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Return-to-work and Job Retention in Workers with Occupational Injuries and Diseases

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Return-to-work and Job Retention in Workers with Occupational Injuries and Diseases

A Dissertation

Submitted to the Department of Public Health
and the Graduate School of Yonsei University

in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy in Public Health

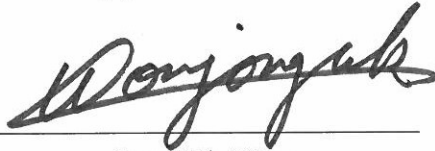
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June 2017

ACKNOWLEDGEMENTS

I would like to express deep gratitude to all the people who supported me during my Ph.D. course academically or otherwise. Without their support, it would be impossible for me to complete my Ph.D. course.

Especially, I sincerely thank Professor Jaehoon Roh for giving me a chance to engage in the field of occupational and environmental medicine and study public health. Also, I would like to give my appreciation to Professor Jong-Uk Won for the ideas and guidance in researches.

Many thanks to Professor Jae Bum Park, Hyoung Ryoul Kim, and Jin-Ha Yoon who are the thesis committee members for their thoughtful advices and bright suggestions which made this study possible, and even better.

I would also like to thank all the former and present members of the institute of occupational health, especially, Professor Chi Nyon Kim, Inah Kim, and Jeongbae Rhie; Doctor Daeho Kim, Innshille Ryu, Pil Kyun Jung, June-Hee Lee, Hongdeok Seok, Wanhyung Lee, Yeong-Kwang Kim, Jihyun Kim, and Sung-Shil Lim; Jungho Hwang, Jihye Baek, Sungho Kim, Seungmin Lee, Okjae Ko, and all the other members.

I greatly thank all my colleagues in occupational and environmental medicine and students of department of public health. Also, I would like to thank the Labor research institute of KCOMWEL for the data.

Last, but most importantly, I would like to thank my father, mother, and sister. I dedicate this dissertation to you.

Sincerely

Inchul Jeong

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ABSTRACT

Return-to-work and Job Retention in Workers with Occupational Injuries and Diseases

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INTRODUCTION

Since 2007 in Korea, the annual number of workers with occupational injuries and diseases was more than 90,000, and the injuries and diseases result in considerable negative impacts. Return-to-work (RTW) is an effective way to prevent and reduce negative effects. Although there are researches and policies promoting RTW of workers, post re-entry situation of returned workers were not well understood. For successful RTW, it is necessary to understand the current situation of job retention along with re-entry after occupational injuries and diseases. Furthermore, researches on impacts of RTW type and period on job retention are also required. Therefore, the objective of this study is to understand the current situation and explore the related factors of RTW including both re-entry and retention, also, this study aims to investigate the impacts of RTW type and period on job retention.

METHODS

The Panel Study of Workers' Compensation Insurance including data from 2,000 systemically sampled workers who had finished recuperation in 2012 was used in this study. Impacts of sociodemographic, work-related, and accident related factors were examined according to the workers' RTW status and retention status. In the first analysis, the relationship between RTW (returned to original work or reemployed) and the factors were examined by logistic regression analyses. In the second analysis, the relationship between 24-month retention according to RTW type and other factors was examined by logistic regression analyses. In the third analysis, the relationship between job retention, regardless of period, according to RTW type and other factors was examined by Cox's proportional-hazards model. In the fourth analysis, the relationship between job retention according to RTW period was examined.

RESULTS

The RTW rate in this study was 80.5% (original work: 35.9% and reemployed: 44.7%). In total workers, age, perceived health status, recuperation period, and disability rating were related to RTW. In workers returned to original work, age, education level, industry, perceived health status, accident type, recuperation period, rehabilitation service utilization, and maintenance of a relationship with employer were related to RTW. In reemployed workers, industry, perceived health status, recuperation period, disability rating, and maintenance of a relationship with employer were related to RTW.

RTW type was related to 24-month job retention with OR for non-retention of 3.88 (2.86-5.28) in reemployed workers. In total workers, age, education level, perceived health status, accident type, and RTW consultation were related to 24-month retention. In workers returned to original work, age, education level, perceived health status, and recuperation period was related to 24-month retention. In reemployed workers, education level and

perceived health status were related to 24-month retention. In the survival analyses, RTW type was related to job retention with HR for non-retention of 2.66 (2.11-3.35). RTW period was related to job retention with HR for non-retention of 3.03 (1.52-6.04) in the workers returned in 13 – 24 months and 5.33 (2.14-13.25) in the workers returned after 24 months.

DISCUSSION

In this study, there are notable results which can be considered in policy implementation. First, higher non-retention rate in the second year in returned to original work group was shown. Therefore period for fund supporting, which is now up to 1 year, needs to be considered for extension. Second, lower job retention probability in reemployed group was shown. Therefore, protection policies for the reemployed workers or benefits to the employers are needed. Third, RTW period was shown as a good prognostic factor for job retention. Therefore, shortening recuperation period along with delay in RTW should be considered.

CONCLUSION

Job retention is an important process in RTW. Considering that reemployed workers and workers with RTW period of more than 13 months are at more risks for non-retention, policies encouraging return to original workplace, protecting reemployed workers, and promoting early RTW should be considered.

Key words: Return-to-work; Job retention; Occupational injury; Occupational disease;
Workers' compensation; Panel study;

I. INTRODUCTION

1. Current Situation of Researches on Return-to-work

Since 2001 in Korea, the annual number of workers with occupational injuries and diseases was more than 80,000, and became more than 90,000 since 2007. Even though the rate is constantly declining in recent ten years (7.69‰ in 2006 and 5.02‰ in 2015), the number of workers with occupational injuries and diseases is still more than 90,000¹.

The occupational injuries and diseases can result in negative effects in various aspects. First, occupational injuries and diseases can cause costs including medical and other indirect costs on social aspect²⁻⁵. Second, companies suffer productivity loss from absenteeism caused by occupational injuries and diseases⁶. Lastly and most important, there are personal outcomes such as disability, psychosocial problem, job loss, and economic loss, which can affect the worker and family even after the worker recover from the injuries and diseases⁷⁻¹¹.

To prevent and reduce the negative effects, there have been a lot of studies targeting on workers with occupational injuries and diseases. As preventing occupational injuries and diseases is an only way to prevent negative impacts and most effective solution to the problem¹², many studies have focused on factors that potentially affecting the occurrence of occupational injuries and diseases¹³⁻¹⁵. Besides that, there were studies on recovery, mental health, and rehabilitation¹⁶⁻¹⁸. On the other hand, some studies had focused on economic influences such as cost of workers' compensation¹⁹ and workers' income⁹.

On the other hand, after the occurrence of occupational injuries and diseases, return-to-work (RTW) after recuperation is another effective way to prevent and reduce negative effects²⁰⁻²². Therefore, numbers of studies were conducted to explore the factors that could influence RTW. In previous studies, individual factors such as age, gender, education, and psychosocial factors showed significant relationships with RTW. Other factors significantly

related to RTW were disability severity, impairment type, physician-related factors, and employer-related factors²³⁻³⁰.

Upon the basis of the studies mentioned above, the Korea Workers' Compensation and Welfare Service (KCOMWEL) that operates workers' compensation insurance in Korea, have taken interest in RTW along with the cash benefits from 2001, and several programs promoting RTW were developed³¹. Currently, Customized and Integrated Rehabilitation Service which includes medical, psychosocial, and vocational rehabilitation is in operation from 2012. As a result, RTW rate showed an increase from 49.5% in 2010 to 56.8% in 2015 in Korea³².

In addition, there are laws and policies protecting the employment status of workers with occupational injuries and diseases. In Korea, the Labor Standard Act, article 23 states that "No employers shall dismiss any worker during a period of temporary interruption of work for medical treatment of an occupational injury or disease and within 30 days thereafter", thereby protects workers from dismissal³³. There are also supporting funds. KCOMWEL provides support funds up to 12 months for keep employing workers more than 6 months who returned to work after recuperation. Additionally, KCOMWEL provides support funds up to 6 months as a salary for substitute workers for employing workers at least one month who returned to work after recuperation. On the other hand, in Ontario state, Canada, the Workplace Safety and Insurance Act, section 41 states that "The employer of a worker who has been unable to work as a result of an injury and who, on the date of the injury, had been employed continuously for at least one year by the employer shall offer to re-employ the worker" and the duration of obligation is one-year after recuperation, whose obligated duration is longer than that of Korea.

Theoretically, since workers return to work when they are able to perform the essential duties of their pre-accident jobs or appropriate accommodations regarding their disabilities are made, there should be no problem maintaining their jobs after RTW. However, it was reported that a lot of workers leave their jobs after RTW³⁴⁻³⁷. Studies targeting Korean

workers reported that approximately 33 to 60 percent of workers left their jobs after the first RTW^{38,39}. The results imply that re-entry to work does not essentially guarantee successful RTW. Therefore, it is necessary to investigate post re-entry situation of returned workers to fully understand RTW.

2. Theoretical Background of the Study

In contrast to the widely recognized importance of RTW, agreement on definition of RTW is still lacking. RTW is a complicated process from the beginning of a worker's disability to beyond successful performance of job tasks. A study on the concept of RTW suggested that the process of RTW consists of four phases: off-work, re-entry, retention (or maintenance), and advancement^{40,41}. According to the concept, most of previous studies on RTW have focused on the second phase (re-entry) and national statistics of Korea also provides information only on re-entry. Therefore, job retention status of Korea is not well defined and there is a lack of understanding in the factors affecting job retention.

Although the importance of job retention was underestimated, impacts of factors which were reportedly related to re-entry to work on job retention were examined in several studies. The factors shown significant relationships with job retention were socio-demographic factors such as age, sex, and education level; and work-related factors such as occupational prestige, work characteristics, working environment, and length of service^{31,42,43}. However, despite the benefits of early RTW, such as rehabilitation, cost, and income, are well known and many countries have introduced policies for promoting early RTW, impact of early RTW on job retention has rarely been examined⁴⁴⁻⁴⁶.

3. Necessities of the Study

Based on the literatures and current situation, for successful RTW, it is necessary to

understand the current situation of job retention along with re-entry after occupational injuries and diseases, and investigate whether the factors that are positively related to re-entry to work are also positively related to job retention, in the same way.

Furthermore, since the outcome variable of most previous studies on RTW was re-entry itself, the impact of characteristics of RTW on job retention was rarely been examined. Therefore, researches on the characteristics of RTW, especially where (same workplace or different) and when, are also required.

II. OBJECTIVES

Along these lines, the objective of this study is to understand the current situation and explore the related factors of RTW including both re-entry and retention in Korea, and also, this study aims to investigate the impacts of RTW type and period on job retention by using panel data of workers with occupational injuries and diseases whose recuperation period is over.

III. MATERIALS AND METHODS

1. Panel Study of Workers' Compensation Insurance (PSWCI)

The Labor Welfare Research Center of KCOMWEL conducts PSWCI to create baseline data to develop medium and long-term policies and evaluate the effectiveness of services. Target population of the study was 89,921 workers who had finished their recuperation by workers' compensation in 2012. Among the 89,921 workers, 73 workers with unknown addresses, five workers with disability ratings of 1-3 and did not utilize rehabilitation services, and 7,350 foreigners and Jeju island residents were excluded. Finally, a total of 82,493 workers were defined as a population in this study. From the population, two thousand workers were selected as panels by stratified systematic sampling. Administrative district, disability rating, and rehabilitation service utilization status were used as stratification variables. Selected panels were interviewed by trained interviewers by one-on-one interview, and to minimize interviewer errors, computer-assisted personal interviewing method was applied. The interview was conducted on an annual basis from August to October and the first interview was carried out on 2013. In this study, three waves of survey data (from 2013 to 2015) were included.

2. Main Outcome Variables

In the PSWCI, current economic activity status of study subjects was categorized into six groups: (1) Returned to original work, (2) Reemployed by another company, (3) Self-employed, (4) Unpaid family worker, (5) Unemployed, and (6) Economic inactivity. Returned to original work includes subjects returned to same workplaces compared to the pre-accident workplaces, and reemployed by another company includes subjects returned to work as paid workers but to different workplaces. Self-employed includes subjects who operates private businesses or work as freelancers. Unpaid family worker includes subjects

who work for family or relative more than 18 hours per week (3-4 hours per day) unpaid. Unemployed includes nonworking subjects who are able to work and tried to get jobs in recent four weeks. Finally, economic inactivity includes nonworking subjects who are unable to work or do not try to work.

In this study, ‘return’ in RTW was defined as the first return, therefore if a worker returned to the original work or reemployed in the second or third survey after self-employed or worked as an unpaid family worker, then was categorized according to the earlier response, i.e. self-employed or unpaid family worker. On the other hand, if a subject was unemployed or economically inactive at first and then responded as returned to original work or reemployed, then the subject was categorized according to the later response, i.e. returned to original work or reemployed by another company. Furthermore, ‘work’ in RTW was defined as a paid work in this study, therefore among the six economic categories described above, the latter four groups were defined as ‘non-RTW’ group, and the former two groups were defined as ‘RTW’ group. However, in a detailed analysis, RTW group was used separately as original work and reemployed group, respectively.

The duration of retention was calculated by using the time of return and the time of leaving. The time of return was investigated when a subject returned to work, and the time of leaving was investigated from the second year only if there is a change of employment status. For the subjects with no change of employment status, the last survey month was regarded as the end of follow-up.

In the logistic analyses, job retention was defined as continued employment in the same workplace more than 24 months. Thus, regardless of change in employment status, a subject who maintained the first job after RTW for more than 24 months was categorized into job retention group. On the other hand, if there is any change in employment status within 24 months, including reemployment with different workplaces between surveys, then the subject was categorized into non retention group. For the subjects with follow-up period of 24 months and less without change in employment status, retention status was

regarded as undetermined, therefore excluded in the logistic regression analyses. On the other hand, in the Cox proportional-hazards models, job retention and non-retention was categorized according to whether there was a change of employment status, regardless of the duration of retention.

RTW period was defined as the duration from accident to return, which is a combination of recuperation period and delay in RTW. According to the period, the subjects were categorized into 6 groups: <3 months, 4–6 months, 7–9 months, 10–12 months, 13–24 months, >24 months. However, the subjects who returned to work before end of recuperation were excluded in the RTW period analysis.

3. Definition of Covariates

Sociodemographic factors (age, sex, education level, and perceived health status), work-related factors (industry and occupation), accident-related factors (accident type, recuperation period, disability rating, and rehabilitation service utilization status), physician-related factor (RTW consultation with a physician during treatment), and employer-related factor (maintenance of a relationship with employer) which are known to be related to RTW were used as covariates in the analyses.

Age was investigated as a continuous variable, and was categorized into 5 groups by decades from ‘younger than 30’ through ‘60 years and older’. Education level was investigated in eight groups: (1) uneducated, (2) elementary school, (3) middle school, (4) high school, (5) junior college, (6) college, (7) graduate school (master), and (8) graduate school (doctor). The former three groups were categorized into ‘less than high school’ group, the latter four groups were categorized into ‘college or above’ group, and high school group was used as is.

Types of industry and occupation were classified following the Korean Standard Industrial Classification (KSIC) and Korean Standard Classification of Occupations

(KSCO), respectively. The KSIC is based on the International Standard Industrial Classification (ISIC) and consists of as follows: A. agriculture, forestry and fishing, B. mining and quarrying, C. manufacturing, D. electricity, gas, steam and water supply, E. sewerage, waste management, materials recovery and remediation activities, F. construction, G. wholesale and retail trade, H. transportation, I. accommodation and food service activities, J. information and communications, K. financial and insurance activities, L. real estate activities and renting and leasing, M. professional, scientific and technical activities, N. business facilities management and business support services, O. public administration and defense ; compulsory social security, P. education, Q. human health and social work activities, R. arts, sports and recreation related services, S. membership organizations, repair and other personal services, T. activities of households as employers; undifferentiated goods- and services- producing activities of households for own use, and U. activities of extraterritorial organizations and bodies⁴⁷. Among these, manufacturing and construction which account for more than half of total occupational injuries and diseases (29.1% for manufacturing, 29.54% for construction in 2015¹) were used separately and other 21 categories were integrated as ‘others’. KSCO is based on the International Standard Classification of Occupations (ISCO) and consists of as follows: (1) managers, (2) professionals and related workers, (3) clerks, (4) service workers, (5) sales workers, (6) skilled agricultural, forestry and fishery workers, (7) craft and related trades workers, (8) equipment, machine operating and assembling workers, (9) elementary workers, and (10) armed forces⁴⁸. Among these, the former three groups were categorized into ‘white collar’ workers, service and sales workers were categorized into ‘service’ workers, and others were categorized into ‘blue collar’ workers.

Data on type of accident (injury or disease), recuperation period, disability rating, rehabilitation service (which KCOMWEL provides) utilization status was obtained from the workers’ compensation insurance administrative database. Recuperation period was categorized into three groups (≤ 6 months, 7–12 months, and > 12 months) in the analyses.

If a worker acquires any type of disability from the occupational injuries and diseases,

then the worker is evaluated by KCOMWEL consultation physicians and gets a disability rating if the worker meets the requirement by the Industrial Accident Compensation Insurance Act⁴⁹. There are fourteen grades from 1 to 14, and lower number stands for more severe disability. According to the disability ratings, subjects were categorized into five groups: 1–7, 8–10, 11–12, 13–14, and no grade.

Regarding the subjects' perceived health status, they were asked "How is your general condition now?", and four choices (very good, good, bad, and very bad) were given. In the analyses, very good and good were categorized into 'good' and the rest were categorized into 'bad'. The subjects were asked "Have you ever had a consultation with a doctor about return-to-work during treatment?" and "Did you keep in touch (hospital visit or phone call) with employer or human resources manager during recuperation?", and asked to answer yes or no.

The categories and definitions of all variables in this study are summarized in table 1.

Table 1. Definition of the variables in the analyses

Variable	Category	Description
Return-to-work	Yes - Returned to original work - Reemployed No (Non-RTW)	Non-RTW includes self-employment, unpaid family work, unemployed, and economic inactivity
Job retention	Yes / No	Continued employment with the same employer more than 24 months
RTW type	Returned to original work Reemployed	Comparison with the pre-accident workplace
RTW period	<3 months / 4–6 months 7–9 months / 10–12 months 13–24 months / >24 months	Duration from accident to return to work
Age	< 30 / 30–39 / 40–49 50–59 / ≥60	Divided by 10-year age group
Sex	Male / Female	
Education level	Less than high school High school College or above	Less, equal, or more than 12 years of education
Industry	Manufacturing Construction Others	Categorized according to KSIC
Occupation	White Collar Blue Collar Service	Categorized according to KSCO
Perceived health status	Good / Bad	Self-rated health status
Accident type	Injury / Disease	Occupational injury or disease recognized by KCOMWEL
Recuperation period	≤6 months / 7–12 months ≥13 months	Duration from accident to end of recuperation
Disability rating	1–7 / 8–10 / 11–12 / 13–14 / None	Ratings by Industrial Accident Compensation Insurance Act
Rehabilitation service utilization	Yes / No	Service provided by KCOMWEL
RTW consultation	Yes / No	Consultation with a doctor during recuperation
Maintenance of a relationship with employer	Yes / No	Keep in touch with employer during recuperation

4. Statistical Analysis

To compare the characteristics of the subjects by RTW and job retention status, chi-square tests were used. Odds ratios (ORs) and 95% confidence intervals (95% CIs) were estimated by binomial/multinomial multivariate logistic regression analyses. Hazards ratios (HRs) for job retention were estimated by Cox proportional-hazards models. The Kaplan-Meier method was used to estimate the survival curves and the log-rank test was used to compare retention probability between the two groups. All statistical tests were two-tailed, and p -values of less than 0.05 were regarded as statistically significant. All statistical analyses were conducted with the SAS software package version 9.4 (SAS Institute, Cary, NC, USA).

IV. RESULTS

1. First Return-to-work Outcomes of Study Subjects

Among a total of 2,000 workers, 717 workers (35.9%) responded that they returned to their original workplaces as the first return (695 on the first year, 20 on the second year, and 2 on the third year), and 893 workers (44.7%) responded that they were reemployed to different workplaces (642 on the first year, 215 on the second year, and 36 on the third year). A hundred and four workers (5.2%) responded that they returned to work as self-employers or unpaid family workers (75 on the first year, 26 on the second year, and 3 on the third year), 210 workers (10.5%) stayed unemployed or economically inactive, and 76 workers (3.8%) were lost to follow-up (53 on the second year and 23 on the third year). RTW outcomes of study subjects by survey year are shown on figure 1.

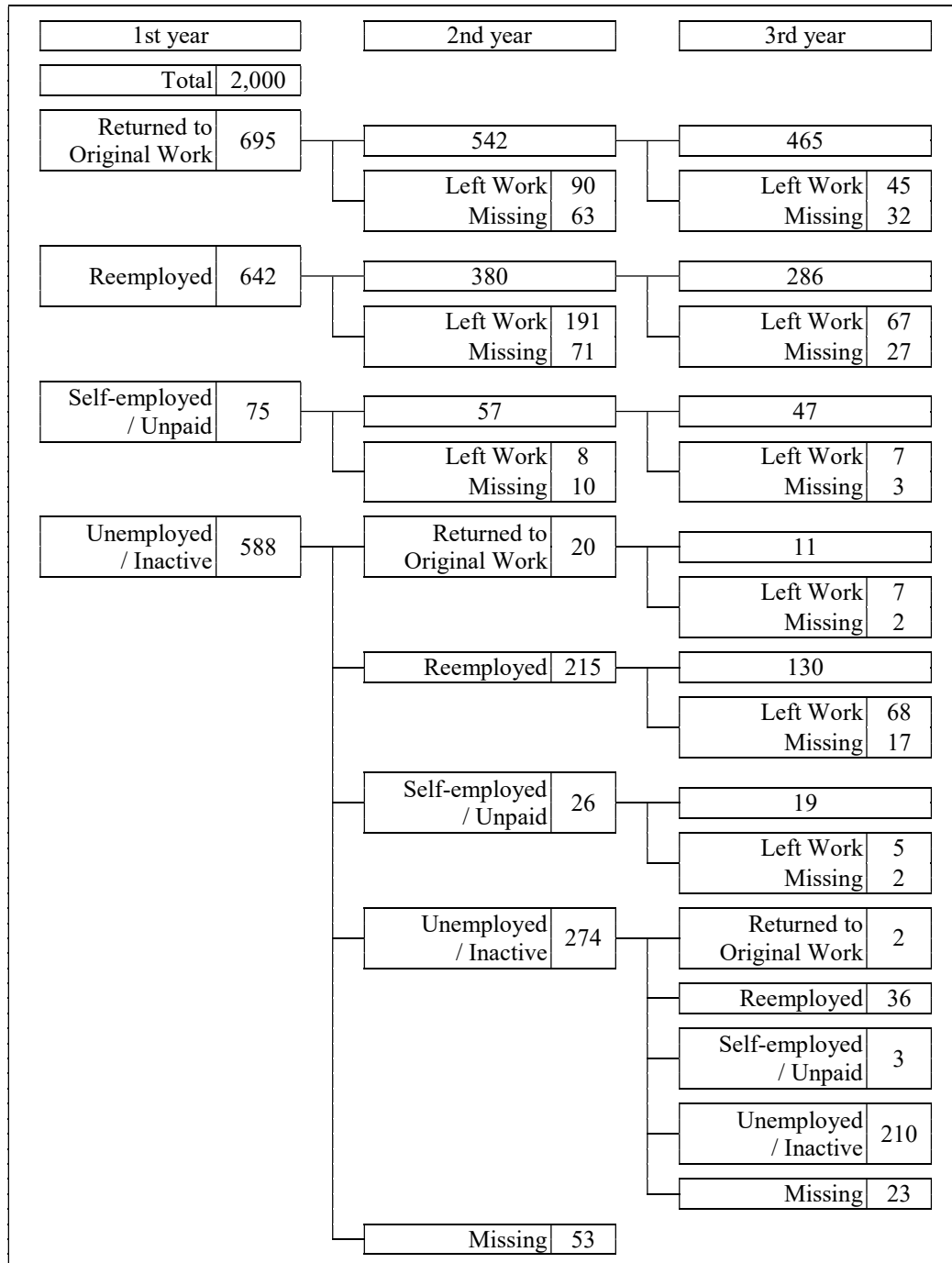


Fig 1. Return-to-work outcomes of study subjects by survey year

2. General Characteristics of Study Subjects by Return-to-work Status

General characteristics of study subjects by RTW status are shown on table 2. All variables except sex showed significant differences among the three groups. Workers in 30s and 40s were more likely to return to work and workers in 60 or older were less likely to return to work. Sex showed no significant difference, but when the workers were divided into two groups (non-RTW and RTW), the difference became significant ($p=0.041$) with men being more likely to return. As education level increases, the proportion of workers who returned to work also increased, therefore highest RTW rate was shown in college or above group. Distributions of industry and occupation showed significant differences among three groups with construction workers being more likely to reemployed and white collar workers being more likely to return to original work. However, there were no significant differences in the two-group comparison ($p=0.138$, 0.066 , respectively). Workers who self-rated their health good were more likely to return to work and specifically, to original work.

The proportions of workers who returned to work were almost identical between injury group and disease group, however, injured workers were more likely to be reemployed. As recuperation period becomes longer, the proportion of workers who returned to original work decreased and proportion of non-RTW increased. Workers with disability ratings of seven or less were less likely to return to work, however there were no differences in RTW by disability ratings. Workers who utilized rehabilitation service were less likely to return to work and more likely to be reemployed among the workers who returned to work. During treatment, who had a chance to consult with their doctors about RTW were more likely to return to original work, but there was no significant difference according to whether they returned or not ($p=0.452$). Workers who maintained relationship with their employers were more likely to return to original work, however, proportion of workers who maintained relationship with their employers was significantly lower in reemployed workers compared to proportion of workers returned to original work.

Table 2. General characteristics of study subjects by return-to-work status

	Non-RTW (n=314) N (%)	Returned to original work (n=717) N (%)	Reemployed (n=893) N (%)	p-value
Age				
<30	18 (16.5)	34 (31.2)	57 (52.3)	< 0.001
30–39	31 (10.8)	146 (50.7)	111 (38.5)	
40–49	51 (10.1)	219 (43.4)	235 (46.5)	
50–59	109 (15.9)	238 (34.8)	337 (49.3)	
≥60	105 (31.1)	80 (23.7)	153 (45.3)	
Sex				
Male	252 (15.6)	606 (37.4)	763 (47.1)	0.092
Female	62 (20.5)	111 (36.6)	130 (42.9)	
Education level				
Less than high school	163 (21.7)	200 (26.6)	389 (51.7)	< 0.001
High school	119 (13.7)	363 (41.7)	388 (44.6)	
College or above	32 (10.6)	154 (51.0)	116 (38.4)	
Industry				
Manufacturing	106 (14.4)	354 (48.1)	276 (37.5)	< 0.001
Construction	99 (18.5)	82 (15.4)	353 (66.1)	
Others	109 (16.7)	281 (43.0)	264 (40.4)	
Occupation				
White collar	19 (10.6)	102 (56.7)	59 (32.8)	< 0.001
Blue collar	273 (17.0)	561 (34.9)	772 (48.1)	
Service	22 (15.9)	54 (39.1)	62 (44.9)	
Perceived health status				
Good	93 (8.6)	512 (47.5)	472 (43.8)	< 0.001
Bad	221 (26.1)	205 (24.2)	421 (49.7)	
Accident type				
Injury	288 (16.3)	636 (36.1)	839 (47.6)	< 0.001
Disease	26 (16.2)	81 (50.3)	54 (33.5)	
Recuperation period				
≤6 months	134 (12.1)	483 (43.5)	494 (44.5)	< 0.001
7–12 months	105 (16.9)	191 (30.8)	325 (52.3)	
>12 months	75 (39.1)	43 (22.4)	74 (38.5)	
Disability rating				
1–7	53 (51.0)	27 (26.0)	24 (23.1)	< 0.001
8–10	72 (20.8)	115 (33.2)	159 (46.0)	
11–12	86 (14.7)	209 (35.7)	291 (49.7)	
13–14	59 (10.8)	227 (41.4)	262 (47.8)	
None	44 (12.9)	139 (40.9)	157 (46.2)	
Rehabilitation service utilization				
Yes	209 (20.9)	316 (31.6)	474 (47.5)	< 0.001
No	105 (11.4)	401 (43.4)	419 (45.3)	
RTW consultation				
Yes	74 (15.1)	222 (45.4)	193 (39.5)	< 0.001
No	240 (16.7)	495 (34.5)	700 (48.8)	
Maintenance of a relationship with employer				
Yes	161 (13.3)	635 (52.6)	412 (34.1)	< 0.001
No	153 (21.4)	82 (11.5)	481 (67.2)	

3. Factors Related to Return-to-work

Two logistic regression analyses were performed to identify influencing factors to RTW. The first one was a binomial logistic regression analysis. In the binomial analysis, ‘returned to original work’ group and ‘reemployed’ group were integrated into RTW group. The second one is a multinomial logistic regression analysis which compared non-RTW group with ‘returned to original work’ group and ‘reemployed’ group separately. Results of the analyses are shown on table 3.

In the first analysis, age, perceived health status, recuperation period, and disability rating were significantly related to RTW. The OR for RTW of 30–39 year group was 2.59 (95% CI: 1.36–4.93) compared with younger than 30 group, but other groups of age showed no significant relationship. Workers who reported good self-rated health were more likely to return to work and OR was 2.79 (2.09–3.74), which is the highest OR among ORs of the selected variables. As the recuperation period gets longer, the OR for RTW also decreased and became significant in the group who recuperated more than 12 months (0.52, 0.33–0.80) compared to who recuperated 6 months or less. Disability rating also showed a significant relationship with RTW. Workers with severe disabilities (ratings of 1–7) were less likely to return to work with OR of 0.30 (0.16–0.57). Sex, education level, industry, occupation, accident type, rehabilitation service utilization, RTW consultation, and maintenance of a relationship with employer showed no significant relationship with RTW in this analysis.

In the second analysis using multinomial logistic regression, variables which were shown to be significantly related to return to original work were age, education level, industry, perceived health status, accident type, recuperation period, rehabilitation service utilization, and maintenance of a relationship with employer. On the other hand, significantly related factors with reemployment were industry, perceived health status, recuperation period, disability rating, and maintenance of a relationship with employer. Sex,

occupation, and RTW consultation were not significantly related both to return to original work and reemployment.

Odds ratio for returning to original work was highest in 40–49 year group with 4.84 (2.33–10.05) among all age groups compared to younger than 30 group. Ages of 50–59 and 30–39 groups also showed significant relationships with ORs of 3.30 (1.60–6.81) and 2.75 (1.29–5.87), respectively. Highly educated workers with college or above were more likely to return to original work compared to lowly educated workers with less than high school education with OR of 1.85 (1.02–3.34). Construction workers were less likely to return to original work compared to the workers in other industries with OR of 0.40 (0.26–0.62). Workers who perceived their health status is good showed a high OR of 3.46 (2.49–4.81) and OR of workers with occupational diseases was 1.76 (1.00–3.08) compared to workers with occupational injuries. The longer the workers recuperated, the less likely the workers to return to work (0.39, 0.22–0.67). Workers who utilized rehabilitation service by KCOMWEL were less likely to return to original work with OR of 0.60 (0.40–0.88), on the other hand, workers who maintained relationship with employer were 5.24 (3.68–7.45) times more likely to return to original work.

Industry, perceived health status, recuperation period, disability rating, and maintenance of a relationship with employer were shown to be significantly related to reemployment. Construction workers were more likely to be reemployed compared to those in other industries (1.46, 1.00–2.13), and workers who reported good self-rated health were also more likely to be reemployed (2.46, 1.82–3.34). On the contrary, workers who recuperated more than a year (0.60, 0.37–0.95), workers with disability ratings of 1–7 (0.22, 0.11–0.45), and workers who maintained relationship with employer (0.71, 0.53–0.95) were less likely to be reemployed.

Table 3. Factors related to return-to-work by binomial and multinomial logistic regression analyses

	Binomial		Multinomial	
	RTW		Returned to original work	Reemployed
	OR (95% CI)		OR (95% CI)	OR (95% CI)
Age				
<30	1.00		1.00	1.00
30–39	1.61 (0.82–3.16)		2.75 (1.29– 5.87)	1.09 (0.54–2.20)
40–49	2.59 (1.36–4.93)		4.84 (2.33–10.05)	1.69 (0.87–3.30)
50–59	1.76 (0.93–3.30)		3.30 (1.60– 6.81)	1.15 (0.60–2.21)
≥60	0.76 (0.39–1.47)		1.16 (0.54– 2.53)	0.54 (0.27–1.08)
Sex				
Male	1.00		1.00	1.00
Female	0.72 (0.49–1.06)		0.68 (0.44–1.06)	0.76 (0.51–1.15)
Education level				
Less than high school	1.00		1.00	1.00
High school	1.06 (0.77–1.48)		1.28 (0.87–1.88)	0.96 (0.68–1.36)
College or above	1.34 (0.79–2.29)		1.85 (1.02–3.34)	1.08 (0.62–1.88)
Industry				
Manufacturing	0.98 (0.70–1.38)		0.94 (0.64–1.38)	0.96 (0.67–1.38)
Construction	1.04 (0.72–1.50)		0.40 (0.26–0.62)	1.46 (1.00–2.13)
Others	1.00		1.00	1.00
Occupation				
White collar	1.00		1.00	1.00
Blue collar	0.86 (0.49–1.51)		0.86 (0.47–1.57)	0.96 (0.53–1.74)
Service	0.91 (0.43–1.93)		0.76 (0.34–1.71)	1.13 (0.51–2.50)
Perceived health status				
Good	2.79 (2.09–3.74)		3.46 (2.49–4.81)	2.46 (1.82–3.34)
Bad	1.00		1.00	1.00
Accident type				
Injury	1.00		1.00	1.00
Disease	1.28 (0.77–2.12)		1.76 (1.00–3.08)	1.02 (0.59–1.77)
Recuperation period				
≤6 months	1.00		1.00	1.00
7–12 months	0.93 (0.68–1.28)		0.75 (0.52–1.08)	1.07 (0.77–1.49)
>12 months	0.52 (0.33–0.80)		0.39 (0.22–0.67)	0.60 (0.37–0.95)
Disability rating				
1–7	0.30 (0.16–0.57)		0.51 (0.23–1.12)	0.22 (0.11–0.45)
8–10	0.89 (0.53–1.48)		0.92 (0.51–1.66)	0.86 (0.50–1.47)
11–12	1.20 (0.75–1.93)		1.24 (0.73–2.13)	1.18 (0.72–1.92)
13–14	1.34 (0.86–2.10)		1.32 (0.80–2.17)	1.36 (0.85–2.16)
None	1.00		1.00	1.00
Rehabilitation service utilization				
Yes	0.78 (0.55–1.10)		0.60 (0.40–0.88)	0.90 (0.63–1.30)
No	1.00		1.00	1.00
RTW consultation				
Yes	1.07 (0.78–1.46)		1.31 (0.92–1.86)	0.95 (0.68–1.32)
No	1.00		1.00	1.00
Maintenance of a relationship with employer				
Yes	1.31 (0.99–1.73)		5.24 (3.68–7.45)	0.71 (0.53–0.95)
No	1.00		1.00	1.00

4. Job Retention Outcomes of Study Subjects

After the workers' first RTW, many workers left their jobs during the follow-up period. Among the 1,610 workers who returned to work, 468 workers (29.1%) left their jobs, when separated by RTW type, proportions of workers who left their jobs were 19.8% (142 out of 717) in workers who returned to original work and 36.5% (326 out of 893) in workers who were reemployed during the follow-up period. The distribution of workers who left their jobs by retention period was different between returned to original work group and reemployed group (figure 2). Among the workers who left their jobs, the proportion of workers who left their jobs in one year was 19.7% in returned to original work group, however, that was 50.6% in reemployed group.

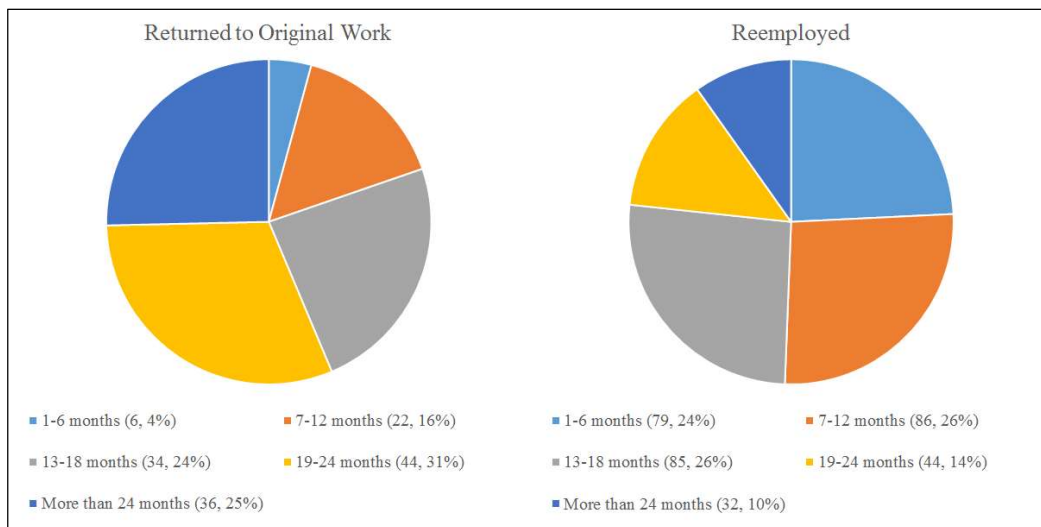


Fig 2. Distribution of workers who left their jobs by retention period

After excluding the workers with follow-up period of 24 months and less, 631 workers who returned to original work and 618 workers who were reemployed were left. After 24 months from RTW, 83.2% (525 workers) and 52.4% (324 workers) workers retained their

jobs in returned to original work group and reemployed group, respectively. Therefore, in the analyses on job retention, those workers were defined as ‘job retention’ group, and 106 and 294 workers who left their jobs in returned to original work group and reemployed group, respectively, were defined as ‘non retention’ group. Job retention outcomes of study subjects are demonstrated on figure 3.

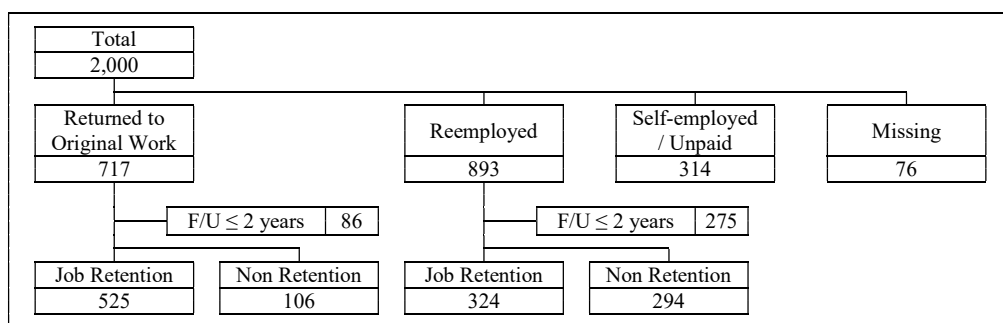


Fig 3. Job retention outcomes of study subjects by retention status

5. General Characteristics of Study Subjects by Job Retention Status

General characteristics of total workers, returned to original work group, and reemployed group by job retention status are shown on table 4, 5, and 6, respectively. In the univariate analyses of total subjects, all independent variables without recuperation period, disability rating, rehabilitation service utilization showed significant relationships with job retention. The groups of higher proportion for job retention were 30–39 year old, male, education of college or above, manufacturing industry, white collar, good perceived health status, occupational disease, consulted RTW with a doctor, maintained relationship with employer, and returned to original work group (table 4). However, in the stratified analyses, the factors shown significant relationship were education level and perceived health status in the returned to original work group; and sex, education level, perceived health status, and RTW consultation in the reemployed group (table 5 and 6).

Table 4. General characteristics of study subjects by retention status (Total)

	Non retention (n=400)	Job retention (n=849)	p-value
	N (%)	N (%)	
Age			
<30	27 (38.6)	43 (61.4)	0.005
30–39	52 (25.1)	155 (74.9)	
40–49	100 (28.6)	250 (71.4)	
50–59	147 (33.3)	295 (66.7)	
≥60	74 (41.1)	106 (58.9)	
Sex			
Male	328 (30.8)	737 (69.2)	0.031
Female	72 (39.1)	112 (60.9)	
Education level			
Less than high school	179 (41.7)	250 (58.3)	< 0.001
High school	176 (29.2)	427 (70.8)	
College or above	45 (20.7)	172 (79.3)	
Industry			
Manufacturing	136 (28.0)	349 (72.0)	< 0.001
Construction	127 (40.6)	186 (59.4)	
Others	137 (30.4)	314 (69.6)	
Occupation			
White collar	36 (25.9)	103 (74.1)	0.044
Blue collar	325 (32.0)	691 (68.0)	
Service	39 (41.5)	55 (58.5)	
Perceived health status			
Good	218 (27.0)	591 (73.1)	< 0.001
Bad	182 (41.4)	258 (58.6)	
Accident type			
Injury	377 (33.1)	762 (66.9)	0.012
Disease	23 (20.9)	87 (79.1)	
Recuperation period			
≤6 months	236 (29.8)	557 (70.2)	0.055
7–12 months	137 (36.8)	235 (63.2)	
>12 months	27 (32.1)	57 (67.9)	
Disability rating			
1–7	13 (37.1)	22 (62.9)	0.795
8–10	60 (29.9)	141 (70.2)	
11–12	123 (31.8)	264 (68.2)	
13–14	119 (31.3)	261 (68.7)	
None	85 (34.6)	161 (65.5)	
Rehabilitation service utilization			
Yes	203 (34.4)	388 (65.7)	0.108
No	197 (29.9)	461 (70.1)	
RTW consultation			
Yes	76 (23.0)	254 (77.0)	< 0.001
No	324 (35.3)	595 (64.7)	
Maintenance of a relationship with employer			
Yes	225 (26.5)	623 (73.5)	< 0.001
No	175 (43.6)	226 (56.4)	
RTW type			
Returned to original work	106 (16.8)	525 (83.2)	< 0.001
Reemployed	294 (47.6)	324 (52.4)	

Table 5. General characteristics of study subjects by retention status (Returned to original work)

	Non retention (n=106) N (%)	Job retention (n=525) N (%)	p-value
Age			
<30	9 (28.1)	23 (71.9)	0.085
30–39	19 (15.0)	108 (85.0)	
40–49	26 (13.3)	169 (86.7)	
50–59	35 (16.8)	174 (83.3)	
≥60	17 (25.0)	51 (75.0)	
Sex			
Male	87 (16.2)	451 (83.8)	0.387
Female	19 (20.4)	74 (79.6)	
Education level			
Less than high school	42 (25.2)	125 (74.9)	0.002
High school	49 (14.9)	280 (85.1)	
College or above	15 (11.1)	120 (88.9)	
Industry			
Manufacturing	48 (15.6)	260 (84.4)	0.465
Construction	15 (21.7)	54 (78.3)	
Others	43 (16.9)	211 (83.1)	
Occupation			
White collar	15 (15.6)	81 (84.4)	0.793
Blue collar	81 (16.7)	404 (83.3)	
Service	10 (20.0)	40 (80.0)	
Perceived health status			
Good	64 (14.0)	392 (86.0)	0.004
Bad	42 (24.0)	133 (76.0)	
Accident type			
Injury	98 (17.5)	461 (82.5)	0.229
Disease	8 (11.1)	64 (88.9)	
Recuperation period			
≤6 months	63 (14.7)	366 (85.3)	0.116
7–12 months	35 (21.5)	128 (78.5)	
>12 months	8 (20.5)	31 (79.5)	
Disability rating			
1–7	3 (14.3)	18 (85.7)	0.943
8–10	20 (19.2)	84 (80.8)	
11–12	29 (15.6)	157 (84.4)	
13–14	34 (17.2)	164 (82.8)	
None	20 (16.4)	102 (83.6)	
Rehabilitation service utilization			
Yes	50 (17.7)	233 (82.3)	0.675
No	56 (16.1)	292 (83.9)	
RTW consultation			
Yes	27 (13.5)	173 (86.5)	0.163
No	79 (18.3)	352 (81.7)	
Maintenance of a relationship with employer			
Yes	92 (16.5)	467 (83.5)	0.638
No	14 (19.4)	58 (80.6)	

Table 6. General characteristics of study subjects by retention status (Reemployed)

	Non retention (n=294) N (%)	Job retention (n=324) N (%)	p-value
Age			
<30	18 (47.4)	20 (52.6)	0.772
30–39	33 (41.3)	47 (58.8)	
40–49	74 (47.7)	81 (52.3)	
50–59	112 (48.1)	121 (51.9)	
≥60	57 (50.9)	55 (49.1)	
Sex			
Male	241 (45.7)	286 (54.3)	0.036
Female	53 (58.2)	38 (41.8)	
Education level			
Less than high school	137 (52.3)	125 (47.7)	0.039
High school	127 (46.4)	147 (53.7)	
College or above	30 (36.6)	52 (63.4)	
Industry			
Manufacturing	88 (49.7)	89 (50.3)	0.740
Construction	112 (45.9)	132 (54.1)	
Others	94 (47.7)	103 (52.3)	
Occupation			
White collar	21 (48.8)	22 (51.2)	0.384
Blue collar	244 (46.0)	287 (54.1)	
Service	29 (65.9)	15 (34.1)	
Perceived health status			
Good	154 (43.6)	199 (56.4)	0.029
Bad	140 (52.8)	125 (47.2)	
Accident type			
Injury	279 (48.1)	301 (51.9)	0.387
Disease	15 (39.5)	23 (60.5)	
Recuperation period			
≤6 months	173 (47.5)	191 (52.5)	0.725
7–12 months	102 (48.8)	107 (51.2)	
>12 months	19 (42.2)	26 (57.8)	
Disability rating			
1–7	10 (71.4)	4 (28.6)	0.197
8–10	40 (41.2)	57 (58.8)	
11–12	94 (46.8)	107 (53.2)	
13–14	85 (46.7)	97 (53.3)	
None	65 (52.4)	59 (47.6)	
Rehabilitation service utilization			
Yes	153 (49.7)	155 (50.3)	0.336
No	141 (45.5)	169 (54.5)	
RTW consultation			
Yes	49 (37.7)	81 (62.3)	0.015
No	245 (50.2)	243 (49.8)	
Maintenance of a relationship with employer			
Yes	133 (46.0)	156 (54.0)	0.520
No	161 (48.9)	168 (51.1)	

6. Factors Related to Job Retention

In table 7, the results of three logistic analyses are demonstrated. First, in the analysis targeting total returned workers with follow-up period of more than 24 months, age, education level, perceived health status, accident type, RTW consultation, and RTW type were significantly related to job retention. Workers in their 40s (0.54, 0.30–0.99) and 50s (0.47, 0.26–0.88) were less likely to leave their jobs compared to the workers with age of younger than 30. Workers with higher education were less likely to leave their jobs with OR of 0.67 (0.48–0.93) in high school education group and 0.36 (0.21–0.61) in college or above group. Perceived health status (0.64, 0.48–0.85), occupational disease (0.56, 0.33–0.96), and RTW consultation (0.71, 0.52–0.97) were negatively related to non-retention. On the other hand, reemployed workers were more likely to leave their jobs (3.88, 2.86–5.28).

When stratified by RTW type, ORs for non-retention in the returned to original work group were significantly lower in all age groups with lowest in 50–59 year group (0.20, 0.07–0.54) compared to younger than 30 group. Education level and perceived health status were also adversely related to non-retention with ORs of 0.44 (0.24–0.80) in high school group, 0.20 (0.08–0.49) in college or above group, and 0.51 (0.32–0.82) in the workers with good self-rated health. Unlike the result from total worker analysis, accident type and RTW consultation showed no significant relationship with original job retention, however, OR of recuperation period of 7–12 months was at a significant level of 1.87 (1.11–3.16) compared to 6 months or less recuperated group. On the other hand, in the analysis of reemployed workers, only education level and perceived health status were related to job retention. Both relationships were significant but weaker than that of the former two analyses.

Table 7. Factors related to job retention by return-to-work type

	Total	Returned to Original work	Reemployed
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Age			
<30	1.00	1.00	1.00
30–39	0.63 (0.33–1.18)	0.35 (0.14–0.91)	0.84 (0.37–1.90)
40–49	0.54 (0.30–0.99)	0.25 (0.10–0.64)	0.91 (0.42–1.96)
50–59	0.47 (0.26–0.88)	0.20 (0.07–0.54)	0.79 (0.36–1.70)
≥60	0.56 (0.28–1.10)	0.23 (0.07–0.73)	0.90 (0.38–2.08)
Sex			
Male	1.00	1.00	1.00
Female	1.23 (0.82–1.83)	1.15 (0.58–2.29)	1.22 (0.72–2.06)
Education level			
Less than high school	1.00	1.00	1.00
High school	0.67 (0.48–0.93)	0.44 (0.24–0.80)	0.79 (0.53–1.19)
College or above	0.36 (0.21–0.61)	0.20 (0.08–0.49)	0.46 (0.24–0.90)
Industry			
Manufacturing	1.25 (0.89–1.74)	1.18 (0.69–2.01)	1.39 (0.89–2.18)
Construction	1.08 (0.75–1.57)	1.32 (0.62–2.81)	1.06 (0.68–1.65)
Others	1.00	1.00	1.00
Occupation			
White collar	1.00	1.00	1.00
Blue collar	0.64 (0.39–1.05)	0.74 (0.36–1.51)	0.52 (0.25–1.09)
Service	1.27 (0.66–2.43)	1.12 (0.42–3.00)	1.50 (0.57–3.96)
Perceived health status			
Good	0.64 (0.48–0.85)	0.51 (0.32–0.82)	0.67 (0.46–0.96)
Bad	1.00	1.00	1.00
Accident type			
Injury	1.00	1.00	1.00
Disease	0.56 (0.33–0.96)	0.53 (0.23–1.22)	0.52 (0.25–1.08)
Recuperation period			
≤6 months	1.00	1.00	1.00
7–12 months	1.28 (0.94–1.74)	1.87 (1.11–3.16)	1.05 (0.72–1.55)
>12 months	0.93 (0.52–1.64)	1.73 (0.69–4.37)	0.61 (0.29–1.26)
Disability rating			
1–7	1.09 (0.45–2.62)	0.56 (0.13–2.45)	2.39 (0.61–9.35)
8–10	0.66 (0.39–1.09)	0.87 (0.38–2.02)	0.55 (0.28–1.06)
11–12	0.70 (0.45–1.08)	0.73 (0.34–1.55)	0.69 (0.40–1.20)
13–14	0.80 (0.54–1.18)	0.87 (0.46–1.67)	0.75 (0.45–1.24)
None	1.00	1.00	1.00
Rehabilitation service utilization			
Yes	1.31 (0.94–1.81)	1.21 (0.69–2.10)	1.36 (0.90–2.06)
No	1.00	1.00	1.00
RTW consultation			
Yes	0.71 (0.52–0.97)	0.70 (0.42–1.16)	0.68 (0.45–1.02)
No	1.00	1.00	1.00
Maintenance of a relationship with employer			
Yes	0.96 (0.71–1.30)	0.96 (0.48–1.92)	0.97 (0.69–1.36)
No	1.00	1.00	1.00
RTW type			
Returned to original work	1.00		
Reemployed	3.88 (2.86–5.28)		

7. General Characteristics of Study Subjects for Survival Analysis

General characteristics of study subjects for survival analysis are shown on table 8. In this analysis, unlike the logistic regression analyses for job retention, 86 workers who returned to original work and 275 reemployed workers with follow-up period within 2 years were included. During the follow-up period, 468 (29.1%) among total workers left their jobs and the mean follow-up period was 24.8 months. Although this study only includes the survey of 3 years, there were workers with follow-up period of more than 3 years because some workers returned to work during recuperation, and since survey was conducted from August to October, follow-up period can exceed 3 years if recuperation of a worker ended before August. Between job retention group and non-retention group, distributions of sex, education level, occupation, accident type, RTW consultation, and maintenance of a relationship with employer were significantly different.

The workers were stratified by RTW type and then divided into job retention group and non-retention group. In the returned to original work group, the mean follow-up period was 31.6 (\pm 10.7) and 142 (19.8%) workers left their jobs, and there were significant differences in distributions of education level, occupation, and perceived health status. In the reemployed group, the mean follow-up period was 19.4 (\pm 11.1) months and 326 (46.5%) workers left their jobs, and there was a significant difference of distribution of sex.

Table 8. General characteristics of study subjects for survival analysis

	Total (n=1,610)	Returned to original work (n=717)	Reemployed (n=893)
	N (%)	N (%)	N (%)
Follow-up period*	24.8 ± 12.5	31.6 ± 10.7	19.4 ± 11.1
Number of events	468 (29.1)	142 (19.8)	326 (36.5)
Age			
<30	91 (5.7)	34 (4.7)	57 (6.4)
30–39	257 (16.0)	146 (20.4)	111 (12.4)
40–49	454 (28.2)	219 (30.5)	235 (26.3)
50–59	575 (35.7)	238 (33.2)	337 (37.7)
≥60	233 (14.5)	80 (11.2)	153 (17.1)
Sex			
Male	1,369 (85.0)	606 (84.5)	763 (85.4)
Female	241 (15.0)	111 (15.5)	130 (14.6)
Education level			
Less than high school	589 (36.6)	200 (27.9)	389 (43.6)
High school	751 (46.7)	363 (50.6)	388 (43.5)
College or above	270 (16.8)	154 (21.5)	116 (13.0)
Industry			
Manufacturing	630 (39.1)	354 (49.4)	276 (30.9)
Construction	435 (27.0)	82 (11.4)	353 (39.5)
Others	545 (33.9)	281 (39.2)	264 (29.6)
Occupation			
White collar	161 (10.0)	102 (14.2)	59 (6.6)
Blue collar	1,333 (82.8)	561 (78.2)	772 (86.5)
Service	116 (7.2)	54 (7.5)	62 (6.9)
Perceived health status			
Good	984 (61.1)	512 (71.4)	472 (52.9)
Bad	626 (38.9)	205 (28.6)	421 (47.1)
Accident type			
Injury	1475 (91.6)	636 (88.7)	839 (94.0)
Disease	135 (8.4)	81 (11.3)	54 (6.1)
Recuperation period			
≤6 months	977 (60.7)	483 (67.4)	494 (55.3)
7–12 months	516 (32.1)	191 (26.6)	325 (36.4)
>12 months	117 (7.3)	43 (6.0)	74 (8.3)
Disability rating			
1–7	51 (3.2)	27 (3.8)	24 (2.7)
8–10	274 (17.0)	115 (16.0)	159 (17.8)
11–12	500 (31.1)	209 (29.2)	291 (32.6)
13–14	489 (30.4)	227 (31.7)	262 (29.3)
None	296 (18.4)	139 (19.4)	157 (17.6)
Rehabilitation service utilization			
Yes	790 (49.1)	316 (44.1)	474 (53.1)
No	820 (50.9)	401 (55.9)	419 (46.9)
RTW consultation			
Yes	415 (25.8)	222 (31.0)	193 (21.6)
No	1,195 (74.2)	495 (69.0)	700 (78.4)
Maintenance of a relationship with employer			
Yes	1,047 (65.0)	635 (88.6)	412 (46.1)
No	563 (35.0)	82 (11.4)	481 (53.9)
RTW type			
Returned to original work	717 (44.5)		
Reemployed	893 (55.5)		

* mean ± standard deviation (months)

8. Survival Analysis for Job Retention by Return-to-work Type

The Kaplan-Meier survival curves showed a significant difference in retention probability between returned to original work group and reemployed group ($p < 0.001$ by log-rank test). The retention curves of the two groups are shown on figure 4.

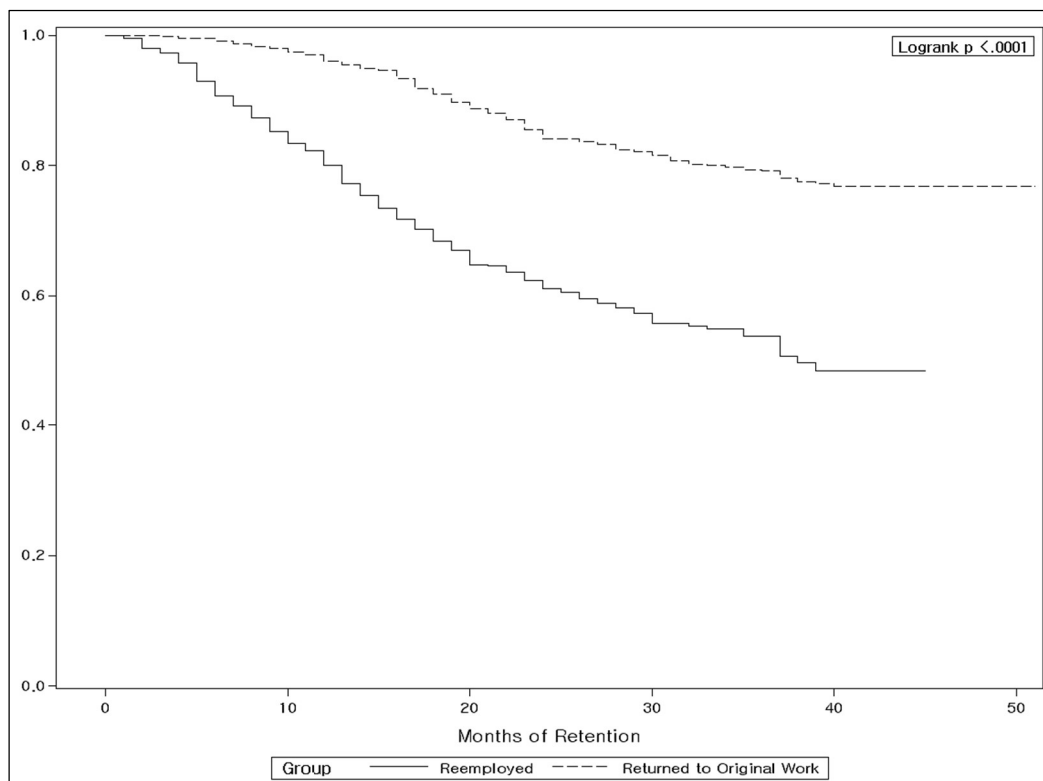


Fig 4. Kaplan-Meier survival curves for job retention stratified by return-to-work type

The Cox proportional-hazards model was used to evaluate the impacts of selected variables on job retention. In the analysis of total returned workers, age, education level, accident type, and RTW type showed significant impacts on job retention. While HRs for non-retention of 50–59 year group (0.64, 0.42–0.96), college or above group (0.58, 0.40–

0.83), and occupational disease group (0.66, 0.44–0.98) were less than 1 at a significant level, HR of reemployed workers compared to returned to original work group was 2.66 (2.11–3.35). In stratified analyses, age, education level, perceived health status, and recuperation period showed significant impacts on job retention in returned to original work group. However, no significant impact of the factors on job retention was found in the analysis of reemployed group (table 9).

Table 9. Cox proportional-hazards ratios for non-retention by return-to-work type

	Total (n=1,610) HR (95% CI)	Returned to original work (n=717) HR (95% CI)	Reemployed (n=893) HR (95% CI)
Age			
<30	1.00	1.00	1.00
30–39	0.81 (0.53–1.23)	0.42 (0.21–0.84)	1.03 (0.60–1.75)
40–49	0.68 (0.46–1.02)	0.32 (0.16–0.64)	0.93 (0.56–1.53)
50–59	0.64 (0.42–0.96)	0.24 (0.11–0.49)	0.91 (0.55–1.51)
≥60	0.72 (0.46–1.13)	0.27 (0.12–0.64)	1.03 (0.59–1.79)
Sex			
Male	1.00	1.00	1.00
Female	1.12 (0.85–1.48)	1.26 (0.77–2.06)	1.06 (0.75–1.50)
Education level			
Less than high school	1.00	1.00	1.00
High school	0.81 (0.64–1.03)	0.56 (0.35–0.89)	0.91 (0.69–1.19)
College or above	0.58 (0.40–0.83)	0.31 (0.16–0.60)	0.71 (0.46–1.11)
Industry			
Manufacturing	1.05 (0.83–1.33)	1.07 (0.71–1.62)	1.08 (0.80–1.44)
Construction	1.03 (0.79–1.35)	1.35 (0.75–2.42)	0.96 (0.71–1.30)
Others	1.00	1.00	1.00
Occupation			
White collar	1.00	1.00	1.00
Blue collar	0.79 (0.55–1.11)	0.85 (0.49–1.50)	0.74 (0.47–1.17)
Service	1.27 (0.82–1.98)	1.95 (0.99–3.84)	1.04 (0.58–1.88)
Perceived health status			
Good	0.88 (0.72–1.08)	0.64 (0.44–0.92)	0.99 (0.78–1.26)
Bad	1.00	1.00	1.00
Accident type			
Injury	1.00	1.00	1.00
Disease	0.66 (0.44–0.98)	0.60 (0.32–1.14)	0.69 (0.41–1.16)
Recuperation period			
≤6 months	1.00	1.00	1.00
7–12 months	1.12 (0.91–1.39)	1.50 (1.01–2.24)	1.04 (0.81–1.35)
>12 months	0.89 (0.59–1.32)	1.34 (0.61–2.91)	0.81 (0.51–1.30)
Disability rating			
1–7	1.00 (0.54–1.83)	0.65 (0.21–2.03)	1.23 (0.60–2.53)
8–10	0.75 (0.52–1.06)	0.84 (0.44–1.59)	0.70 (0.46–1.09)
11–12	0.80 (0.59–1.08)	0.78 (0.45–1.37)	0.79 (0.55–1.13)
13–14	0.87 (0.67–1.14)	0.78 (0.48–1.26)	0.88 (0.64–1.22)
None	1.00	1.00	1.00
Rehabilitation service utilization			
Yes	1.12 (0.89–1.40)	1.01 (0.66–1.56)	1.15 (0.88–1.50)
No	1.00	1.00	1.00
RTW consultation			
Yes	0.84 (0.67–1.05)	0.96 (0.66–1.39)	0.76 (0.57–1.01)
No	1.00	1.00	1.00
Maintenance of a relationship with employer			
Yes	0.94 (0.76–1.16)	0.87 (0.51–1.48)	0.94 (0.75–1.18)
No	1.00	1.00	1.00
RTW type			
Returned to original work	1.00		
Reemployed	2.66 (2.11–3.35)		

9. Survival Analysis for Job Retention by Return-to-work Period

Additionally, another survival analysis was conducted to evaluate the impacts of RTW period on job retention only in the workers who returned to original work. The result indicated that HRs for non-retention were higher in the workers who returned in 13–24 months (3.03, 1.52–6.04) and more than 24 months (5.33, 2.14–13.25).

Table 10. Cox proportional-hazards ratios for non-retention by return-to-work period in the workers returned to original work

Return-to-work period	N	HR (95% CI) *
≤3 months	103	1.00
4–6 months	275	0.96 (0.53– 1.73)
7–9 months	138	1.50 (0.77– 2.92)
10–12 months	52	2.10 (0.96– 4.59)
13–24 months	70	3.03 (1.52– 6.04)
>24 months	26	5.33 (2.14–13.25)

* Adjusted for age, sex, education level, industry, occupation, perceived health status, accident type, disability rating, rehabilitation service utilization, RTW consultation, and maintenance of a relationship with employer

V. DISCUSSION

1. Summary of the Findings

As the workforce ages, workers are at more risks of occupational injuries and diseases, and consequently, they are exposed to greater risks of occupational injuries, diseases, and/or disabilities as a result^{25,50}. Considering that Korea is one of the most rapidly aging and longest working country in the world, the magnitude of the risk is substantial^{51,52}. Therefore, in order to reduce social burden that occupational injuries and diseases can cause, there are necessities for successful RTW.

RTW rate in this study was 80.5% (original work and reemployed, 35.9% and 44.7%, respectively) and job retention rate for 1-year and 2-year was 86.1% and 68.0% in total workers, and higher in workers who returned to original work with 95.8% and 83.2% than in reemployed workers with 77.3% and 52.4%, respectively. This shows a difference with statistics from KCOMWEL which was 53.9% in 2014, 56.8% in 2015, and 61.9% in 2016. The definition of RTW in KCOMWEL survey is returning to work until the end of the next month of end of recuperation. On the contrary, workers were considered as returned to work regardless of returning time in this study. Therefore, RTW rate was higher in this study.

In this study, personal and accident-related factors potentially affecting RTW and job retention were examined. In analyses with total workers, age and perceived health status were significantly related both to RTW and job retention. Recuperation period and disability rating were only shown to be related to RTW. Education level, accident type, and RTW consultation were only related to job retention, although relationship of perceived health status and RTW consultation with job retention were not significant in the survival analysis.

In analyses with workers returned to original work, age, education level, perceived health status, and recuperation period were significantly related both to RTW and job retention. Industry, accident type, rehabilitation service, and maintenance of a relationship

with employer were only related to RTW, but no factors were only related to job retention.

In analyses with reemployed workers, perceived health status was only factor that was related both to RTW and job retention, although the relationship was not significant in survival analysis. Industry, recuperation period, disability rating, and maintenance of a relationship with employer were only related to RTW. Education level was only related to job retention.

When workers who returned to original work were divided by RTW period, workers who returned after 12 months were more likely to leave job, and the risk was higher among workers returned in 13–24 months and more than 24 months.

2. Interpretation of the Findings and Comparison with Previous Literatures

In general, there were differences in characteristics of workers returned to original work and reemployed workers, and also, factors affecting RTW and job retention showed differences between the two groups, which is a consistent result with a previous study⁵³.

There were differences in the results of job retention analysis between logistic regression with 2-year retention and survival analysis. Although the direction of results were generally identical, strength of association was weaker in survival analysis.

Returned to original work group and reemployed group showed a significantly different job retention rate, which was lower in reemployed group. One possible explanation is the effect of supporting fund by KCOMWEL which is provided only when a worker returns to original workplace up to 12 months. While non-retention rate of the second year in reemployed workers was almost same as that of the first year, non-retention rate of workers who returned to original work in the second year almost three times that of the first year. Another possible explanation is that workers who returned to original work

are more skilled at their jobs than who were reemployed, which makes them important in their workplace. This could be understood in the same context with the findings from age and education level⁵⁴. Additionally, reemployed workers might experience difficulties in adaptation as more than half of the reemployed workers responded that the reemployment occurred due to involuntary reasons in the first survey.

Age was shown to be significantly related to RTW and job retention, although the results were not significant in reemployed workers, patterns were similar, and the result is consistent with the previous reports^{31,55}. Although not included in this study, information on the length of service showed an inverted U-shape with the longest work period in 40s. Therefore, there is a possibility that the effect of age includes the effect of length of service. On the other hand, the OR for job retention was highest in 50s, unlike the OR for RTW was highest in 40s, which requires more researches to clarify the reason.

Education level was also shown to be significantly related to RTW³¹ (only in workers returned to original work) and job retention, in addition, the strength of association was higher for job retention. Generally, jobs requiring higher education are usually well-paid and have more authority for decision making, which can act as attracting factors for RTW and job retention, yet the effects become weaker when reemployed. In the PSWCI, there was a positive correlation between education level and income. Specifically, income was higher in job retention group of workers returned to original work, however, there were no correlations in non-RTW group and reemployed group. Therefore, it can be regarded that the effect of education level potentially includes the effect of income. Also, characteristics of jobs requiring higher education other than income might play a role⁵⁶.

RTW of construction workers showed contrasting results between the two groups. This result possibly arises from the nature of construction work. Since construction work is categorized as a very heavy labor⁵⁷, it is difficult to return to original work once a worker get an injury or disease, which makes workers to be reemployed. However, after RTW, which can be regarded as a proof for their physical capacity, no differences for job retention

among industries were found.

Perceived health status was significantly related to RTW and job retention, whose strength of association was higher for RTW. The result was consistent with previous studies^{53,58}.

Possibilities for RTW (only in workers returned to original work) and job retention were higher among workers with occupational diseases more than workers with occupational injuries. In the stratified analysis, the ORs for job retention were not significant, but the insignificances are might be due to lack of statistical power. As previous studies on RTW and job retention mostly targeted patients with a specific disease or injury entity, studies comparing RTW rate between disease and injury are scarce. There is a possibility of existing more severe sequelae in injured workers than workers with diseases, and higher rate of injury in construction workers can be another explanation for this, however, more detailed approach is required regarding this result.

Longer recuperation period was negatively related with RTW, which is a consistent result with previous studies^{59,60}. However, workers who recuperated 6–12 months in workers who returned to original work were less likely to sustain job, and the reason is unclear. On the other hand, recuperation period was not significantly related with job retention in reemployed workers.

Workers with disability ratings of 1–7 were less likely to return to work, which is a consistent result with previous reports^{28,53}. However, there was no significant relationship in workers who returned to original work. This is partially explained by the supporting fund (amount of fund is determined by disability rating). Disability ratings showed no significant effect on job retention. Due to small number of workers with severe disabilities, ratings with 1–3 group and 4–7 group were integrated. Therefore, there is a possibility of bias to the null in the analyses.

Rehabilitation service utilization status was shown to be negatively related with RTW

in workers who returned to original work, and was not significantly related to job retention. There is a possibility of reverse causation regarding this. If workers who were difficult to return to original work in the first place utilized the service, the relationship between rehabilitation service utilization and return to original work can be appeared as a negative relationship. However, more studies on how the workers decide to utilize the rehabilitation service is needed.

RTW consultation was related to job retention in the both groups, but not with RTW. In contrast to the result of a previous study reporting that doctors can play a pivotal role in RTW⁶¹, the relationship was significant only with job retention. Therefore, a qualitative approach is required for this problem.

Maintenance of a relationship with employer showed a predictable result for RTW, contrasting results between the two groups. However, no relationship to job retention was found.

RTW period was significantly related to job retention. In a previous study targeting workers with mental health problems, it was reported that only 50% of workers who are off work for 6 months and more returned to work⁶² and another study targeting Korean workers with occupational injuries and diseases reported that recuperation period of more than 6 months showed an odds ratio of 0.33 for RTW⁵³. Although outcome of these studies are different from that of this study (re-entry versus retention, respectively), there is a consistency that duration of sickness absence, which includes recuperation period, affects process of RTW negatively⁶³.

3. Comprehensive Findings of Overall Results

In this study, there are notable results that can be considered in policy implementation. First, considering that workers who left their jobs was much higher in the second year in returned to original work group, period for fund supporting (which is now up to 12 months)

needs to be considered for extension up to 2 years. Second, contrast to that there are protection policies for workers who returned to original work, there is no strategy for reemployed workers to retain job in Korea. Thus, benefits to the employers hiring returning workers after occupational injuries and diseases should be taken into account to promote job retention rate in reemployed workers. Lastly, the survival analysis for non-retention by RTW period indicates that early RTW is a good prognostic factor for job retention. Therefore, shortening recuperation period and delay in RTW after end of recuperation should be concurrently considered.

4. Strengths and Limitations

There are some strengths in this study. First, as panels of this study were systematically sampled from all workers who had finished recuperation from occupational injuries and diseases, the results can be regarded as having representativeness for Korean population. Second, the panel data was collected prospectively. Therefore, possibilities for recall bias or reverse causation were minimized in the survival analysis. Lastly, the impacts of RTW type and period on job retention along with sociodemographic, work-related, accident-related factors were investigated, which is, to the best of the author's knowledge, the first attempt targeting Korean workers.

On the other hand, there are also limitations to consider when interpreting the results. First, there is no information on diagnosis of the workers, which made it impossible to evaluate the effect of individual disease entities on job retention and differences among them. Moreover, this could have acted as a confounder due to the heterogeneity of severity among the workers. In order to overcome this limitation, disability rating was used as an alternative to adjust the severity, since disability rating is based on the loss of labor capacity⁶⁴. Second, panels were planned to be surveyed for five years, however, as this study was conducted in the middle of the five-year period, only the first three waves of data

could be used. Although follow-up period was rather short, the findings from this study showed distinct differences according to RTW type and period, however, a possibility of more evident result with longer follow-up period remains, which requires a future research.

VI. CONCLUSION

Through this study, the factors related RTW and job retention were identified, and the factors affect RTW and job retention differently. Also, job retention outcomes were different according to RTW type and period.

In conclusion, in order to accomplish successful RTW, approaches and more researches should be made regarding identified factors related to RTW and job retention. Additionally, workers who were reemployed after occupational injuries and diseases and with prolonged RTW period of more than 12 months are at high risks for non-retention. Therefore, policies encouraging return to original workplace, protecting reemployed workers, and promoting early RTW should be implemented. Also, further studies with longer follow-up period and approaches for common disease entities are required.

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국 문 요 약

산업재해 환자의 직장복귀와 직업유지에 관련된 요인

서론

한국의 산재근로자 수는 2007년부터 90,000명을 넘고 있으며 이는 여러 방면에서 상당한 부정적인 영향을 불러일으킨다. 직장복귀는 이러한 영향을 막을 수 있는 효과적인 방법이다. 직장복귀율을 제고하기 위한 연구와 정책들이 이루어지고 있지만, 직장에 복귀한 뒤의 상황에 대해서는 충분한 연구가 이루어지지 않았다. 성공적인 직장복귀를 위해서는 복귀와 함께 직업유지의 현황에 대해서도 이해하는 것이 필수적이다. 따라서 본 연구의 목적은 복귀와 유지를 모두 고려한 직장복귀의 현 상황을 파악하고 관련된 요인을 연구하는 것이며, 직장복귀 형태와 시기가 직업유지에 미치는 영향을 알아보는 것이다.

방법

산재보험 패널조사는 2012년 산재요양이 종결된 환자를 대상으로 표본추출한 2,000명의 근로자를 대상으로 한다. 사회인구학적요인, 직업 및 사고관련 요인들이 직장복귀와 직업유지에 어떠한 영향을 미치는지 알아보았다. 첫 번째 분석에서는, 로지스틱 회귀분석에 의해 각 요인들이 직장복귀(원직복귀 및 재취업)에 어떠한 영향을 미치는지 분석되었다. 두 번째 분석에서는, 로지스틱 회귀분석에 의해 복귀형태를 비롯한 각 요인들이 직업유지(24개월 기준)에 어떠한 영향을 미치는지 분석되었다. 세 번째 분석에서는, 콕스비례위험모

형에 의해 복귀형태를 비롯한 각 요인들이 유지기간에 관계 없이 직장복귀에 어떠한 영향을 미치는지 분석되었다. 네 번째 분석에서는, 직장복귀 시기가 직업유지에 어떠한 영향을 미치는지 분석되었다.

결과

본 연구에서 직장복귀율은 80.5%로 나타났다(원직복귀 35.9%, 재취업 44.7%). 전체 근로자에서는 연령, 자각건강상태, 요양기간, 장애등급이 직장복귀와 관련이 있는 것으로 나타났다. 원직복귀자에서는 연령, 교육수준, 업종, 자각건강상태, 사고종류, 요양기간, 재활서비스 이용 여부, 사업주와의 관계유지가 직장복귀와 관련이 있는 것으로 나타났다. 재취업자에서는 업종, 자각건강상태, 요양기간, 장애등급, 사업주와의 관계유지가 직장복귀와 관련이 있는 것으로 나타났다.

재취업자는 원직복귀자와 비교하여 24개월간 직장을 유지하지 못할 오즈비가 3.88(2.86-5.28)로 높게 나타났다. 전체 근로자에서는, 연령, 교육수준, 자각건강상태, 사고종류, 직장복귀상담이 24개월 직장유지와 관련이 있는 것으로 나타났다. 원직복귀자에서는, 연령, 교육수준, 자각건강상태, 요양기간이 24개월 직장유지와 관련이 있는 것으로 나타났다. 재취업자에서는, 교육수준과 자각건강상태가 24개월 직장유지와 관련이 있는 것으로 나타났다. 생존분석에서는 재취업자가 원직복귀자와 비교하여 직장을 유지하지 못할 위험비가 2.66(2.11-3.35)로 높게 나타났다. 사고 후 3개월 이내 직장복귀를 한 근로자에 비하여 사고 후 13-24개월에 복귀한 근로자는 직장을 유지하지 못할 위험비가 3.03(1.52-6.04), 24개월 이후에 복귀한 근로자는 5.33(2.14-13.25)로 높게 나타났다.

고찰

본 연구에서는 정책 시행에 참고 될만한 결과들이 나타났다. 첫 번째로, 원직복귀자들의 경우 2년차에 직장이탈율이 높은 것으로 나타났다. 따라서 현재 12개월까지 주어지는 원직복귀 지원금의 연장에 대한 고려가 필요하다. 두 번째로, 재취업자의 직업유지율이 낮게 나타났다. 따라서, 재취업자에 대한 보호정책이나 재취업자를 채용하는 고용주에 대한 혜택이 고려되어야 한다. 세 번째로, 복귀시기가 늦어질수록 직업유지가 힘들어지는 것으로 나타났다. 따라서 조기복귀를 위한 정책이 필요할 것으로 생각된다.

결론

직업유지는 직장복귀의 과정에서 중요한 단계이다. 재취업자와 13개월 이후 직장에 복귀한 근로자들의 직업유지율이 낮다는 점을 고려하여, 원직복귀의 장려, 재취업자에 대한 보호, 조기복귀율 향상을 위한 노력이 필요하다.

핵심되는 말: 직장복귀; 직업유지; 직업성 손상; 직업성 질환; 산업재해보상보험; 패넬 연구