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Prediction Model for Job Retention According to the Type of Return to Work Among Industrially Injured Workers in Korea

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Objectives: This study aimed to investigate how the type of return to work after an industrial accident affects job retention. **Methods:** Using data from the panel study of workers' compensation insurance first-third, and hazard ratios (HRs) and 95% confidence intervals were calculated for workers leaving their jobs. **Results:** The HR leaving their jobs were higher in the "reemployed" compared with that in the "returned to original work," with HR of 2.69 (2.33–3.10). According workers' status, the HRs leaving their jobs were higher among the "reemployed" than among those who "returned to original work." Regular and daily workers' HRs were 1.70 (1.37–2.11) and 3.55 (2.96–4.26), respectively. **Conclusions:** The findings suggest that to increase job retention rate, protection policies for reemployed workers or support for employers who hire reemployed workers should be considered.

Keywords: job retention, return to work, industrial accident, regular worker, daily worker, panel study of workers' compensation insurance

Industrial accidents are among the main causes of injury and death in economically active populations worldwide. Every year, approximately 2.34 million workers die from industrial accidents globally.^{1,2} In 2019, there were 109,242 industrial accident in Korea, with a death toll of 2020 (1.8%).^{3,4} The incidents accounted for 54.54 million lost working days, indicating that labor loss due to industrial accidents was also significant⁵ and labor losses lead to economic losses. Hence, there is a need for efforts to support workers' return to work after industrial accidents.^{6–10}

In Korea, to promote compensation after industrial accidents and support for medical and rehabilitation services, the coverage of

industrial accidents has continuously expanded. Before 2018, when an industrial accident occurred, the employer made an industrial accident claim. Therefore, to improve employees' accessibility, the employer confirmation system was abolished in 2018, thereby, allowing workers to file industrial accident claims without requiring confirmation from their employers.¹¹ In addition, medical and rehabilitation services are supported to promote the return of injured workers to work.^{12,13} This policy of strengthening accessibility and guarantee may encourage injured workers to return to work.¹¹ To understand industrially injured workers' (IIWs) successful return to work, it is necessary to investigate their postreturn to work situation.

Unemployment and remaining disability because of industrial accidents can substantially affect the lives of workers in terms of their earning capacity and involvement in social activities.^{4,5} IIWs often have difficulty returning to work.¹⁴ In addition, even if they successfully returned to work after termination of care, approximately 60% of the workers who left job¹⁵ or returned to work had experienced difficulties in adapting to work as they experience absenteeism related to industrial accidents at least once.¹⁶ In particular, the rate of return to work is low among daily workers.^{3–5} In addition, although they may return to work, compared with regular workers, daily workers may find it more difficult to retain their jobs. This scenario implies that returning to work does not guarantee job retention⁹ and indicates the need to increase awareness regarding job retention.

Failure to return to work and returning workers' multiple experiences of absenteeism are known to be common among IIWs.^{15,16} Clearly, when an injured worker returns to work following an accident, their attendance does not necessarily signal that their "return" is stable.¹⁷ Accordingly, confirmation of employment patterns after injury may be helpful for developing an injured-worker management strategy.^{15,16} However, only a few studies^{9,14,17–19} have focused on job retention after returning to work, and, to the best of our knowledge, there have been no published reports on the status of workers at the time of the accident and job retention after the accident.

Therefore, this study's the purpose was (i) to investigate the effect of the type of return to work after an industrial accident on job retention and (ii) how it affects job retention by stratifying workers' status at the time of the accident using data from the panel study of workers' compensation insurance (PSWCI).

METHODS

Data Source

This study used PSWCI first-third data from the Korea Workers' Compensation and Welfare Service Labor Welfare Research Institute. The PSWCI was implemented to comprehensively understand the situation of IIWs after the termination of medical treatment and produce objective data to evaluate industrial accident insurance services. A survey was conducted on 3294 IIWs who completed medical care in 2017. The first wave of this survey—which is conducted annually (August–October)—began in 2018, and thus far, three waves of the survey have been completed. A professional interviewer visits the survey participants in person to conduct computer-assisted personal interviews (computer-based interpersonal interviews). We obtained anonymized data from 2018 to 2020 from the Korea Workers' Compensation and Welfare Service Labor Welfare Research Institute.

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Author contributions: S.W.B. conceived and planned the study, performed the analysis, visualized the results, and contributed to the interpretation of the results. J.-U.W. conceived and planned the study, wrote the original draft with input from all the authors, validated the study, and contributed to the interpretation of the results. W.M.P. conceived and planned the study, validated it, contributed to the interpretation of the results, and supervised the entire process. All authors have read and approved the final article.

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Study Population

Among the 3294 sampled workers, 24 whose status at the workplace at the time of their industrial accident was *self-employed* or *employer* were excluded because their work title and status would remain the same even after returning to original work; thus, their data could affect the results. In addition, workers whose first return to work was unpaid (including self-employment) and who were continuously unemployed or inactive after the termination of medical treatment were considered not to have returned to work. Thus, 853 workers were excluded. Finally, 2417 workers were included in this study.

Sociodemographic Characteristics

Participant age classifications were “under 40,” “40s,” “50s,” and “60s or older.” Education level classifications were “less than college” and “college or above.”

Occupational-Related Characteristics

Occupational-related factors include the working environment of the worker at the time of their industrial accident: industry, occupation, duration of employment, and status of workers. Industries were surveyed according to the Korean Standard Industrial Classification based on the International Standard Industrial Classification, classified as “manufacturing,” “construction,” “service,” and the rest as “other.” Occupations were surveyed according to the Korean Standard Classification of Operations based on the International Standard Classification of Operations and classified as “white collar,” “blue collar,” and “service.” The duration of employment was classified as “<1 year,” “1 to less than 3 years,” and “≥3 years.” Regular workers are workers with a labor contract period of more than 1 year or workers who can continue to work if they want without a fixed contract period. In contrast, temporary workers' contract period is more than 1 month but less than 1 year, or those who end their work within 1 year, even if there is no work contract period. Daily workers have a working contract period

TABLE 1. General Characteristics of Study Participants According to Their Job Retention Status

	Job Retention (n = 1,152)		Nonretention (n = 1,265)		P*
	n	%	n	%	
Follow-up period, mo					
Mean (SD)	35.1	5.9	13.2	8.7	<0.001
Age, yr					<0.001
<40	213	48.1	230	51.9	
40–49	298	53.5	259	46.5	
50–59	446	49.1	462	50.9	
≥60	195	38.3	314	61.7	
Gender					0.126
Male	967	48.4	1,032	51.6	
Female	185	44.3	233	55.7	
Education level					0.001
Less than college	888	46.0	1,042	54.0	
College or above	264	54.2	223	45.8	
Industry					<0.001
Manufacturing	478	56.2	373	43.8	
Construction	240	34.3	460	65.7	
Service	169	51.8	157	48.2	
Other	265	49.1	275	50.9	
Occupation					0.060
White collar	144	54.6	120	45.5	
Blue collar	910	46.8	1,034	53.2	
Service	98	46.9	111	53.1	
Duration of employment, yr					<0.001
<1	542	38.1	881	61.9	
1–less than 3	213	56.1	167	44.0	
≥3	397	64.7	217	35.3	
Status of workers					<0.001
Regular worker	828	56.0	650	44.0	
Daily worker	324	34.5	615	65.5	
Accident type					0.109
Injury	1,084	47.2	1,211	52.8	
Disease	64	57.1	48	42.9	
Commuting injury	4	40.0	6	60.0	
Recuperation period, mo					0.775
≤6	728	48.2	782	51.8	
7–12	331	46.9	375	53.1	
>12	93	46.3	108	53.7	
Disability rating					0.974
1–7	65	48.2	70	51.9	
8–14	823	47.5	909	52.5	
None	264	48.0	286	52.0	
RTW type					<0.001
Returned to original work	699	67.9	330	32.1	
Reemployed	453	32.6	935	67.4	

RTW, return to work.

*P value from the chi-squared test (categorical variables), t-test (continuous variable).

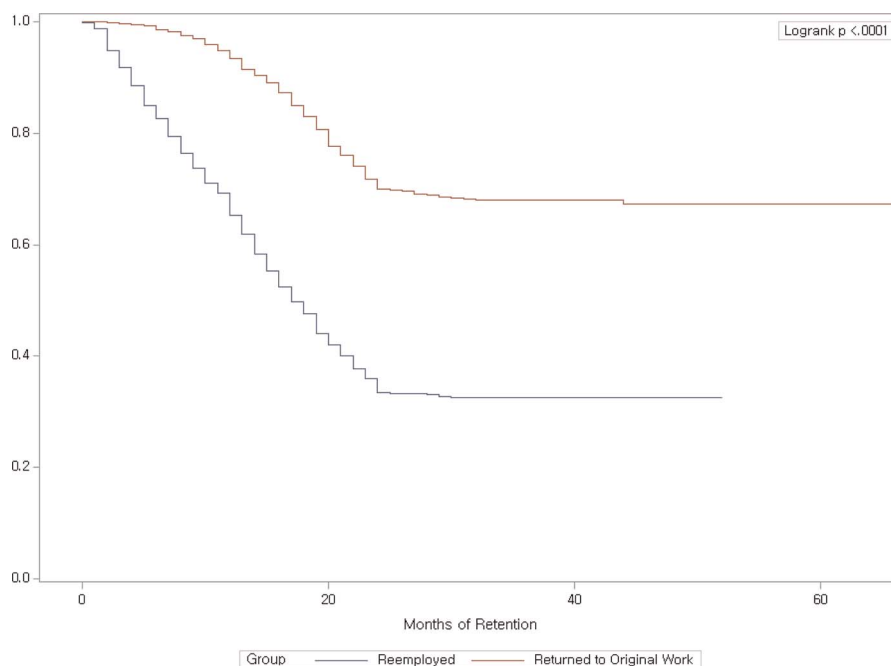


FIGURE 1. Kaplan-Meier survival curves for job retention stratified by type of return to work.

of less than 1 month, are employed and work on a daily basis, or are paid to walk around without a certain place. Workers' status was categorized as "regular workers" and "daily workers" for both temporary and daily workers.

Injury-Related Characteristics

Industrial accident type was classified as injury, disease, or commuting. The recuperation period was classified as follows: "≤6 months," "7 to 12 months," and ">12 months." In Korea, workers who suffer from industrial injuries are cured after convalescence but receive disability ratings if mental or physical deficits remain. The ratings for these conditions were classified as "1 to 7 (severe)," "8 to 14 (moderate to mild)," and "none," according to the disability rating.

Main Outcome Variables

In PSWCI, the types of economic activities were investigated as "returned to original work," "reemployed," "self-employed," "unpaid family work," "unemployed," and "economic inactivity," and return to work types were classified as "returned to original work" and "reemployed." Because we used longitudinal data, if the first return to work was paid work (excluding self-employment), the corresponding worker was included in the study. In contrast, unemployed or economically inactive workers were considered not economically active; workers who were unemployed or economically inactive were classified as a later response when they returned to their original work or were reemployed in a later survey.

Along with employment status, return and leave times were also investigated, and the job retention period was used to calculate. In this study, the status classification was "job retention" or "nonretention" group, and job retention was defined as the first job that was maintained for 2 years after industrial injuries were incurred.

Statistical Analyses

The general characteristics of the study participants according to their job retention status were compared using *t* tests and chi-squared tests. Survival curves were estimated using the Kaplan-Meier method, and the probability of job retention between "returned to original

work" and "reemployed" groups was confirmed by the log-rank test. Using Cox proportional-hazards models, hazard ratios (HRs) and 95% confidence intervals (CIs) were obtained for regular and daily workers leaving their jobs. Statistical significance was set at <0.05. All analyses were performed using the SAS static package version 9.4 (SAS Institute, Cary, NC).

RESULTS

The general characteristics according to job retention status are presented in Table 1. Of the 2417 workers, 1265 workers (52.3%) failed to maintain their jobs during the follow-up period. The average job retention and nonretention groups had 35.1 (SD = 5.9) and 13.2 (SD = 8.7) months, respectively ($P < 0.001$). Workers who were men, in white-collar jobs, were college level graduates or above, in manufacturing, had more than 3 years of work experience at the time of the accident, had been regular, and returned to their original work were more likely to continue working after the accident.

Figure 1 shows the Kaplan-Meier survival curves of job retention according to the type of return to work. There was a significant difference in the probability of job retention between the "returned to original work" and "reemployed" groups ($P < 0.001$ by log-rank test); we found that the job retention rate of the "returned to original work" group was higher than that of the "reemployed" group. In the Cox proportional-hazards regression analysis, the hazard for nonretention was higher in the "reemployed" group compared with that in the "returned to original work" group, with HR of 2.69 (2.33–3.10) (Supplementary Table 1, <http://links.lww.com/JOM/B225>).

In the Cox proportional-hazards regression analysis, the hazard for nonretention according to the status of workers was statistically significantly higher in the "reemployed" group than the "returned to original work" group. The HRs of regular and daily workers were 1.70 (1.37–2.11), and 3.55 (2.96–4.26), respectively (Table 2).

From Tables 3 and 4, it is possible to see HR as nonretention by stratifying the status of workers by gender. The female HR was significantly higher among both regular and daily workers. For male regular workers, the HR of the "reemployed" group was 1.69 (1.32–2.16) compared with the "returned to original work" group; for women,

TABLE 2. Cox Proportional Hazards Ratios for Leaving the Job by Workers' Status

Status of Workers		Crude		Adjusted ^a	
		HR	95% CI	HR	95% CI
Regular worker	RTW type				
	Returned to original work	1.00		1.00	
Daily worker	Reemployed	1.74	1.41–2.15	1.70	1.37–2.11
	RTW type				
Daily worker	Returned to original work	1.00		1.00	
	Reemployed	3.64	3.10–4.29	3.55	2.96–4.26

RTW, return to work; HR, hazard ratio; CI, confidence interval.
^aAdjusted for all covariates, excluding an interesting variant.

TABLE 4. Cox Proportional Hazards Ratios for Leaving the Job by Stratifying Daily Workers by Gender

Daily Worker		Crude		Adjusted ^a	
		HR	95% CI	HR	95% CI
Male	RTW type				
	Returned to original work	1.00		1.00	
Female	Reemployed	3.43	2.86–4.12	3.22	2.62–3.97
	RTW type				
Female	Returned to original work	1.00		1.00	
	Reemployed	4.47	3.07–6.50	5.20	3.44–7.86

RTW, return to work; HR, hazard ratio; CI, confidence interval.
^aAdjusted for all covariates, excluding an interesting variant.

the HR of the crude group was 1.83 (1.12–2.99). For male daily workers, the HR of the “reemployed” group was 3.22 (2.62–3.97) compared with the “returned to original work” group, and the HR of women was 5.20 (3.44–7.86).

DISCUSSION

In this study, the probability of job retention by return to work type was confirmed through PSWCI data tracked for 3 years after the termination of medical care for injured workers. In addition, the risk of leaving a job was compared by worker status. To the best of our knowledge, this is the first study of its kind to be conducted on Korean workers.

The likelihood of continuing to work at the job they returned to after the accident was higher for male workers, those with college level education or higher, manufacturing workers, white-collar workers, those with more than 3 years of work in the workplace at the time of the accident, regular workers, and returning to their original work worker. This is consistent with the results of existing job retention studies.^{17,20} The longer the working period at the workplace at the time of the accident, the higher the proficiency of the work and the higher the re-adaptation to the work, which may lower the possibility of employment interruption.²⁰ In particular, the job retention rate of reemployed workers was 32.6%, indicating that returning to work after an accident may not be a successful return to work.⁹

The job retention rate of workers who returned to their original work was higher than that of reemployed workers. This result is consistent with a previous study conducted on injured Korean workers who reported that workers who returned to their original work were less likely to leave their jobs.²⁰ It can be seen that returning to the original work is important in enhancing the employment stability of injured workers.^{21,22} In Korea, employers who have maintained employment

by returning injured workers to their original work are provided with return support funds and adjustment training expenses; however, there are no policies to protect workers who have been reemployed or to encourage employers to hire and maintain such workers.²² This suggests that to increase the job retention rate, the support given to employers who return injured workers to their original work should be strengthened, and protection policies for reemployed workers or support for employers who hire reemployed workers should be considered. In addition, injured workers experience injury-related absences even if they successfully return to work^{15,16} or suffer trauma because of posttraumatic stress disorder often and have extreme difficulties in their work.^{23,24} In Korea, return-to-work programs (work capacity evaluation and work capacity build-up programs) are supported, mainly focusing on physical problems.²⁵ However, this suggests that not only physical but also neuropsychiatric problems need to be considered when returning to work.

The HRs for reemployed workers leaving their jobs were 1.70 (1.37–2.11) and 3.55 (2.96–4.26) for regular and daily workers, respectively, compared with those who returned to their original work. In particular, the HR of daily female workers was 5.20 (3.44–7.86). As a vulnerable group, daily and female workers have low job maintenance stability.^{17,20} Our results estimated that daily and female workers who are relatively vulnerable to return to work compared with men and regular workers (who are known to have a high return to original work after an accident)^{3–5} found jobs regardless of their preaccident jobs. However, to confirm this, a detailed follow-up investigation is required for workers who fail to return to their original work after an accident. In addition, special consideration and more in-depth research are required for the vulnerable after industrial accidents.

The strengths of this study are as follows: First, the PSWCI data used in this study is a large-scale survey conducted by the Korea Workers' Compensation and Welfare Service, which provides compensation and medical services to injured workers^{4,5}; the results of the study are, therefore, representative of Korean injured workers.^{5,11} Second, this is the first study to attempt to predict job retention by the status of workers among injured workers in Korea, and it produced meaningful results.

This study has some limitations. First, since the data were obtained through the survey method by visiting during the survey period of August to October every year, the timing of returning to work or leaving the job may have affected the research results owing to the respondents' recall bias.^{3,4,11} Second, the study was followed the 3 years after the completion of medical care for injured workers. Although the follow-up period was rather short, the results of this study showed a clear difference depending on worker status. Nevertheless, the longer follow-up periods may have provided stronger results. Third, further research is required to determine the factors that affect job retention. In our study, the risk of leaving the job was estimated by stratifying

TABLE 3. Cox Proportional Hazards Ratios for Leaving the Job by Stratifying Regular Workers by Gender

Regular Worker		Crude		Adjusted ^a	
		HR	95% CI	HR	95% CI
Male	RTW type				
	Returned to original work	1.00		1.00	
Female	Reemployed	1.72	1.36–2.18	1.69	1.32–2.16
	RTW type				
Female	Returned to original work	1.00		1.00	
	Reemployed	1.83	1.12–2.99	1.69	0.99–2.87

RTW, return to work; HR, hazard ratio; CI, confidence interval.
^aAdjusted for all covariates, excluding an interesting variant.

the status of workers. However, in future research, it is necessary to consider the mechanism of injury, industry classification, and grade of injury.

CONCLUSIONS

This study provides useful information regarding job retention among Korean workers from the perspective of employment patterns after industrial accidents. The findings indicate that returning to work after an industrial injury does not guarantee job retention, and that there is a need to increase awareness regarding job retention. In particular, vulnerable groups, such as daily and female workers, had low job maintenance stability. Therefore, it is necessary to strengthen support for employers who return injured workers to their original work, expand support for employers who employ injured workers, and implement policies to protect the vulnerable population.

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