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TITLE PAGE

Title: Socioeconomic factors' effect on return to work after first time stroke.

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Abstract

Objective: This nationwide study analysed how stroke sequelae symptoms and socioeconomic status affect return to work (RTW) among younger patients with first time stroke in a Sweden

Material and methods: This register-based cohort study included employed patients aged 25-55 with first time stroke between 2008 and 2011 and primary outcome was RTW within one year after stroke. Data regarding activities of daily living (ADL), patient reported outcome (PROM), functional impairment measured as PROM proxy respondents and employment status were retrieved from the Swedish stroke register, Riksstroke, and socioeconomic data (income, education and country of birth) from Statistics Sweden.

Results: We included 2539 patients who had answered the question of RTW and 1880 (74,0%) had RTW within 12 months. Patients with low income (69.9% in lowest income group vs. 79.9% in highest group, $p<0.001$), patients born in countries outside the Nordic countries (Sweden 75,5%, Nordic countries 74,3%, European countries 61.7% other countries 57.3%, $p<0.001$) and the youngest patients (25-34 63,1%, 35-44 75,9%, 45-55 74,3%, $p=.0.008$) were less likely to RTW. Pain, low mood and proxy respondents of PROM were more common in low socioeconomic groups and when adjusting for these variables, together with age and sex, income and country of birth were no longer independent predictors for RTW.

Conclusion: Patients with low socioeconomic status less often RTW one year after stroke. Socioeconomic differences are mediated through stroke sequelae symptoms such as pain, low mood and functional impairments measured as proxy respondents of PROMs. The stroke sequelae should therefore targeted for improvements to achieve greater chance for RTW after stroke.

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Key words: return to work, stroke, socioeconomic factors,

Introduction

Except for being one of the most common causes of death in the world, stroke is also a leading cause of disabilities among young adults (1). Survivors have to cope with both physical and cognitive impairments that can result in difficulties with return to work (RTW) after stroke (2-4). Successful return can decrease the economic burden of society and enhance life satisfaction of stroke survivors by reinforcing self-esteem and social-identity (5). It is therefore important to map out the factors that hinders or favours RTW, and in continuation facilitate an increased chance of RTW in different patient groups.

Previous studies have shown a socioeconomic gradient in RTW among stroke patients, where low level of income and education, is associated with a lower probability of RTW (2, 3, 6-8). There is less information on how functional impairment affects the relationship between socioeconomic status and RTW (9).

The aim of this nation-wide study was to investigate the relationship between socioeconomic status and RTW in younger stroke patients of working age. Our hypothesis was that patients with low socioeconomic status less often RTW within one year after stroke. We also aimed to further explore the importance of physical and cognitive impairments on associations between socioeconomic and ability to RTW.

Material and methods

Material

Patient information was retrieved from the Swedish Stroke Register, Riksstroke (10). Riksstroke was established in 1994 and since 1998 it covers all hospitals in Sweden that admit acute stroke patients (72 in 2012). Information on patients' living situation, comorbidities, and acute care are collected in the acute phase. A 3-month follow-up, and since 2009, a 12-month follow up includes information on patient reported outcome, living situation,

rehabilitation, quality of care and RTW. More information can be found at Riksstroke homepage www.riksstroke.org/eng/.

Individual patient data concerning country of birth, income, education and employment the year before stroke onset, were retrieved from the Longitudinal Integration Database for Health Insurance and Labour Market Studies (LISA by Swedish acronym), provided and managed by Statistics Sweden, using personal identification numbers (11).

The study included 25-55 year old, first-time stroke patients, registered in Riksstroke 2008-2011 with an intracerebral hemorrhage (ICD 10-code: I61), cerebral infarction(I63) or unspecified stroke (I64). Patients who were un-employed the year preceding stroke or were missing information on employment status at the 12-month follow-up were excluded.

Variable definitions

The primary outcome variable was if the patient had resumed working one year after stroke, based on the Riksstroke follow-up question “Have you been able to return to work” with the response alternatives “Yes, to the same extent as before stroke”, “Yes, but to a less extent than before stroke”, “No, but planning to do so”, “No”, and “Do not know”. Patients answering any of the first two alternatives were defined to have resumed work.

Income was measured as the individual’s part of the family’s disposable income and was grouped into tertiles (low, medium or high income). Highest achieved level of education was categorized into primary school (6 to 9 years of compulsory school), secondary school, or university. Country of birth was grouped into Sweden, the Nordic countries (except Sweden), European countries (except the Nordic) and countries outside Europe.

Age were categorized into 25-34, 35-44 and 45-55 years. A patient was defined to be independent in activities of daily living (ADL) if he managed dressing, toileting and mobility

indoors without assistance. Similar questions were used to assess if patients experienced low mood or pain with the response alternatives “Never or almost never”, “Sometimes”, “Often”, “Constantly” or “Do not know”. Patients who reported often or constantly were defined to experience corresponding problems. Information regarding ADL, depression and pain were retrieved from the 12-month follow up. “Who answered the questionnaire” was used as a proxy for difficulties with communication. Previous validations of Riksstroke have shown that patients with proxy responses suffer more functional impairments compared to other stroke patients (www.riksstroke.org/eng).

Statistical analyses

The χ^2 -test was used for simple group comparisons of patient characteristics and the probability of returning to work. Multiple logistic regression was used to adjust for possible confounders. Outcome was presented as odds ratios (OR) and 95% confidence intervals (95% CI). Patients who participated in the 1-year follow-up were compared with non-participants using t-test for age and χ^2 -test for categorical variables.

Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 23.0 (Armonk, NY).

Results

From January 1, 2008 to December 31, 2011, 100 112 stroke patients were registered in Riksstroke of which 5482 were 25-55 years old with first time stroke. 3826 worked before stroke according to Statistics Sweden, of which 2634 (68.8%) were still alive and participated in the 1-year follow-up. 2539 answered if they had RTW 12 month after stroke and were included in the analysis (Fig. 1).

In total, 1880 (74.0%) had returned to work 12 month after stroke, 75.4% of men and 71.8% of women (Table 1). Patients in the youngest group (25-34 years) had less often returned to work (63.1%) compared with 75.9% in 35-44 year old and 74.3% in 45-55 year old patients (Table 1).

Patients with low income were less likely to RTW (69.9% in the low-income group compared to 79.9% in high-income group, $p<0.001$), (Table 1). The proportion of patients who returned to work was higher in patients born in Sweden (75.5%) or other Nordic countries (74.3%), compared to other European countries (61.7%) or countries outside Europe (57.3%) ($p<0.001$). Level of education or cohabitant status was not significantly associated with returning to work (Table 1).

Patients were less likely to have resumed work ($p<0.001$) when they experienced low mood (54.0 % vs. 78.2 %) or pain (52.5% vs. 78.6%), and only 4.1% of patients who were dependent in ADL and 18.4% of those who answered the questionnaire with help had returned to work 12 month after stroke (Table 1).

Men and older patients were more likely to be in the high income group, while university education were more common in women and younger patients (Table 2). A higher proportion of the patients who experienced low mood, pain, were dependent in ADL, or had answered the questionnaire with help, had a low income, primary or secondary education, or were born outside Sweden and the other Nordic countries (Table 2).

After adjustment for age, sex and stroke sequelae symptoms (low mood, pain and ADL-dependency) in the total study population, high income was still independently associated with increased chance of RTW compared with low income patients (OR =1.36 95% CI: 1.04-1.77). Education or country of birth was not shown to be independently associated with RTW

(Table 3). After adding who had answered the questionnaire to the multiple regression model none of the socioeconomic variables were significantly associated with RTW (Table 3).

Missing data

The questionnaire was sent to 3546 patients of which 2634 (74.2%) responded. The proportion of men and women did not differ between responders and non-responders and the level of education was similar ($P=0.144$). Non-responders had lower income (29.9% vs. 34.7% in the highest income tertile, $P=0.010$), were more often born outside the Nordic countries (12.8% vs. 9.3%, $P=0.001$), were on average 1.1 year younger ($P<0.001$), and were more often unconscious at hospital arrival (3.8% vs. 2.1%, $P=0.017$), than were responders.

Among responders, the variables with the highest proportion of missing data were low mood and pain (1.8% missing respectively).

Discussion

The present study shows socioeconomic differences in RTW after stroke. However, the differences are partly mediated through functional impairments after stroke such as low mood and pain.

Patients with the lowest income also had the lowest probability to RTW after stroke. This result is consistent with earlier Swedish and international studies (2, 3, 6-8). Stroke sequelae symptoms such as physical impairments, low mood and pain are independent predictors that negatively affect RTW. The connection between physical impairments as well as pain and low mood and RTW is in line with previous studies (2-4). In our study, we could show that socioeconomic difference in RTW was partly mediated by socioeconomic differences in stroke sequelae symptoms after stroke; when we adjusted for differences in low mood, pain

and proxy respondents, none of the socioeconomic variables remained significantly associated with RTW.

We did not show an association between education and RTW. The impact of high education differs between studies and individual countries but is often positively associated with RTW (2-4). An earlier Swedish study by Trygged et al. showed higher RTW for groups with higher grade of education, however no information about the clinical condition of the patients were known which could have influenced the results (6). The vast majority of our patients were born in Sweden, and hence the study had a low power to detect differences based on country of birth. Unadjusted analysis showed that patients born outside the Nordic countries had a lower chance to return to work. In a study based on The South London Stroke Register, the proportion of non- European ethnicity was much higher than in our study and black ethnicity was shown to be an independent predictor for RTW (8). The association between ethnicity and outcome after stroke such as RTW is relatively unexplored and is a warranted topic for future research.

In a review by Wozniak et. al., patients over 65 years were less likely to RTW than those younger (12). Other national and international studies have found no significant age differences for patients younger than 55 years old (13, 14). In the present study, middle-aged patients were more likely to RTW compared to younger patients. One explanation could be high job security in Sweden for the older age groups. Statistics Sweden also shows that older patients are more likely to have a conditional tenure than young patients (15).

In the present study, 26 % of patients had not returned to work within one year after stroke. In another Swedish study, 31 % had not resumed work within four years (6). Our figure is also lower than previously reported in literature where between 35 - 50 % of surviving stroke patients do not RTW (2, 5). In a recently published Dutch study the proportion unemployed

eight years after stroke was 29.1% and longer duration of follow up was among other factors associated with unemployment (16). Besides difficulties comparing different stroke populations, national strategies in rehabilitation, employment of disabled persons and income supplements could contribute to large variations in proportion of patients who RTW after stroke (12, 17, 18). The citizens in Sweden have access to a free general health care system with the goal of offering equal care and rehabilitation for all stroke patients. Because of the differences in healthcare quality and socioeconomic equality it is difficult to draw conclusions of independent socioeconomic factors in an international perspective. However because of the width of the national sample we should be able to draw conclusions about Sweden and countries with similar health care and welfare systems.

National coverage of registers and databases is a major strength of this study. We also have access to individual level real-life data including a long-term follow up with high coverage for a national cohort of stroke patients. Patient reported outcome measures (PROM) in Riksstroke has been validated and shown good agreement with standard instruments for ADL and pain (www.riksstroke.org/eng). For the variable low mood, sensitivity but not the specificity was high in comparison with Prime-MD. Another limitation of this study is self-assessment of the outcome variable, RTW, which could have introduced bias. Also, data on patient's occupation pre- and post-stroke were not available as well as data on stroke severity other than level of consciousness. In international literature, white collar work is less physical demanding and it is assumed to be easier to switch work assignments or make physical adjustments compared to blue-collar profession which positively affect RTW (2, 3, 7, 12).

The impact of socioeconomic differences in stroke sequelae symptoms on RTW after stroke gives reasons to perform future studies on improving the chance of RTW among patients with stroke sequelae. Information on the length and nature of pre- and post-stroke employment,

such as occupation, proportion with reduced working hours and conditional tenure, as well as information regarding comorbidity other than stroke risk factors should be included in future studies.

In this nationwide study of younger stroke patients of working age, patients with low socioeconomic status less often RTW one year after stroke. Stroke sequelae symptoms such as physical impairments, low mood and pain are independent predictors that negatively affect RTW. Stroke sequelae are also more common in patients with lower socioeconomic status and mediate socioeconomic differences in RTW. The stroke sequelae should therefore targeted for improvements to achieve greater chance for RTW after stroke.

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Conflicts of interest

None

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Tables

Table 1. Number and proportion (%) of patients who had returned to work 12 month after stroke in different patient groups

Variable	Valid cases N	Returning to work n (%)	P-value (χ^2 -test)
<i>Socioeconomic factors (the year before stroke) and country of birth:</i>			
Income (tertiles)			<0.001
- Low	846	591 (69.9)	
- Middle	846	612 (72.3)	
- High	847	677 (79.9)	
Education			0.078
- Primary	395	285 (72.2)	
- Secondary	1358	992 (73.0)	
- University	780	601 (77.0)	
Living alone			0.302
- No	1993	1488(74.7)	
- Yes	530	384 (72.4)	
Country of birth			<0.001
- Sweden	2213	1670 (75.5)	
- Nordic countries (except Sweden)	109	81 (74.3)	
- European countries (except the Nordic)	107	66 (61.7)	
- Countries outside Europe	110	63 (57.3)	
<i>Demography, stroke type and severity</i>			
Sex			0.042
- Men	1594	1202 (75.4)	
- Women	945	978 (71.8)	
Age			0.008
- 25-34 years	141	89 (63.1)	
- 35-44 years	555	421 (75.9)	
- 45-55 years	1843	1370 (74.3)	
Stroke subtype			<0.001
- Hemorrhagic	425	248 (58.4)	
- Ischemic	2087	1607 (77.0)	
- Unspecified	27	25 (92.6)	
Level of consciousness at stroke onset			<0.001
- RLS 1	2272	1780 (78.3)	
- RLS 2-3	184	75 (40.8)	
- RLS 4-8	55	11 (20.0)	

<i>Sequela</i> 1 year after stroke:			
Low mood			<0.001
- No	2128	1663 (78.2)	
- Yes	365	197 (54.0)	
Pain			<0.001
- No	2088	1641 (78.6)	
- Yes	406	213 (52.5)	
Dependent in ADL			<0.001
- No	2400	1867 (77.8)	
- Yes	121	5 (4.1)	
Help with answering the questionnaire			<0.001
- No	2257	1817 (80.5)	
- Yes	255	47 (18.4)	

Table 2. Proportion (%) of patients with high income, high education, being married or cohabitant, and born in the Nordic countries, in different patient groups (defined by sex, age, stroke subtype, level of consciousness at hospital admission, low mood, pain, ADL-dependency, and need of help to answer the questionnaire). P-values of simple group comparisons (χ^2 -test)

Variable	High income (%)	University education (%)	Cohabitant (%)	Born in Nordic countries (%)
<i>Demography, stroke type and severity</i>				
Sex	P<0.001	P<0.001	P<0.001	P=0.397
- Men	41.3	28.1	76.5	91.1
- Women	19.9	35.3	83.2	92.1
Age	P<0.001	P<0.001	P=0.018	P=0.683
- 25-34 years	24.1	43.3	77.3	92.2
- 35-44 years	24.1	36.5	83.3	92.2
- 45-55 years	36.8	28.1	77.8	91.2
Stroke subtype	P=0.145	P=0.890	P=0.171	P=0.218
- Hemorrhagic	35.8	31.8	76.4	92.2
- Ischemic	33.1	30.6	79.4	91.2
- Unspecified	18.5	29.6	88.9	100
Level of consciousness at stroke onset	P=0.882	P=0.202	P=0.436	P=0.213
- RLS 1	33.2	30.2	79.2	91.1
- RLS 2-3	35.3	36.9	75.0	94.6
- RLS 4-8	34.6	29.6	81.1	96.4
<i>Sequelae 1 year after stroke:</i>				
Low mood	P<0.001	P=0.001	P=0.162	P<0.001
- No	35.2	32.2	79.6	93.2
- Yes	23.8	23.6	76.4	83.6
Pain	P<0.001	P<0.001	P=0.010	P<0.001
- No	36.0	32.7	78.1	93.2
- Yes	21.4	21.3	83.9	84.2
Dependent in ADL	P=0.143	P=0.104	P=0.078	P=0.010
- No	33.7	31.2	79.4	91.8
- Yes	27.3	24.2	72.6	85.1
Help with answering the questionnaire	P<0.001	P<0.001	P=0.637	P<0.001
- No	34.6	32.2	78.8	92.7
- Yes	24.3	17.8	80.1	80.8

Table 3. Multiple logistic regression modelling the probability of RTW. Separate models for income, education, living alone, and country of birth. Odds ratio (OR) with 95% confidence interval (CI)

Socioeconomic status, and country of birth	Unadjusted OR (95% CI)	Adj. for sex and age OR (95% CI)	Adj. for sex, age, sequelae OR (95% CI)	Adj. for sex, age, sequelae, help answering OR (95% CI)
Income (tertiles)				
- Low (reference)	1	1	1	1
- Middle	1.14 (0.91-1.42)	1.12 (0.90-1.40)	1.01 (0.79-1.29)	0.98 (0.76-1.27)
- High	1.64 (1.30-2.06)	1.61 (1.26-2.05)	1.36 (1.04-1.77)	1.23 (0.93-1.62)
Education				
- Primary (reference)	1	1	1	1
- Secondary	1.00 (0.77-1.30)	1.01 (0.78-1.32)	0.97 (0.72-1.30)	0.82 (0.60-1.13)
- University	1.23 (0.92-1.64)	1.28 (0.96-1.72)	1.09 (0.79-1.50)	0.84 (0.59-1.19)
Living alone				
- No (reference)	1	1	1	1
- Yes	0.89 (0.71-1.11)	0.88 (0.70-1.10)	0.89 (0.69 -1.14)	0.82 (0.63-1.06)
Country of birth				
- Sweden (reference)	1	1	1	1
- Nordic countries (except Sweden)	0.93 (0.59-1.48)	0.92 (0.58-1.47)	1.12 (0.67-1.90)	1.41 (0.80-2.49)
- European countries (except the Nordic)	0.52 (0.34-0.78)	0.51 (0.34-0.77)	0.70 (0.43-1.12)	0.73 (0.44-1.21)
- Countries outside Europe	0.45 (0.29-0.69)	0.45 (0.30-0.70)	0.57 (0.36-0.92)	0.98 (0.56-1.70)

Figure 1. Study flowchart

*) According to Statistics Sweden

**) 62 patients answered that they did not work before stroke