

BMJ Open Factors influencing return to work after stroke: the Korean Stroke Cohort for Functioning and Rehabilitation (KOSCO) Study

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ABSTRACT

Objective To investigate the rate of return to work and identify key factors associated with return to work between 3 months and 2 years after stroke.

Design Prospective cohort study.

Setting The Korean Stroke Cohort for Functioning and Rehabilitation (KOSCO) in Korea.

Participants A total of 193 persons with first-ever stroke who reported working status at 3 months after stroke.

Outcome measures Data on baseline characteristics were collected from medical records. Functional assessments were performed using the National Institutes of Health Stroke Scale, the modified Rankin Scale, the Fugl-Meyer Assessment, the Functional Ambulatory Category, the Korean Mini-Mental State Examination, the Korean version of the Frenchay Aphasia Screening Test, the American Speech-Language-Hearing Association National Outcomes Measurement System, the Korean-Modified Barthel Index, the Geriatric Depression Scale-Short Form and the EuroQoL-5 dimensions. An enumeration survey included the Reintegration to Normal Living Index, the Psychosocial Well-being Index-Short Form, the Family Support Index and the Caregivers Burden Index.

Results Overall, 145 (75.1%) patients who had a stroke in the "Continuously-Employed" group and 48 (24.9%) in the "Employed-Unemployed" group returned to work between 3 months and 2 years after stroke. Multivariate logistic analysis demonstrated that in patients who had a stroke, characteristics such as age, PWI-SF Score, and caregiver characteristics, including age, sex (female) and living arrangements, were significantly associated with return to work between 3 months and 2 years after stroke.

Conclusion Age and PWI-SF Score of patients who had a stroke, as well as the age, sex and living arrangements of caregivers, are key factors influencing the return to work after stroke.

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INTRODUCTION

Stroke is a common cause of adult disability and is a resource-intensive disease for society.¹ Globally, approximately 31% of patients who

Strengths and limitations of this study

- ▶ This was the first study to investigate return to work or job loss despite successful return to work in patients who had a stroke living in Korea.
- ▶ The study suggests factors associated with return to work in patients who had a stroke by performing face-to-face interviews with functional assessments and an enumeration survey.
- ▶ A relatively high dropout rate was observed in the large stroke centre because patients either could not be contacted or showed a lack of willingness to participate; however, 193 patients who had a stroke consented to be evaluated regarding returning to work between 3 months and 2 years after stroke.
- ▶ This study was performed in the Korean context, and applicability of the results to other cultural contexts needs to be considered carefully.
- ▶ Job type, job position and employment sustainability significantly affected the rate of return to work among patients who had a stroke; however, intrinsic job and work environment factors were not considered in this study, and further studies are necessary to obtain more relevant data.

had a stroke are younger than 65 years at the time of their first stroke.² In Korea, the corresponding percentage is 36%.^{3,4}

Patients who had a stroke have a relatively long life expectancy, and many young patients who had a stroke have a desire to return to work provided their health permits it and their work environment is favourable and supportive.⁵ Moreover, social and economic trends have suggested that many patients who had a stroke in Korea may increasingly seek work for economic reasons.⁶

The ability to work is important as it enhances reintegration into society.^{7,8} Return to work helps patients who had a stroke regain confidence in their abilities, and it improves

their quality of life⁷ and is therefore a significant goal of rehabilitation. Indeed, having an occupation is beneficial for health as unemployment may be a risk factor for patients who had a stroke.⁹

Currently, approximately 40% (range, 11%–85%) of patients who had a stroke return to work.¹⁰ A workforce-based study published in 2018 showed that patients who had a stroke tend to leave the workforce permanently or stay on sick leave for 1 year after the stroke.¹¹ Working-age individuals with a stroke are a significant challenge for the workforce because despite successful return to work they have a high risk of stroke event, psychological burden, lower position and change in the employment status. It would be of great value to determine the proportion of patients who had a stroke returning to and remaining at work.

Changes in the employment status after successful return to work have been associated with age, sex, physical dependency at discharge, degree of residual disability, sick leave and comorbidities, all of which are critical in predicting return to work among patients who had a stroke.^{12–14} Other factors that have shown limited support as a predictive factor for return to work are job type, higher education and social-environmental factors such as social support and job adaptations.^{12 15 16} Knowledge of the factors that may predict job loss after returning to work is particularly important for the development of rehabilitation programmes.

Most patients who had a stroke were found to return to work within 3–6 months after stroke, with only a few returning to work more than 1 year after the stroke event.^{6 17} However, previous studies lack standardisation and have provided limited coherent information to facilitate the return to work for willing individuals after stroke.

Considering the lack of research, increasing incidence and significant impact of stroke on working-age adults, a better understanding of the requirements for successful return to work in patients who had a stroke is necessary. Therefore, we conducted this prospective study in conjunction with the Korean Stroke Cohort for Functioning and Rehabilitation (KOSCO) to investigate the rate of return to work among patients who had a stroke and the factors influencing return to work between 3 months and 2 years after stroke.

MATERIALS AND METHODS

Korean Stroke Cohort for Functioning and Rehabilitation

KOSCO is a large multicentre prospective cohort study of persons with first-ever stroke admitted to participating hospitals in nine distinct areas of Korea. The recruitment of persons with first-ever stroke began in August 2012 and is ongoing. All participants provided informed written consent within 7 days of the stroke event before inclusion in the study. The rationale and protocols of the KOSCO study were described in an earlier study.¹⁸

Study population

A total of 10 636 participants were enrolled in the KOSCO cohort from August 2012 to December 2017 and included in this study. The inclusion criteria were as follows: (A) First-ever stroke (ischaemic or haemorrhagic stroke) with a corresponding lesion on MRI/angiography scan. (B) Age ≥ 19 years. (C) An understanding of the purpose of the study and consent to participate in the study. (D) Working status reported at 3 months after the stroke event. The exclusion criteria were as follows: (A) Transient ischaemic attack. (B) Recurrent stroke.

Data collection

Clinically experienced occupational therapists who received training in the use of functional assessments and questionnaires collected the data. Baseline assessments were performed at 3 months after stroke in the hospital, and follow-up assessments were conducted at the hospital 2 years after the stroke. Both assessments were performed at the participant's home if they were unable to visit the hospital. Self-administered questionnaires were also distributed and filled out at 3 months and 2 years after stroke. Data collected by interview included working status (return to work and job loss despite a successful return to work). We assigned the participants into the following two groups based on working status: the "Continuously-Employed" group, which included patients who had a stroke who had been continuously working between 3 months and 2 years after stroke, and the "Employed-Unemployed" group, which included participants who were working at 3 months, but had not worked since then.

Demographic and clinical characteristics

Data on subject demographics and clinical characteristics were collected from medical records on first admission, which included basic information such as age, sex, education, marital status, religion, smoking status, alcohol consumption, stroke type and stroke location. Comorbidity level was assessed using the Charlson Comorbidity Index (CCAS, with lower scores representing lower comorbidities).¹⁹ In addition, the time course of initial admission, transfer to rehabilitation department and discharge was recorded. Caregiver characteristics included basic information such as age, sex, education, marital status, quality of relationship with patients who had a stroke and relationship to the patients who had a stroke, presence of an alternative caregiver, living arrangements (living with patients who had a stroke), household type, employment status and income.

Functional assessment between 3 months and 2 years after stroke

Functional evaluations were performed using previously validated instruments, including the National Institutes of Health Stroke Scale (NIHSS, 0–42 points; a lower score is better),²⁰ modified Rankin Scale (mRS, score range of 0–6; a lower score is better),²¹ Fugl-Meyer Assessment (FMA),²² Functional Ambulatory Category (FAC),²³

Korean Mini-Mental State Examination (K-MMSE),²⁴ Korean version of the Frenchay Aphasia Screening Test (K-FAST),²⁵ American Speech-Language-Hearing Association National Outcomes Measurement System (ASHA-NOMS),²⁶ Korean-Modified Barthel Index (K-MBI),²⁷ Geriatric Depression Scale-Short Form (GDS-SF)²⁸ and EuroQol-5 dimensions (EQ-5D).²⁹

Structured self-administered questionnaires between 3 months and 2 years after stroke

Each participant was given a structured self-administered questionnaire to complete and was interviewed face to face during the hospital visit. Our structured multiple-choice, self-administered questionnaire assesses multiple important factors related to an individual's decision to return to work or to job loss after stroke. The structured self-administered questionnaires and face-to-face interviews included Reintegration to Normal Living Index (RNLI),³⁰ Psychosocial Well-being Index-Short Form (PWI-SF),³¹ Family Support Index (FSI)³² and Caregivers Burden Index (CBI).³³ Questions were asked regarding healthcare and medical rehabilitation utilisation. Higher PWI-SF scores are worse, while higher FSI and RNLI scores are better.

Statistical analysis

Data are expressed as mean±SD. Statistical comparisons were performed using R statistical software V.3.4.2 (R Foundation, Vienna, Austria). Data were analysed statistically using descriptive statistics for demographic and clinical characteristics. The χ^2 test and *t*-test were used to compare variables between the two groups. We then used a multiple logistic regression model to estimate the association between factors influencing return to work in the patient groups. To prevent overfitting, we performed stepwise regression using backward elimination algorithms according to the Akaike Information Criteria. A *p* value <0.05 was considered statistically significant.

Patient and public involvement

No patients who had a stroke were involved in the development of the hypothesis, aims, or research questions or in the design, planning or implementation of the study. No patients who had a stroke were involved in the interpretation of study results or in the writing of the manuscript. The patients who had a stroke were provided feedback on the research findings for 2 years after the study.

RESULTS

Demographics and clinical characteristics

Of the 10 636 individuals admitted to the study, 2626 did not meet the inclusion criteria. Overall, 8010 patients who had a stroke agreed to participate in the study. Of the 5815 participants who were followed up at 3 months after stroke, 1126 reported on their working status. Of these 1126 patients who had a stroke, 193 were included in the final analysis (figure 1). The characteristics of the

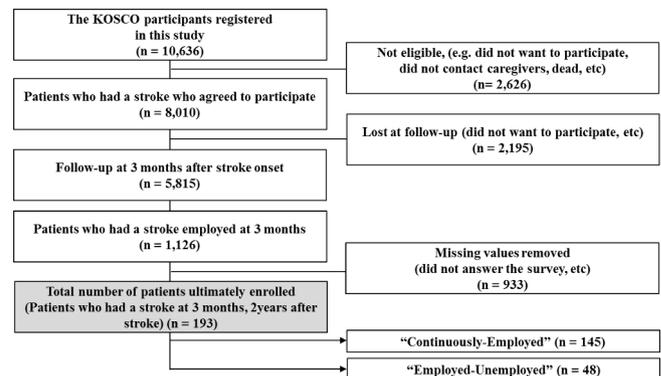


Figure 1 Flow chart of the study population. Baseline data were collected at 3 months after stroke. The group was divided into two groups according to working status ("Continuously-Employed" and "Employed-Unemployed"). The functional assessment and questionnaire survey were conducted between 3 months and 2 years after stroke. KOSCO, Korean Stroke Cohort for Functioning and Rehabilitation.

participants are shown in tables 1–3. The results of the interviews with the 193 caregivers are shown in table 4.

Return to work between 3 months and 2 years after stroke

A total of 145 (75.1%) patients who had a stroke returned to work between 3 months and 2 years after the stroke, while 48 (24.9%) lost their jobs despite a successful return to work (figure 1). As illustrated in figure 2A, among the working-age (younger than 65 years) patients who had a stroke who returned to work between 3 months and 2 years after stroke, 101 (85.6%) returned to work, while 17 (14.4%) lost their jobs. Forty-four (58.7%) patients who had a stroke aged 65 years and older worked continuously, while 31 (41.3%) were out of work between 3 months and 2 years after stroke. Furthermore, we compared sex and employment status as a function of age. Following stratification by age and sex, male patients who had a stroke less than 65 years of age were shown to have a significantly higher rate of return to work compared with patients of other ages (figure 2B).

Predictive factors associated with return to work

In comparison with the "Employed-Unemployed" group, the characteristics of the "Continuously-Employed" group, including age, sex, marital status, age-related score of comorbidity, NIHSS, mRS, FAC, K-MMSE, K-FAST, EQ-5D, RNLI and PWI-SF scores were significantly different (*p*<0.05) between 3 months and 2 years after stroke as shown in tables 1–3. Caregiver characteristics such as age, sex, relationship to the participant, living arrangements (living with patients who had a stroke), household type and income were significantly different than the "Employed-Unemployed" group (*p*<0.05), as shown in table 4. The multivariate logistic regression analysis is shown in table 5 and included age (≥ 65 years) (OR 2.55, 95% CI 1.10 to 5.90), NIHSS at 3 months (moderate) (OR 2.78, 95% CI 0.79 to 9.79), PWI-SF (potential stress) (OR 4.52, 95% CI 1.68 to 12.17) and

Table 1 Basic characteristics of subjects

Characteristics	Total	"Continuously-Employed"	"Employed-Unemployed"	P values
Participants, n (%)	193 (100.0)	145 (75.1)	48 (24.9)	
Age, n (%)				0.000***
<65 years	118 (61.1)	101 (69.7)	17 (35.4)	
≥65 years	75 (38.9)	44 (30.3)	31 (64.6)	
Sex, n (%)				0.001**
Male	163 (84.5)	130 (89.7)	33 (68.8)	
Female	30 (15.5)	15 (10.3)	15 (31.2)	
Education, n (%)				0.303
None	13 (6.7)	8 (5.5)	5 (10.4)	
Primary education	20 (10.4)	12 (8.3)	8 (16.7)	
Middle school education	31 (16.1)	23 (15.9)	8 (16.7)	
High school education	69 (35.8)	55 (37.9)	14 (29.2)	
University education	60 (31.1)	47 (32.4)	13 (27.1)	
Marital status, n (%)				0.002*
Married	178 (92.2)	136 (93.8)	42 (87.5)	
Widowed or divorced	12 (6.2)	6 (4.2)	6 (12.5)	
Never married	3 (1.6)	3 (2.1)	0 (0.0)	
Religion, n (%)				0.516
None	89 (46.1)	67 (46.2)	22 (45.8)	
Buddhism	48 (24.9)	33 (22.8)	15 (31.2)	
Christianity	47 (24.4)	37 (25.5)	10 (20.8)	
Catholic	9 (4.4)	8 (5.5)	1 (2.1)	
Smoking, n (%)				0.991
Yes	14 (7.3)	10 (6.9)	4 (8.3)	
No	179 (92.7)	135 (93.1)	44 (91.7)	
Alcohol consumption, n (%)				0.934
Yes	39 (20.2)	30 (20.7)	9 (18.8)	
No	154 (79.8)	115 (79.3)	39 (81.2)	

*p<0.01, **p<0.001, ***p<0.0001 when compared with the "Employed-Unemployed" group.

PWI-SF (severe stress) (OR 5.21, 95% CI 1.30 to 20.95), as well as the caregiver's age (OR 1.04, 95% CI 1.00 to 1.08), sex (female) (OR 0.27, 95% CI 0.11 to 0.67) and living arrangements (living with patients who had a stroke) (OR 3.08, 95% CI 1.07 to 8.86) between 3 months and 2 years after stroke.

DISCUSSION

This study showed that the rate of return to work was 75.1% in patients who had a stroke between 3 months to 2 years. We found that men aged <65 years had a significantly higher rate of return to work than did those aged ≥65 years among the subjects who reported their working status between 3 months and 2 years after stroke. Characteristics of patients who had a stroke such as age (≥65 years) and PWI-SF Score and caregiver characteristics such as age, sex (female) and living arrangements (eg,

living with patients who had a stroke) were the factors significantly associated with return to work between 3 months and 2 years after stroke. The results of this study elucidate the incidence, factors and effect of return to work on patients who had a stroke in Korea.

To the best of our knowledge, this was the first study tracking return to work or job loss despite successful return to work in patients who had a stroke living in Korea. The rate of return to work differs by country, culture and compensation policy.³⁴ The conditions for stroke rehabilitation in Korea have changed drastically over the past decade. However, the overall time course of return to work after stroke was similar to that reported in a previous study.² This suggests that return to work after stroke may not be strongly influenced by medical factors, which have changed dramatically, but may be influenced by socioeconomic factors, especially sick benefits, which

Table 2 Stroke characteristics of subjects

Characteristics	Total	"Continuously-Employed"	"Employed Unemployed"	P values
Participants, n (%)	193 (100.0)	145 (75.1)	48 (24.9)	
Comorbidity affecting RTW, mean (SD)				
Weighted index of comorbidity	2.7 (1.1)	2.7 (1.1)	2.8 (1.2)	0.918
Age-related score of comorbidity	5.1 (1.7)	5.0 (1.6)	5.6 (1.8)	0.038*
Stroke type, n (%)				
Ischaemic stroke	170 (88.1)	130 (89.7)	40 (83.3)	
Haemorrhagic stroke	23 (11.9)	15 (10.3)	8 (16.7)	
Stroke location, n (%)				
Right	85 (44.0)	63 (43.4)	22 (45.8)	
Left	98 (50.8)	74 (51.0)	24 (50.0)	
Both	10 (5.2)	8 (5.5)	2 (4.2)	
Initial stroke management, n (%)				
REH consult	148 (76.7)	111 (76.6)	37 (77.1)	1.000
REH transfer	24 (12.4)	18 (12.4)	6 (12.5)	1.000
Discharge destination, n (%)				
Home	173 (89.6)	133 (91.7)	40 (83.3)	
REH specialised clinic or hospital	11 (5.7)	9 (6.3)	2 (4.2)	
Other clinic or hospital	9 (4.7)	3 (2.1)	6 (12.6)	

*p<0.05 when compared with the "Employed-Unemployed" group.
REH, rehabilitation department; RTW, return to work.

have remained unchanged over the time period of this study.³⁵

Return to work is an essential part of daily life that may impact social integration and quality of life.³⁶ Individuals who face job loss experience a stressful life event, which can lead to decreased social status, disrupted family life and social roles,³⁷ financial strain and loss of self-esteem.³⁸ However, a previous study lacked standardisation of return to work or job loss of patients who had a stroke.¹ Most studies in the field of stroke rehabilitation have focused mainly on elderly patients who had a stroke who returned to work, which meant that the needs of younger patients who had a stroke were overlooked.^{10 35 39} Return to work after stroke should be investigated on the basis of working age, and it is important to identify the factors associated with return to work after stroke and minimise the risk factors associated with long-term disability.

To determine the return to work rate, we examined patients who had a stroke who reported their working status between 3 months and 2 years after stroke. Patients who had a stroke who had been consistently working were dominant in the "Continuously-Employed" group but not in the "Employed-Unemployed" group. Characteristics of patients who had a stroke such as age, sex, marital status, comorbidity, NIHSS, mRS, FAC, K-MMSE, K-FAST, EQ-5D, RNLI, PWI-SF and caregiver characteristics such as age, sex, relationship to the patients who had a stroke, living arrangements (eg, living with patients who had a stroke), household type and income were all factors correlating

with return to work that were discretely determined in the "Continuously-Employed" and "Employed-Unemployed" groups. Among these factors, characteristics of patients who had a stroke such as age (≥ 65 years) and PWI-SF Score and the caregiver characteristics of age, sex and living arrangements (eg, living with patients who had a stroke) were found to influence return to work most frequently.

Barker-Collo *et al*⁴⁰ showed that age was an important predictor of return to work; therefore, age at the time of return to work and involvement in complex and social activities after stroke should be considered when planning health and social services. Previously, it was shown that the life circumstances of young patients who had a stroke differed from those of older patients who had a stroke,¹⁷ with younger individuals having a higher likelihood of neurological recovery and social participation.⁴¹ As in previous studies,^{1 10 42 43} our results showed a significant association between a younger age and return to work, which suggests that institutions should develop intensive rehabilitation programmes that can accommodate young patients who had a stroke.

Our study found that patients who had a stroke aged <65 years, especially working-age men, had a significantly higher rate of return to work between 3 months and 2 years after stroke than that of the persons in other stroke groups (figure 2). Men were continuously employed and played the role of breadwinners in the household.²⁹ The perception that men have a greater responsibility

Table 3 Clinical characteristics of subjects

Characteristics	Total	"Continuously-Employed"	"Employed-Unemployed"	P values
Participants, n (%)	193 (100.0)	145 (75.1)	48 (24.9)	
NIHSS at admission, n (%)				0.527
Mild (0–2)	157 (81.3)	120 (82.8)	37 (77.1)	
Moderate (3–15)	35 (18.1)	24 (16.6)	11 (22.9)	
Severe (16–42)	1 (0.5)	1 (0.7)	0 (0.0)	
NIHSS at discharge, n (%)				0.230
Mild (0–2)	165 (85.5)	127 (87.6)	38 (79.2)	
Moderate (3–15)	28 (14.5)	18 (12.4)	10 (20.8)	
Severe (16–42)	0 (0.0)	0 (0.0)	0 (0.0)	
Functional outcomes at 3 months				
NIHSS, n (%)				0.019*
Mild (0–2)	178 (92.2)	138 (95.2)	40 (83.3)	
Moderate (3–15)	15 (7.8)	7 (4.8)	8 (16.7)	
Severe (16–42)	0 (0.0)	0 (0.0)	0 (0.0)	
mRS, n (%)				0.041*
No symptoms at all (0)	72 (37.3)	59 (40.7)	13 (27.1)	
No significant disability (1)	97 (50.3)	74 (51.0)	23 (47.9)	
Slight disability (2)	16 (8.3)	8 (5.5)	8 (16.7)	
Moderate disability (3)	5 (2.6)	2 (1.4)	3 (6.2)	
Moderate to severe disability (4)	2 (1.0)	1 (0.7)	1 (2.1)	
Severe disability (5)	1 (0.5)	1 (0.7)	0 (0.0)	
FMA (total affected side), n (%)				0.066
Normal (100)	136 (70.5)	109 (75.2)	27 (56.2)	
Slight (96–99)	37 (19.2)	21 (14.5)	16 (33.3)	
Moderate (85–95)	10 (5.2)	8 (5.5)	2 (4.2)	
Marked (50–84)	7 (3.6)	5 (3.4)	2 (4.2)	
Severe (0–49)	3 (1.6)	2 (1.4)	1 (2.1)	
FMA (total unaffected side)				0.235
Normal (100)	166 (86.0)	127 (87.6)	39 (81.2)	
Slight (96–99)	19 (9.8)	14 (9.7)	5 (10.4)	
Moderate (85–95)	8 (4.1)	4 (2.8)	4 (8.3)	
Marked (50–84)	0 (0.0)	0 (0.0)	0 (0.0)	
Severe (0–49)	0 (0.0)	0 (0.0)	0 (0.0)	
FAC, n (%)				0.013*
1	2 (1.0)	1 (0.7)	1 (2.1)	
2	1 (0.5)	1 (0.7)	0 (0.0)	
3	4 (2.1)	3 (2.1)	1 (2.1)	
4	17 (8.8)	7 (4.8)	10 (20.8)	
5	169 (87.6)	133 (91.7)	36 (75.0)	
K-MMSE, n (%)				0.004**
Normal (25–30)	162 (83.9)	129 (89.0)	33 (68.8)	
Mild (21–24)	16 (8.3)	8 (5.5)	8 (16.7)	
Moderate (11–20)	15 (7.8)	8 (5.5)	7 (14.6)	
Severe (0–10)	0 (0.0)	0 (0.0)	0 (0.0)	

Continued

Table 3 Continued

Characteristics	Total	"Continuously-Employed"	"Employed-Unemployed"	P values
K-FAST, mean (SD)	25.8 (5.4)	26.7 (4.6)	23.3 (6.6)	0.001***
ASHA-NOMS, n (%)				0.316
1	1 (0.5)	1 (0.7)	0 (0.0)	
2	0 (0.0)	0 (0.0)	0 (0.0)	
3	0 (0.0)	0 (0.0)	0 (0.0)	
4	0 (0.0)	0 (0.0)	0 (0.0)	
5	2 (1.0)	2 (1.4)	0 (0.0)	
6	17 (8.8)	10 (6.9)	7 (14.6)	
7	173 (89.6)	132 (91.0)	41 (85.4)	
K-MBI, mean (SD)	97.5 (7.0)	98.0 (6.1)	95.9 (9.2)	0.143
GDS-SF, mean (SD)	4.1 (3.2)	3.8 (3.2)	4.8 (3.1)	0.082
EQ-5D, mean (SD)	0.9 (0.1)	0.9 (0.1)	0.9 (0.1)	0.018*
RNLI, mean (SD)	91 (16.0)	93.1 (14.8)	84.9 (17.9)	0.002**
PWI-SF, n (%)				0.002**
Healthy (0–8)	69 (35.8)	62 (42.8)	7 (14.6)	
Potential stress (9–26)	103 (53.4)	70 (48.3)	33 (68.8)	
Severe stress (27–54)	21 (10.9)	13 (9.0)	8 (16.7)	
FSI, mean (SD)	48.5 (6.4)	49.0 (6.2)	47.2 (6.9)	0.094

*p<0.05; **p<0.01; ***p<0.001 when compared with the "Employed-Unemployed" group.

ASHA-NOMS, American Speech-Language-Hearing Association National Outcomes Measurement System; EQ-5D, EuroQol-5 dimensions; FAC, Functional Ambulatory Category; FMA, Fugl-Meyer Assessment; FSI, Family Support Index; GDS-SF, Geriatric Depression Scale-Short Form; K-FAST, Korean version of Frenchay Aphasia Screening Test; K-MBI, Korean version of the Modified Barthel Index; K-MMSE, Korean version of the Mini-Mental State Examination; mRS, modified Rankin Scale; NIHSS, National Institutes of Health Stroke Scale; PWI-SF, Psychosocial Well-being Index-Short Form; RNLI, Reintegration to Normal Living Index.

towards their families' lives⁴⁴ may have affected their rate of returning to work. However, the overall participation rate of women in the labour force has increased in a previous study.⁴⁵ In our study, 70.6% of working-age women returned to the labour force between 3 months and 2 years after stroke. This means that more than half of all working-age women were either employed or looking for work. Therefore, women should be supported and encouraged to participate in return to work.

Psychosocial factors such as self-reported nervousness, anxiety or sleeplessness may also affect return to work, as the support of family, friends and co-workers is important and positively influences the decisions of patients who had a stroke.⁴⁶ A low level of psychosocial stress may result in an increased speed and breadth of functional recovery after stroke.⁴⁷ Meanwhile, exposure to negative psychosocial stress adversely affects return to work in patients who had a stroke,⁴⁸ as revealed and confirmed by our findings. We assessed patients who had a stroke using the PWI-SF and the results showed a strong correlation between low levels of psychosocial stress and return to work. Thus, psychosocial support should be considered a critical aspect of stroke rehabilitation.

Culturally, family support plays an important role in Korea, although our findings did not show a strong correlation between family support and return to work.

However, caregiver demographic factors were strongly associated with return to work, in line with the results of previous reports.²⁹ A family caregiver of a person with stroke is defined as someone living with patients who had a stroke who is closely involved in taking care of him/her at home. Most patients who had a stroke are dependent on family caregivers who must assume multiple responsibilities.⁴⁹ The emotional and practical support provided by caregivers is known to positively affect functional and psychosocial outcomes⁵⁰ and to improve the quality of life of patients who had a stroke.⁴⁷ Thus, the caregiver may play a pivotal role in their return to work.

We found that caregiver demographic factors were strongly associated with age, sex and living arrangements (eg, living with patients who had a stroke). Younger caregivers of patients who had a stroke predominated in the "Continuously-Employed" group but not in the "Employed-Unemployed" group. Although younger caregivers may have a positive impact on the return to work of patients who had a stroke, as observed in this study, we were unable to determine exactly how the younger age of caregivers affects the return to work of patients who had a stroke. In Korean culture, older caregivers who are the spouse or parent⁵¹ of patients who had a stroke tend to feel strongly responsible for them and spend a lot of time taking care of them. One hypothesis is that this may

Table 4 Caregiver characteristics

Characteristics	Total	"Continuously-Employed"	"Employed-Unemployed"	P values
Participants, n (%)	193 (100)	145 (75.1)	48 (24.9)	
Age (years), mean (SD)	53.6 (12.1)	52.5 (11.6)	56.9 (13.0)	0.028*
Sex, n (%)				0.001***
Male	41 (21.2)	22 (15.2)	19 (39.6)	
Female	152 (78.8)	123 (84.8)	29 (60.4)	
Education, n (%)				0.531
None	8 (4.1)	5 (3.4)	3 (6.2)	
Primary education	22 (11.4)	15 (10.3)	7 (14.6)	
Middle school education	28 (14.5)	20 (13.8)	8 (16.7)	
High school education	84 (43.5)	68 (46.9)	16 (33.3)	
University education	51 (26.4)	37 (25.5)	14 (29.2)	
Marital status, n (%)				0.566
Married	175 (90.5)	132 (91.0)	43 (89.6)	
Widowed or divorced	5 (2.6)	5 (3.5)	0 (0.0)	
Never married	13 (6.7)	8 (5.5)	5 (10.4)	
Quality of relationship with patients who had a stroke, n (%)				0.232
Very good	69 (35.8)	46 (31.7)	23 (47.9)	
Good	93 (48.2)	76 (52.4)	17 (35.4)	
Not bad	29 (15.0)	21 (14.5)	8 (16.7)	
Bad	1 (0.5)	1 (0.7)	0 (0.0)	
Very bad	1 (0.5)	1 (0.7)	0 (0.0)	
Relationship to the patients who had a stroke, n (%)				0.002**
Spouse	149 (77.2)	119 (82.1)	30 (62.5)	
Sons or daughters	35 (18.1)	20 (13.8)	15 (31.2)	
Parents	5 (2.6)	5 (3.4)	0 (0.0)	
Others	4 (2.1)	1 (0.7)	3 (6.2)	
Presence of an alternative caregiver, n (%)				0.997
Yes	2 (1.0)	1 (0.7)	1 (2.1)	
No	191 (99.0)	144 (99.3)	47 (97.9)	
Living with patients who had a stroke, n (%)				0.005**
Yes	160 (82.9)	127 (87.6)	33 (68.8)	
No	33 (17.1)	18 (12.4)	15 (31.2)	
Household type, n (%)				0.050*
Live alone	6 (3.1)	2 (1.4)	4 (8.3)	
Conjugal family	171 (88.6)	130 (89.7)	41 (85.4)	
Extended family	16 (8.3)	13 (9.0)	3 (6.2)	
Employment status, n (%)				0.643
Employed	88 (45.6)	68 (46.9)	20 (41.7)	
Unemployed	105 (54.4)	77 (53.1)	28 (58.3)	
Income (Won), mean (SD)	3342.6 (4829.2)	3699.7 (5230.7)	2263.8 (3139.7)	0.024*
EQ-5D, mean (SD)	0.9 (0.1)	0.9 (0.1)	0.9 (0.1)	0.257
PWI-SF, n (%)				0.817
Healthy (0–8)	46 (23.8)	33 (22.8)	13 (27.1)	
Potential stress (9–26)	116 (60.1)	88 (60.7)	28 (58.3)	
Severe stress (27–54)	31 (16.1)	24 (16.6)	7 (14.6)	
CBI, mean (SD)	26.2 (10.8)	25.8 (10.7)	27.1 (11.1)	0.493

*p<0.05; **p<0.01; ***p<0.001 when compared with the "Employed-Unemployed" group.

CBI, Caregiver Burden Index; EQ-5D, EuroQol-5 dimensions; PWI-SF, Psychosocial Well-being Index-Short Form.

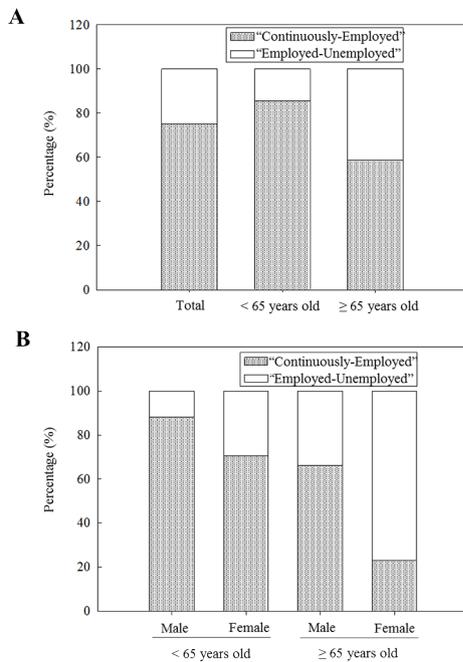


Figure 2 Proportion of patients who had a stroke who returned to work between 3 months and 2 years. The proportion of patients who had a stroke who returned to work between 3 months and 2 years after stroke is shown as a percentage (%) according to (A) Working age. (B) Sex.

negatively affect the independence of patients who had a stroke.

Caregiver sex was another predictor of return to work. Caregivers of patients who had a stroke were predominantly female in the "Continuously-Employed" group compared with the "Employed-Unemployed" group, which is not surprising considering the traditional sex-based role expectations for female caregivers.⁵² This means that female caregivers do all of the housework despite more women entering and playing a role in the labour force. Our results are consistent with those of a previous study from Korea.⁵³

In this study, the caregiver's living arrangements (living with patients who had a stroke) was the principal determinant of return to work in patients who had a stroke. In recent studies, the caregivers' living arrangements and the psychological state of patients who had a stroke showed positive correlations.^{54 55}

There are some limitations to this study. First, a relatively small number of patients who had a stroke from large stroke centres in Korea was included in the study. The high dropout rate in our study can be attributed to difficulty in contacting patients who had a stroke or their caregivers, and a lack of willingness to participate on the part of some patients who had a stroke. Second, we did not consider the intrinsic job factors or working environmental factors, which makes interpretation of our results difficult. Therefore, this issue needs further investigation.

Despite these limitations, our study identified factors affecting return to work between 3 months and 2 years after stroke. We suggest that individually tailored rehabilitation programmes factoring in functional ability, emotional support and psychosocial support may facilitate an increased rate of return to work in patients who had a stroke. In addition, patients who had a stroke may be more suitable candidates for vocational rehabilitation, and institutional support may be needed to improve rate of return to work of working-age patients who had a stroke.

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Factors	OR	95% CI	P values
Intercept	0.02	0.00 to 0.15	0.0003***
Patients who had a stroke			
Age (≥65 years)	2.55	1.10 to 5.90	0.0285*
NIHSS at 3 months (moderate)	2.78	0.79 to 9.79	0.1114
PWI-SF (potential stress)	4.52	1.68 to 12.17	0.0028**
PWI-SF (severe stress)	5.21	1.30 to 20.95	0.0200*
Caregiver's age	1.04	1.00 to 1.08	0.0444*
Caregiver's sex (female)	0.27	0.11 to 0.67	0.0048**
Caregiver's living arrangements (living with patients who had a stroke)	3.08	1.07 to 8.86	0.0365*

*p<0.05; **p<0.01; ***p<0.001 when compared with the "Employed-Unemployed" group. NIHSS, National Institutes of Health Stroke Scale; PWI-SF, Psychosocial Well-being Index-Short Form.

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