0.41	0.49	0.57	0.62	0.67	0.71	0.92	0.96	0.98	
4					0.11	0.22	0.33	0.43	0.51	0.57	0.63	0.67	0.91	0.96	0.98	
5						0.12	0.25	0.35	0.45	0.52	0.58	0.63	0.90	0.95	0.97	
6							0.14	0.27	0.37	0.46	0.53	0.58	0.88	0.94	0.97	
7								0.14	0.27	0.37	0.45	0.51	0.86	0.93	0.96	
8									0.10	0.18	0.25	0.30	0.84	0.92	0.96	
9										0.09	0.16	0.23	0.81	0.91	0.95	
10											0.13	0.23	0.78	0.89	0.94	
11												0.12	0.75	0.88	0.94	
Year 1													0.72	0.86	0.93	
2														0.52	0.74	
3															0.46	
(1b) If Treatment claims filed	0.075	0.194	0.293	0.375	0.445	0.510	0.581	0.641	0.693	0.734	0.768	0.796	0.942	0.972	0.985	

*Top rows of tables show probability of being off treatment at different time intervals, given that the claimant has been on treatment. Bottom row of table shows the probability of being off treatment if a claim has been filed. See examples in the Results section of the text.

duration to present the point in time when a LBP workers can prepare to return to work, by predicting the off-treatment period, and to presents evidence for active management of work-related lower back pain.

This study reveals that work-related LBP has disproportional distribution between duration and cost in Korea. That is, 20.5% of all the claimants needed a year or more of long-term treatment due to work-related LBP, and accounted for 61.5% of the total cost. On the other hand, 51.0% of the claimants with less than 6 months of treatment took up only 10.2% of the total cost. This trend of some claimants with long-term treatment accounting for a relatively higher cost and some claimants with shorter treatment duration accounting for a relatively lower cost was also seen in other studies. Hashemi et al. (7) reported that 12.4% of the claimants, who had 3 months or more of treatment, accounted for 87.9% of the total cost. Thomas et al. (11) reported that 10.7% of those who had a year or more of treatment accounted for 87.9% of the total cost. The treatment duration in this study was longer than those in other studies, which implies differences in the calculation based on work-related accidents and the recognition standards of compensation. Korea, Taiwan, and France calculate the treatment duration based on the compensated accidents which require 4 or more days of treatment indispensably. While the United States, Britain, and Japan calculate it based on the reported accidents. The former is thus underestimated compared with the latter in terms of work-related accidents and compensated accidents. For this reason, it is not adequate to compare the work-related LBP's treatment duration and cost of the former with them of the latter directly.

Although there is a difference in the duration, the prolonged treatment duration makes work-related LBP as a chronic disease, needs higher cost including insurance benefit and lowers the possibility of returning to work. Actually, after a year of treatment, it has been reported that the possibility of a patient ever returning to work is 25% (12). On the contrary, the fact that the treatment duration of work-related LBP is prolonged reflects reluctance to return to work. Because rehabilitation program or social conditions allowing patients with LBP to return to work have not been properly established.

As in Bayes' rule, it was found that approximately 50% will be off treatment at the end of $n+5$ months among those claimants who remain on treatment at the end of n months. This calculation can be used in conjunction with clinical information to make a rough prediction of the proportion of those who might go on having prolonged treatment. Hashemi et al. (7) presented, however, that the point in time when 50% will be off treatment will be $6n$ weeks, when the treatment is carried out at a certain point in time (n week) using the unit of weeks. At a certain point in time, the fact that the time when 50% of the target is off treatment is regular implies that the treatment duration is proportional to the seriousness of the disease. When a certain period has passed at a certain

point in time, the fact that care of 50% of the study subjects is complete can be interpreted to mean that the treatment duration is decided differently from the seriousness of the disease. That is, the treatment duration may be extended due to the patient's delayed response to the treatment, but the possibility that the treatment duration is being extended regularly for the secondary gain of the patient or the treatment institution cannot be discounted.

This study is significant because it presents the importance of work-related LBP in occupational health by suggesting the actual treatment duration and the cost of its treatment using work-related accident data. By estimating from a certain point in time the duration of the remaining treatment that does not follow normal distribution, the point in time when a patient could return to work can be predicted indirectly. Conclusively these results can be utilized as evidence for the prevention and management of work-related LBP.

But this study had some limitations. First, the data obtained were from an administrative database created for claims processing. For this reason, this system does not have an accurate data of treatment duration and cost and does not provide a direct information on return to work. Moreover, a portion of the assessed treatment cost has been underestimated, since cost spending was not complete in the case of non-completed treatment. Second, there is a misclassification bias that generates the possibility of errors in the treatment duration and cost of each disease that causes LBP because the relationship between the treatment duration and cost of work-related LBP in the mixed state of various diseases can exclude features between the treatment and cost of each disease. Finally, since the active management of LBP varies depending on the patient's characteristics, namely, his/her clinical state, rehabilitation opportunity, or possibility of returning to work, this study is not suitable for use as a direct basis for restricting or regulating the treatment duration of each LBP patient.

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