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Gender and the functional outcome of elderly ischemic stroke patients

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ABSTRACT

The purpose of this study was to investigate the effect of gender on the functional outcome after ischemic stroke. In a retrospective chart review we studied 919 survivors of ischemic stroke admitted for rehabilitation at a geriatric rehabilitation ward of a university affiliated hospital. Functional outcome of female and male patients was assessed by Functional Independence Measurement (FIM™) at admission and discharge. Data were analyzed by *t* test, Chi-square test and Linear Regression. A total number of 919 patients were admitted of whom 56% were males. A higher proportion of male patients reported ischemic heart disease ($p < 0.001$), hypercholesterolemia ($p = 0.035$), Parkinson's disease ($p = 0.044$), and previous stroke ($p < 0.001$). Males had also higher Mini-Mental State Examination (MMSE) scores ($p < 0.001$). Total FIM at admission (62.54 ± 25.98 and 66.00 ± 25.49; $p = 0.043$), and total FIM at discharge (80.39 ± 30.35 and 85.59 ± 29.08; $p = 0.008$), motor FIM at admission (40.04 ± 18.89 and 42.51 ± 18.47; $p = 0.047$) and motor FIM at discharge (56.41 ± 23.04 and 60.44 ± 21.84; $p = 0.007$) were higher among male patients. However, a trend for a borderline statistical difference was observed for FIM gains upon discharge between men and women. A multiple linear regression analysis showed that total FIM at discharge was neither associated with male nor female gender ($\beta = -0.009$; $p = 0.69$). The findings suggest that the functional outcome of male survivors presenting for rehabilitation after acute ischemic stroke is slightly better. After adjusting for possible covariates, gender did not emerge as an independent predictor for higher FIM at discharge, suggesting that gender should not be held as adversely affecting rehabilitation of such patients.

1. Introduction

Stroke is the third leading cause of death in most countries, and is one of the leading causes of long-term disability. Each year, around 795,000 Americans experience a new or recurrent stroke, incurring high annual costs (Lloyd-Jones et al., 2010). The female population carries a higher burden of stroke due to longer life expectancy in women and accounts for the majority of stroke deaths (Seshadri et al., 2006; Lloyd-Jones et al., 2010). The incidence of stroke in women becomes higher than in men at the age of 80 years (Olsen et al., 2009). Over the past decade published cohort studies have consistently shown that women and men with stroke have different characteristics (Turzo and Mccullough, 2008; Vukovic et al., 2009; Jamieson and Skliut, 2010; Persky et al., 2010), with different age- and gender-specific prevalence of various cardiovascular risk factors (Andersen et al., 2010). Overall, men have better outcomes after stroke than women. Among individuals who survive stroke, women are more likely to have worse pre-stroke and post-stroke disability (Roquer et al., 2003; Kapral et al., 2005) and have higher rates of institutionalization (Glader et al., 2003; Kelly-Hayes et al., 2003).

There is a difference of opinions about the possible impact of gender on rehabilitation outcomes among stroke patients. A Norwegian study on functional outcomes after stroke found that women were six times more likely to be institutionalized at one year than men, while men were three times more likely to achieve a high score on the Barthel Index, compared to women (Wyller et al., 1997). Two recent publications have also confirmed less favorable functional outcome and high disability rates in women, compared to male patients (Appelros et al., 2010; Kong et al., 2010). A recent study has concluded that gender was not a significant predictor of total and motor FIM score at discharge (Oneş et al., 2009), yet, another study including 100 patients found that while at the beginning of rehabilitation functional status was worse in women than men, women's functional status improved equally during rehabilitation, though the difference between men and women persisted at discharge (Petruseviciene and Krisciūnas, 2005).

The present study aimed to evaluate whether, and to what extent, gender is interrelated to overall functional outcome of a large group of elderly stroke survivors. This would assist in evaluating rehabilitation potential or possible need of applying different rehabilitation strategies for women.

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2. Patients and methods

2.1. Setting

The Geriatric Rehabilitation ward at our medical center is a 36-bed unit. The ward utilizes an interdisciplinary team approach, where representatives from geriatrics, physiotherapy, nursing, rehabilitation therapies (physical, occupational and speech), social services, and psychology meet twice a week to evaluate the status of each patient. During these meetings, a treatment plan is established and monitored with the purpose of coordinating and integrating staff activities, and promoting effective rehabilitation. The patients undergo a typical amount of 6 h per week of physical and occupational therapy (6 days per week) which is typical of other facilities in the country.

2.2. Participants

This retrospective study included 919 patients aged ≥60 years with ischemic stroke. Patients were consecutively admitted to our ward during a 7-years period, after a short stay in the departments of internal medicine or neurology. Stroke was diagnosed on the basis of clinical presentation of acute onset of focal neurological signs. CT or MRI scans were performed in all cases to confirm the presence of ischemic stroke. Primary inclusion criteria, other than ischemic nature of stroke, included stable medical status (enabling active rehabilitation treatment), and a length of stay and nature of ischemic stroke in the rehabilitation ward of more than seven days (assuming that a shorter extent of rehabilitation is meaningless). The study sample did not include patients with residual brain damage due to infection, trauma or surgery and patients with space occupying lesions or hemorrhagic stroke.

The presence of arterial hypertension, ischemic heart disease (manifested as stable or unstable anginal syndrome), atrial fibrillation, previous stroke, diabetes mellitus and hyperlipidemia were established by medical history, obtained by interview and a complete physical examination.

2.3. Functional assessment

The patients were evaluated within three days of admission by members of the rehabilitation team experienced with the FIM scale (Lincare et al., 1994), a standardized method of measuring the level of physical independence. FIM data were documented at admission and upon discharge. The dependent outcome variables that were examined included the absolute change in total and motor FIM changes during rehabilitation stay. Patient's cognitive status was assessed by the Mini-Mental State Examination (Folstein et al., 1975) within one week after admission to the rehabilitation ward.

2.4. Data analysis

Patients were divided into two groups, by gender. Comparisons between the two groups, with regards to demographic and clinical characteristics, were performed using *t*-tests, Chi square tests and multiple regression analyses. The statistical significance level was set to 0.05. The SPSS for Windows software, version 11.0, was used for these analyses.

3. Results

The data of 919 consecutive ischemic stroke survivors aged 60 and older were available. The clinico-demographic characteristics of these patients are shown in Table 1. Mean age was 75.7 ± 7.9 years. 405 patients (44%) were females.

The mean rehabilitation length of stay in our ward was 50.29 ± 27.4· which is typical of post-acute care in our country.

There were no statistically significant differences between the two groups regarding age, length of stay, hypertension or diabetes mellitus. Ischemic heart disease (22.5% vs. 35.9%, $p < 0.001$), atrial fibrillation (60.7% vs. 39.3%, $p < 0.001$), Hyperlipidemia (28.8% vs. 35.3%, $p = 0.035$), Parkinson's disease (2.5% vs. 5.1%, $p = 0.044$) previous stroke (14.1% vs. 28.5%, $p < 0.001$) and MMSE (21.5 ± 5.6 vs. 23.2 ± 5.2, $p < 0.001$) emerged as the statistically significant parameters differing between females and males, respectively shown in Table 1.

Male patients presented to rehabilitation with significantly higher total ($p = 0.043$) and motor ($p = 0.047$) FIM scores, compared to female patients are shown in Table 2.

Male patients were also discharged from the ward with better total ($p = 0.008$) and motor ($p = 0.007$) FIM scores. However, there was only a borderline statistical difference between females and males patients in gain in total FIM ($p = 0.084$) and gain in motor FIM at discharge ($p = 0.073$).

Since the male group patients had better cognitive status and a better functional starting point, we performed a multiple linear regression analysis to test for predictors of functional outcome at hospital discharge. This showed that total FIM at discharge was independently, and inversely associated with age ($\beta = -0.096$, $p < 0.001$). A higher MMSE and total FIM score at admission predicted higher total FIM scores at discharge ($\beta = 0.11$, $p < 0.001$; and $\beta = 0.73$, $p < 0.001$, respectively) as shown in Table 3. None of the other variables that we tested, including gender, were predictive of higher total FIM scores at discharge.

Table 1
Patients' demographic, clinical and cognitive characteristics, by gender.

Variable	All	Females	Males	p^a
N	919	405(44%)	514(56%)	
Age (years; mean)	75.70 ± 7.9	76.2 ± 7.9	75.3 ± 8.0	0.11*
(years; median)	75.0	76.0	75.0	
Length of stay (days)	50.29 ± 27.4	49.56 ± 26.83	50.8 ± 27.8	0.51*
Diabetes mellitus (%)	37.8	38.8	37.2	0.63†
Hypertension (%)	70.4	66.5	66.5	0.37†
Ischemic heart disease (%)	29.8	22.5	35.9	<0.001†
Atrial fibrillation (%)	18.6	60.7	39.3	<0.001†
Hyperlipidemia (%)	31.7	28.8	35.3	0.035†
Parkinson's disease (%)	3.9	2.5	5.1	0.044†
Previous Stroke (%)	22.1	14.1	28.5	<0.001†
MMSE	22.5 ± 5.4	21.5 ± 5.6	23.5 ± 5.2	<0.001*

Data are mean ± SD.
[a] *p*-Value calculated using Student's *t*-test for continuous variables and χ^2 test for categorical variables.
* Continuous variable.
† Categorical variable.