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Proportion of Non-severe Ischemic Stroke Patients Returning to Work

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ABSTRACT

OBJECTIVE To explore the proportion of non-severe ischemic stroke patients returning to work (RTW) and to examine the association of demographic, clinical, and evaluative information with RTW outcomes.

METHODS This observational study included non-severe ischemic stroke patients at the stroke ward, Srinagarind Hospital, Khon Kaen, Thailand between September 2021 and November 2022. Patients included were over 18-year-old, had NIHSS scores not exceeding 14, were currently employed and wanted to RTW. Patients were assessed at the discharged time, 2-week-follow-up, and 3-month-follow-up. Bivariate analysis was conducted using either Chi-square or Fisher's exact test.

RESULTS Sixty-four patients were recruited of whom 4 dropped out, leaving a total of 60. The cumulative proportions of successful RTW patients at the discharged time, 2-week-follow-up, 1-month-follow-up, and 3-month-follow-up were 26.7%, 51.7%, 70%, and 76.7% (95%CI 16.8-38.8, 39.2-64.0, 57.7-80.5, 64.9-86.0), respectively. Most patients could RTW in the first month, then the number plateaued at 3 months. More successful RTW patients included those in cognitive demand occupations, evaluated as normal to minor neurological severity, motor power graded 4-5 at discharge, passed MoCA or MMSE test, and who were rated as independent by either the mRS or the BI. Bivariate analysis revealed statistically significant association between RTW proportion and occupation type, neurological severity, motor power, and ADL disability.

CONCLUSIONS Most non-severe ischemic stroke patients could RTW within 3 months after discharge. Occupational type, neurological severity, motor power, and ADL associated with the proportion of RTW (3-month-follow-up). RTW evaluation of non-severe stroke patients should be assessed at short intervals for 3 months after discharge.

KEYWORDS return to work, ischemic stroke, occupation, cognition, activities of daily living

INTRODUCTION

The World Health Organization reported that stroke was the third global leading cause of death and disabilities (1,2). In Thailand, stroke incidence has risen every year, from 278.4 per 100,000 population in 2017 to 330.7 per 100,000 population in 2022. Acute ischemic stroke was 2.5 times more frequent than intracerebral hemorrhage, and in 2022, Khon Kaen province was ranked fourth for the most ischemic stroke incidents in Thailand (3). Previous studies have found that stroke in young adults was increasing (4,5), an additional cause of concern. This upward trend could result in an increasing burden on the healthcare system as well as having a negative impact on the Thai economy due to the effects of disabilities on the workforce. Moreover, prolonged absence from normal roles and workplace activities can adversely affect a person's physical, mental, and social well-being. Helping patients return to their usual activities as soon as it is safe to do so after a stroke can help improve their physical and psychosocial well-being (6). Thus, an appropriate program to facilitate return to work is necessary.

Patients who return to work successfully are those who have sufficient physical and cognitive recovery. It has been reported that, on average, motor recovery is almost complete within the second month after a stroke and reaches a plateau by the end of the third month (7,8). Beyond six months, approximately 5-10% of the patients will show improvements in limb function (9). Recent studies have reported that upper limb recovery plateaus at 6 weeks and that it remains unchanged after 3-6 months (10,11). Cognitive function significantly improves over a period of 1-6 months before reaching a plateau. Spatial memory, motor speed, and executive function are largely recovered by 6 months. Processing speed continues to improve for 12 months, while verbal memory remains low for an extended period (12). The most significant recovery of both physical and cognitive function generally occurs in the first three months after a stroke.

Return to work (RTW) is one of the indicators for successful rehabilitation and recovery (13,14). Patients with a less severe stroke are more likely to RTW (15). Therefore, it was important to promote RTW for stroke patients with non-severe neurological impairment to the greatest extent possible. Although some studies have introduced the process of RTW after a stroke (16), there is no established medical consensus regarding acceptable risk, appropriate health conditions, and how they should be measured. The reported proportion of successful RTW outcomes has varied from 18-85% (17-21) due to differences in research designs among previous studies. Additionally, variations in participant characteristics, severity of impairment, and socioeconomic background have also contributed to the discrepancies. It is crucial to have a comprehensive understanding of the relevant patients in order to promote a compatible RTW program for them.

The general logic of RTW involves considering the patients' risk, capacity, and tolerance. Risk refers to the possibility of harm to the patient or the public. Capacity refers to the patient's current measurable abilities. Tolerance refers to the ability to endure pain or fatigue while sustaining work, which cannot be scientifically measured (6). Several studies have evaluated factors associated with RTW outcomes using various tools and methods, e.g., evaluation of cognitive function using the Montreal Cognitive Assessment (MoCA) or Mini-Mental State Examination (MMSE) (22,23), or evaluation of activities of daily living (ADL) function using the modified Rankin scale (mRS) and the Barthel index (BI) (20,24). However, each tool has its own standards and cannot be directly cross-compared. The results have been diverse and have had limited application because of the different conditions in each study and the lack of supporting local information. Furthermore, there have been few RTW studies conducted on ischemic stroke patients in Thailand, and none have examined cognitive function (20,21). It is necessary to have knowledge of not only the details of cognitive assessment but also the socioeconomic background of the patients to be able to assess accurately.

This study was aimed to explore the proportion of non-severe ischemic stroke patients RTW and to examine the association of demographic, clinical, and evaluative information with RTW outcomes.

METHODS

Population

This observational study was conducted at the stroke center of Srinagarind Hospital located in Khon Kaen province in northeastern Thailand. The participants were non-severe ischemic stroke patients admitted from 22 September 2021 to 30 November 2022. The sample size was calculated using WinPepi Software using a confidence level of 95%, an acceptable difference of 0.1, and an assumed proportion of 0.79, following a study by Indrabhinduwat et al. (21). The expected loss of subjects was 30% and the required sample size was 92 people. The inclusion criteria consisted of age over 18, diagnosed with acute ischemic stroke (ICD-10: I63), National Institutes of Health Stroke Scale (NIHSS) score not exceeding 14, and that the patient had been employed prior to the stroke and wanted to get back to work after recovering. There were no exclusion criteria.

Operative definitions

RTW refers to resuming working after sick leave, either original work, transitional work, or new work and can be divided into four categories: 1) RTW after discharge, i.e., the patient can return to work the next day after discharge, 2) RTW within the 2nd week, i.e., the patient can return to work within two weeks following discharge, 3) RTW within the 1st month, i.e., the patient can return to work within one month after discharge, and 4) RTW within the 3rd month, i.e., the patient can return to work within three months after discharge.

RTW proportion refers to the proportion of stroke patients who successfully RTW within three months after discharge. This includes all enrolled stroke patients who did not drop out.

Cognitive demand occupation refers to an occupation that prioritizes the need for integrity of cognitive function to do tasks, e.g., teacher, office worker, and merchant.

Physical demand occupation refers to an occupation that prioritizes the need for physical strength, endurance, or flexibility to complete tasks, e.g., agriculture, construction work, and manual labor.

Study protocol

Information obtained on patients included discharge date, gender, age, underlying diseases, occupation, employment type, neurological information, NIHSS score, cognitive impairment assessed by the MoCA and the Thai MMSE, ADL assessed by the mRS and BI as well as RTW information. Patients who were unable to RTW immediately after discharge were followed up after the second week, first month, and third month. These periods were selected as motor and cognitive recovery occurs most rapidly after a stroke during these periods. Patients who were able to RTW any time within three months were classified as successful RTW for that period. If they could not RTW within three months they were classified as unsuccessful RTW. Patients with whom contact was lost were classified as dropped out.

Evaluative tools

The evaluative tools used in this study included neurological severity assessed by the NIHSS, cognitive function assessed by the MoCA and the Thai MMSE, and ADL disability assessed by the mRS and the BI (Table 1).

The current version of the NIHSS evaluates stroke severity using eleven items with a maximum total score of 42. Measurements include consciousness level, response to questions and commands, eye movements, visual field, facial movements, arm and leg muscle strength, coordination, sensation, language, speech, and extinction and inattention (formerly neglect). Scoring of each item ranges from 0-2, 0-3, or 0-4, with a higher score indicating greater severity. The sum of the scores are classified into four categories as follows: minor < 5, moderate 5-14, moderate to severe 15-20, and very severe >20 (25).

The MoCA evaluates seven domains: visuospatial-executive function, naming, attention, language, abstraction, recall, and orientation. The maximum total score is 30, with item scoring ranges of 0-1, 0-2, 0-3, 0-5, and 0-6. Higher scores indicate better cognitive function. A total score < 26 indicates cognitive impairment (26).

The Thai MMSE contains eleven items that assess orientation, attention, registration-recall, naming, repetition, complex commands, and

Table 1. Evaluation tools

Name	Objective	Items and scoring	Interpretation
NIHSS	Neurological severity measurement	11 items Score range 0-4 Total 42 points	< 5 minor 5-14 moderate 15-20 moderate to severe > 20 very severe
MoCA	Cognitive function measurement	12 items 7 domains Score range 0-5 Total 30 points	≥ 26 cognitively competent < 26 cognitive impairment
Thai MMSE	Cognitive function measurement	11 items Score range 0-5 Total 30 points	Cognitive impairment cutoff < 14 no formal education < 17 formal education 1-6 years < 22 formal education > 6 years
mRS	ADL disability measurement	7 categories No scores	Grade 0 normal people Grade 1-2 ADL independence Grade 3-5 ADL dependence Grade 6 death
BI	ADL disability measurement	10 items Score range 0-15 Total 100 points	≥ 75 ADL independence < 75 ADL dependence

NIHSS, National Institutes of Health Stroke Scale; MoCA, Montreal Cognitive Assessment; MMSE, Mini-Mental State Examination; mRS, modified Rankin scale; BI, Barthel index; ADL, activities of daily living

visuoconstruction. The cognitive impairment cut-points are classified into three groups: scores < 14 for no formal education, < 17 for 1-6 years of formal education, and < 22 for more than 6 years of formal education (27).

The mRS is divided into seven categories with grades of 0-6. Grade 0 is normal people, grade 1-2 is ADL independence, grade 3-5 is ADL dependence, and grade 6 indicates a deceased patient (28).

The BI has ten items with a maximum total score of 100. Activities include feeding, grooming, bathing, dressing, bowel and bladder control, toilet use, mobility, transfers, and stairs. Scoring for each of the different activities ranges from 0-5, 0-10, and 0-15, with higher scores indicating greater disabilities. The combined ADL independence cutoff score is ≥ 75 (29).

Statistical analysis

The IBM Statistical Package for Social Sciences (SPSS) software version 28 was used for data analysis. The RTW proportion and other information are described as numbers (N), percentages (%), median and interquartile range (IQR). The accumulated RTW proportion is presented as a Kaplan-Meier one minus survival curve. Bivariate analysis of important factors was done using the Chi-square or Fisher's exact test as appropriate. Statistical significance was set as $p < 0.05$. The strength of association is reported as relative risk (RR) and 95% confidence interval (CI).

Ethics

The Khon Kaen University Ethics Committee approved this study for Human Research based on the Declaration of Helsinki and the ICH Good Clinical Practice Guidelines (HE641328).

RESULTS

A total of 64 ischemic stroke patients who met the inclusion criteria were enrolled of whom four later dropped out leaving a total of 60 patients (Figure 1). There were 36 males and 24 females. The median age was 52, and IQR was 10.75. Thirty-nine patients had diabetes, hypertension, dyslipidemia, cardiovascular diseases, or cerebrovascular diseases, and five patients had other underlying diseases. The majority had physical demand type occupations, and most were employed full-time in the private sector (Table 2).

Most of the patients were rated as NIHSS normal to minor severity, and most were motor power grade 4-5. A smaller portion of the patients exhibited neurological impairment.

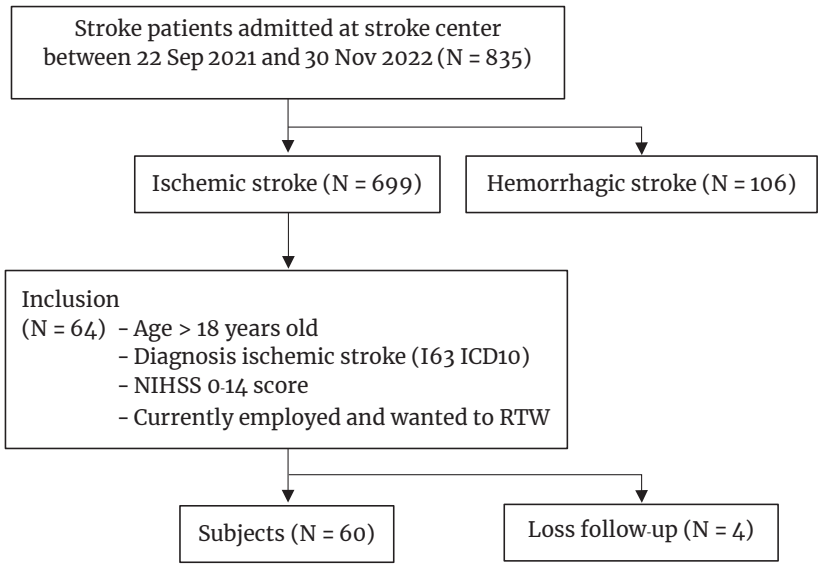

Figure 1. Subject recruiting flow chart

Table 2. Demographics of the participants and RTW proportions

Demographic	Total n (%)	RTW after discharge n (%)	RTW within 3 months n (%)
Characteristic			
Gender			
Male	36 (60.0)	9 (25.0)	27 (75.0)
Female	24 (40.0)	7 (29.2)	19 (79.2)
Age			
31-50 years old	28 (46.7)	6 (21.4)	23 (82.1)
> 50 years old	32 (53.3)	10 (31.3)	23 (71.9)
Underlying Diseases			
None	18 (30.0)	6 (33.3)	15 (83.3)
Present	42 (70.0)	10 (23.8)	31 (73.8)
Occupation			
Cognitive demand	27 (45.0)	10 (37.0)	25 (92.6)
Physical demand	33 (55.0)	6 (18.2)	21 (63.6)
Employment			
Public full-time	15 (25.0)	6 (40.0)	12 (80.0)
Private full-time	42 (70.0)	10 (23.8)	33 (78.6)
Part-time	3 (5.0)	0 (0)	1 (33.3)
CT brain			
Pathology			
No lesion found	12 (20.0)	5 (41.7)	10 (83.3)
Lacunar infarction	40 (66.7)	10 (25.0)	32 (80.0)
Acute infarction	19 (31.7)	2 (10.5)	11 (57.9)
Chronic infarction	7 (11.7)	0 (0)	4 (57.1)
Side			
Left side	10 (16.7)	1 (10.0)	6 (60.0)
Right side	13 (21.7)	2 (15.4)	10 (76.9)
Bilateral	25 (41.7)	8 (32.0)	20 (80.0)
Location			
Frontal lobe	24 (40.0)	5 (20.8)	16 (66.7)
Lentiform nucleus	21 (35.0)	6 (28.6)	17 (80.9)
Internal capsule	19 (31.7)	4 (21.1)	11 (57.9)

Annotation: each patient might have several lesions found by CT brain

RTW, return to work; n, number

Cognitive assessment tools consisted of the MoCA and the Thai MMSE. The Thai MMSE classified more patients as cognitively competent compared to the MoCA. In the ADL disability evaluation, BI categorized more patients as independent than did mRS (Table 3).

Table 3. Evaluation of neurological, cognitive function, ADL and RTW proportions

Evaluation	Total n (%)	RTW after discharge n (%)	RTW within 3 months n (%)
Neurological severity			
NIHSS			
Normal	17 (28.3)	6 (35.3)	14 (82.4)
Minor	34 (56.7)	10 (29.4)	28 (82.4)
Moderate	9 (15.0)	0 (0)	4 (44.4)
Neurological impairments			
Motor power			
Grade 4-5	54 (90.0)	16 (29.6)	44 (81.5)
Grade 0-3	6 (10.0)	0 (0)	2 (33.3)
Sensory			
Normal	37 (61.7)	10 (27.0)	27 (72.9)
Impairment	23 (38.3)	6 (26.1)	19 (82.6)
Cerebellar			
Normal	56 (93.3)	16 (28.6)	43 (76.8)
Impairment	4 (6.7)	0 (0)	3 (75.0)
Extraocular movement			
Normal	57 (95.0)	16 (28.1)	44 (77.2)
Impairment	3 (5.0)	0 (0)	2 (66.7)
Facial palsy			
Absent	47 (78.3)	15 (31.9)	37 (78.7)
Present	13 (21.7)	1 (7.7)	9 (69.2)
Dysarthria			
Absent	47 (78.3)	13 (27.7)	37 (78.7)
Present	13 (21.7)	3 (23.1)	9 (69.2)
Aphasia			
Absent	58 (96.7)	16 (27.6)	45 (77.6)
Present	2 (3.3)	0 (0)	1 (50.0)
Cognitive function			
MoCA			
Competent	41 (68.3)	12 (29.3)	33 (80.5)
Impairment	19 (31.7)	4 (21.1)	13 (68.4)
Thai MMSE			
Formal education > 6 years			
Competent	36 (60.0)	11 (30.6)	30 (83.3)
Impairment	2 (3.3)	1 (50.0)	1 (50.0)
Formal education 1-6 years			
Competent	20 (33.3)	4 (20.0)	13 (65.0)
Impairment	2 (3.3)	0 (0)	2 (100)
Total			
Competent	56 (93.3)	15 (26.8)	43 (76.8)
Impairment	4 (6.6)	1 (25.0)	3 (75.0)
Activities of Daily Living			
modified Rankin scale			
Independent	49 (81.7)	16 (32.7)	41 (83.7)
Dependent	11 (18.3)	0 (0)	5 (45.5)
Barthel index			
Independent	53 (88.3)	16 (30.2)	43 (81.1)
Dependent	7 (11.7)	0 (0)	3 (42.9)

NIHSS, National Institutes of Health Stroke Scale; MoCA, Montreal Cognitive Assessment; MMSE, mini-mental state examination; RTW, return to work; n, number

Table 4. Successful RTW: proportion of non-severe ischemic stroke patients

Time to RTW	New RTW n (%)	95%CI	Accumulate RTW n (%)	95%CI
After discharge	16 (26.7)	16.8-38.8	16 (26.7)	16.8-38.8
2nd week	15 (25.0)	15.4-37.0	31 (51.7)	39.2-64.0
1st month	11 (18.3)	10.2-29.5	42 (70.0)	57.7-80.5
3rd month	4 (6.7)	2.3-15.1	46 (76.7)	64.9-86.0

RTW, return to work; n, number; CI, confidence interval

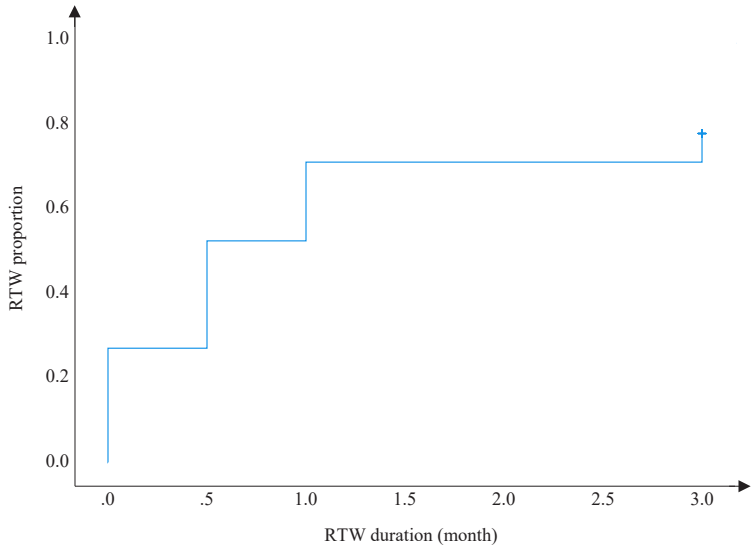

Figure 2. Kaplan-Meier one minus survival curve of RTW proportion

The proportion of non-severe ischemic stroke patients who successfully RTW within three months was 76.7% (95%CI 64.9-86.0). Sixteen people (26.7%, 95%CI 16.8-38.8) were able to RTW the day after discharge. By the second week the RTW number increased to 31 (51.7%, 95%CI 39.2-64.0) then to 42 (70%, 95%CI 57.7-80.5) in the first month after discharge (Table 4). Most of the RTW occurred in the first month and the total plateaued at three months after discharge (Figure 2). At three months, both genders had similar proportion of RTW (female 79.2%, male 75%, p = 0.709). More patients 31-50 years old were able to RTW 82.1%, higher than the 71.9% for patients over 50 (p = 0.348). The proportion of RTW for patients who did not have an underlying medical condition was 83.3%, while the proportion for those with underlying conditions was 73.8% (p = 0.520). More patients with cognitive demand occupations were able to RTW (92.6%) than those with physical demand occupations (63.6%) (p = 0.008) (Table 5). Patients in full-time employment had a RTW proportion higher than those in part-time employment, but the difference was not statistically significant (p = 0.113).

Three months after discharge, 82.4% of patients who were neurologically normal or who had only minor neurological impairment as categorized by NIHSS could RTW, while only 44.4% of those with moderate impairment could do so (p = 0.025). The proportion of RTW for patients with motor power grades 4-5 was significantly higher (81.5%) than those with grades 0-3 (33.3%) (p = 0.023). The RTW proportion of the cognitively competent group according to MoCA (80.5%) was not statistically significantly higher than that of the impairment group (68.4%) (p = 0.338). However, more patients in the competent group were later found to have complications compared to the impairment group. One patient in the competent group had a brain tumor, one patient had complications due to immunocompromised status, and five patients were not willing to work. In contrast, only one patient in the impaired group was later found to have cancer. The Thai MMSE cognitively competent group had a RTW proportion

Table 5. Bivariate analysis of factors which affected RTW within 3 months

Factors	RR	95%CI	*p*-value
Gender			
Male	0.94	0.71-1.25	0.709
Female	Ref.		
Age			
31-50 years old	1.14	0.86-1.50	0.348
> 50 years old	Ref.		
Underlying diseases			
None	1.12	0.85-1.48	0.520
Diseases	Ref.		
Occupation			
Cognitive demand	1.45	1.10-1.92	0.008*
Physical demand	Ref.		
Employment			
Full-time	2.36	0.47-11.80	0.113
Part-time	Ref.		
NIHSS			
Normal to minor	1.85	0.88-3.88	0.025*
Moderate	Ref.		
Moter power			
Grade 4-5	2.44	0.78-7.63	0.023*
Grade 0-3	Ref.		
MoCA			
Competent	1.17	0.83-1.65	0.338
Impairment	Ref.		
Thai MMSE			
Total competent	1.02	0.57-1.83	1.000
Total impairment	Ref.		
mRS			
Independence	1.84	0.95-3.55	0.014*
Dependence	Ref.		
Barthel index			
Independence	1.89	0.79-4.49	0.045*
Dependence	Ref.		

RR, relative risk; CI, confidence interval; Ref, reference; *, statistical significance

of 76.8%, slightly higher than the 75% of the cognitive impairment group (p = 1.000). ADL independent patients assessed by mRs and BI had a statistically significantly higher RTW proportion than the ADL dependence patients (p = 0.014, 0.045).

DISCUSSION

Our study found that 76.7% of non-severe ischemic stroke patients were able to RTW within three months after discharge (95%CI 64.9-86.0). Previous studies reported various RTW proportions ranging from 18% to 85% (17-21). Those differences were due to differences in study design, the demographics of the patients, the severity of neurological impairment, and socioeconomic background. Most of the participants in this study RTW in the first month, with the number of additional RTW declining over the next 2 months which was consistent with the recovery principle. This was also compatible with a previous study which found most patients RTW in 1 month (20) and that the highest RTW rate occurred in first three months after discharge (30). This finding contrasted with another study which described approaching an RTW plateau in 3 years (18) with the longest RTW delay being five years (19). In this study, most people who successfully RTW were working in cognitive demand occupations, had less neurological impairment, had good recovery of motor power and cognitive function, and had attained ADL independence. Age and gender were not significantly associated with the RTW results: both had nearly equal RTW proportions. Underlying health conditions in general had less effect than current neurological severity, but a few people had limited RTW capabilities due to serious underlying complications. The problem of underlying complications impacted RTW due to physical limitations even with well-preserved cognitive function.

Factors significantly affecting RTW outcomes included types of occupation, neurological severity as assessed by NIHSS, motor power, and level of ADL disability as assessed by mRS and BI (Table 5). Our assessment found that motor power grade 4-5 and cognitive ability above the cognitive impairment cut-point had a higher proportion of RTW. Although there are various tools for physical function analysis, we found that motor power evaluated by physical examination was quite practical and was significantly associated with RTW outcomes (p = 0.023). Some patients who could not RTW within three months were ADL dependent, with the majority being affected by motor dysfunction. A systematic review of studies reported that independent ADL, less neurological deficits, and better cognitive ability were good predictors of RTW (22). A literature review found that stroke severity, as well as physical, cognitive, and social condition, were relevant factors (15). Another review found stroke severity, time remaining before retirement, depression, medical condition, and occupation were consistent predictors (31).

Furthermore, being a white-collar worker and responsible for household income were reported to be a positive predictors of RTW (24). The present study, however, did not find a statistically significant association between RTW and cognitive assessment although tendency identified were consonant with previous reports.

Occupation was an important factor associated with RTW. We found cognitive demand occupations had a proportion of RTW higher than physical demand occupations. (RR = 1.45, p = 0.008). Even among patients with cognitive impairment, the RTW Proportion of cognitive demand occupations was higher than of physical demand occupations in the first month, then declining to become nearly equal in the third month. This finding was in agreement with other predictive studies although they categorize occupations differently, e.g., non-manual occupation, white-collar occupation, qualified occupation, professional job, business job, and manager job (18,20,30,32-34). They reported that cognitive demand occupations were more tolerant of physical weakness because physical weakness limited abilities to perform physical demand job tasks but had less effect on cognitive demand job tasks (33). The majority of patients in this study worked in physical demand occupations; the patients that could not RTW within three months were inhibited by motor and cognitive deficiency. People who were full-time employees RTW at a higher proportion than part-time workers because of the higher employment security in those positions. Especially during COVID-19 crisis, part-time employees were the group most susceptible to losing their job.

Our study evaluated the cognitive impairment by MoCA and Thai MMSE. More individuals in the cognitively competent groups identified by both tools RTW than those in the impaired groups (Table 3); however, those differences were not statistically significant due to the impact of underlying disease complications. Classification according to MoCA was able to separate RTW results more clearly than Thai MMSE because Thai MMSE has a lower standard for measuring difficulty which results in higher numbers of patients being classified as cognitively competent. Minor stroke caused damage to the white matter of the brain resulting in early cognitive impairment was detected by MoCA but not by MMSE (35). Comparison studies found that MoCA had higher sensitivity while MMSE had better specificity. MoCA could detect even mild cognitive impairment, meaning it is suitable for screening purposes (27,36). Reasons for the differences in measuring performance included the contrast of visuospatial, recall, abstraction, and language domains (23). Higher initial MoCA scores, especially executive function, indicated better functional outcomes in cases of subacute stroke (37).

ADL disabilities showed a significant impact on RTW results as these were basic competencies which need to be regained before RTW. Independence in ADL was associated with good RTW outcomes (18,24). Our study assessed ADL using mRs and BI and found that both tools were able to classify patients with statistically significant differences (p = 0.014, 0.045). Patients who reached the cutoffs of these tests were more likely to RTW. BI included more elements than mRs which led to a more nuanced evaluation. The mRs could be evaluated faster but the results were more difficult to describe clearly. The BI was better able to detect minimal changes in physical function than mRs (38). Although mRs reliability and intraobserver variability were limited, both tools proved to be valid and have been found to be reasonable as predictive tools (39-42). Patients who gained independence within three months were likely to RTW within six months (24). In addition, independent people had higher rates of RTW for a period as long as five years (18). Previous studies reported that ADL were mostly recovered within 1-3 months after discharge, after which unsubstantial improvement continues for two years (43-45). Functional recovery, feeding, grooming, toileting, bladder and bowel continence, transferring and ambulation reached a plateau at three months. Dressing and stair climbing plateaus at six months, while bathing were the slowest, plateauing at 12 months (43).

A limitation of this study was the small number of cases and the low diversity of occupations, factors which were limited by chance, the COVID pandemic situation, and the geography of a single study center. Additionally, follow-

up times were limited which might have obscured larger recovery plateaus occurring later. Systematic reviews and multicenter studies could potentially help solve these problems.

In clinical practice, aside from routine physical examination, assessment of neurological severity, and ADL evaluation of stroke patients, we recommend assessing cognitive ability to estimate the potential for RTW and the progression of recovery. Cognitive function is a capacity required by various types of work; lack of cognitive function can significantly diminish the patient's opportunity for RTW, even if they have normal physical function. Interventions aimed at improving cognitive function may be able to help increase the opportunity for RTW; further experimentation in this area is needed. Finally, we recommend conducting short-interval RTW assessments for non-severe ischemic stroke patients during the first three months to align with the most accelerated recovery period and facilitate early RTW without delays.

CONCLUSIONS

Approximately 76.7% of non-severe ischemic stroke patients could RTW within three months. Improvement was most rapid in the first month. Factors associated with statistically significantly more successful RTW included cognitive demand occupation, normal to minor neurological severity, motor power grade 4-5, and independence in ADL. Competent cognitive patients were more successful in RTW, although the association was not statistically significant. Evaluation of the RTW status of non-severe stroke patients should be assessed at short intervals for the first three months, including cognitive function assessment.

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CONFLICTS OF INTERESTS

The authors declare no conflict of interest.

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