

# The influence of patient's knowledge about stroke in Brazil: a cross sectional study

A influência do conhecimento do paciente sobre o AVC no Brasil: um estudo transversal

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## ABSTRACT

Little is known about stroke patients' awareness about the warning signs of stroke and its therapeutic time window in Brazil. **Method:** We interviewed consecutive patients with acute stroke admitted to a tertiary public hospital in Brazil. Data collected included demographics, mode of arrival, National Institutes of Health Stroke Scale (NIHSS) scores and knowledge of stroke warning signs and therapeutic time window. Early arrival was defined as within 4.5 hours of symptoms onset. **Results:** Although 66.2% of patients knew the warning signs of stroke, only 7.8% reported to know that stroke had a limited therapeutic time window. Stroke severity measured by the NIHSS was independently associated with early arrival, but not knowledge of stroke signs and symptoms. **Conclusion:** Knowledge about stroke symptoms was not a predictor of early arrival.

**Keywords:** stroke, public awareness, knowledge.

## RESUMO

Pouco se sabe sobre o conhecimento dos pacientes com acidente vascular cerebral (AVC) acerca dos sinais de alarme da doença e sua janela terapêutica no Brasil. **Método:** Foram entrevistados consecutivamente os pacientes com AVC agudo internados em um hospital público terciário no Brasil. Os dados coletados incluíram dados demográficos, o modo de chegada, escala de AVC do National Institute of Health (NIH) e conhecimento sobre a janela de tempo terapêutica e os sinais de alerta do AVC através de um questionário padronizado. Chegada precoce foi definida como aquela dentro de 4,5 horas do início dos sintomas. **Resultados:** Embora 66,2% dos pacientes sabiam os sinais de alerta do AVC, apenas 7,8% relataram saber que a doença tinha uma janela de tempo terapêutica limitada. A gravidade do AVC avaliada pela escala do NIH foi preditora de chegada precoce, mas conhecimento acerca dos sinais e sintomas do AVC não foram. **Conclusão:** O conhecimento acerca dos sintomas do AVC não foi preditivo de chegada precoce ao hospital.

**Palavras-chave:** acidente vascular cerebral, sensibilização pública, conhecimento.

Stroke is a major public health problem and the leading cause of mortality in Brazil. In 2005, 10% of all deaths in the country (90,006 deaths) as well as 10% of all public hospital admissions were due to stroke<sup>1,2</sup>.

Intravenous thrombolytic therapy for ischemic stroke was approved in Brazil in 2001 but the number of patients who have access to stroke reperfusion therapies remains low, despite the advances in stroke treatment in the country<sup>3</sup>. Early hospital presentation is a prerequisite for successful management of acute ischemic stroke<sup>4</sup>. Many factors contribute to delays in seeking for treatment for acute stroke. However, the most important is lack of public

awareness regarding stroke symptoms and the need for a rapid response<sup>5</sup>.

A previous community-based study has shown alarming lack of awareness about stroke in Brazil. Most of the studies evaluating knowledge about stroke symptoms in the country have been conducted in the general population<sup>6,7,8</sup>. Little is known about stroke patients' awareness about stroke warning signs and its therapeutic time window and how these factors influence the timing of seeking for medical care in Brazil. Therefore, the aim of this study was to evaluate the knowledge of stroke patients and that of their families about stroke recognition and the impact of lack of stroke awareness on late hospital arrival.

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## METHOD

This study was undertaken at the Neurological Emergency Unit of a public tertiary care university hospital from March 2012 to December 2012. Our hospital is located in Sao Paulo, a city that comprises around ten million people. We prospectively evaluated consecutive patients with acute ischemic or hemorrhagic stroke confirmed by neuroimaging. We excluded patients who died within the first 24 hours, patients with extra-axial hematomas, intracerebral hemorrhages secondary to tumors, trauma, aneurysm and cerebral venous thrombosis.

Interviews with patients and family members were conducted within 48 hours of hospital admission. Data collected included demographics, mode of arrival (emergency medical services versus patients own means), presence of stroke risk factors, National Institutes of Health Stroke Scale (NIHSS) scores, thrombolysis status and knowledge of stroke warning signs and therapeutic time window using a standardized, structured questionnaire. Admission time was recorded for every patient. The time of symptoms onset or time from last seen well was obtained from the patient or available witness. Door to neuroimaging time (for all patients) and door to needle time (for patients treated with thrombolysis) were also registered.

Early arrival was defined as within 4.5 hours of stroke symptoms onset. In patients with symptoms upon awake, the time the patient was last seen well was considered as time of stroke onset. The Local Ethics Committee approved the study and the procedures followed were in accordance with institutional guidelines.

### Statistical analysis

Means and standard deviations or medians and interquartile intervals were used to describe patients' characteristics. The independent samples *t*-test or the Mann-Whitney test, as appropriate, was used to compare the early and late arrival groups. Categorical variables were compared with Chi-square or Fisher exact test. We used multiple logistic regression to investigate the influence of epidemiological and clinical data and knowledge about stroke recognition upon time to hospital admission (early versus late arrival). All variables that showed an association in the univariate analyses with a  $p \leq 0.1$  were included in the multivariate analysis. A 2-tailed  $p < 0.05$  was considered statistically significant. Statistical analysis was performed with SPSS 16.0 software (Chicago, IL).

## RESULTS

A total of 104 patients were interviewed; 86.3% had an ischemic stroke and 13.7% an intracerebral hemorrhage.

Mean age was  $64.15 \pm 16.20$  years; 54.8% of the patients were males. The median time interval from stroke symptom onset (or from last seen well) to hospital admission was 6.5 [2-24] hours. A total of 12 patients (11.5%) had an undetermined time from symptoms onset. Only 35 patients (33.7%) arrived within the first 4.5 hours of symptoms onset (early arrival). The median door to neuroimaging time was 52 [35-128] minutes. Sixteen patients (17.7% of the patients with ischemic stroke) were treated with intravenous thrombolysis. The median door to needle time was 80 [60-180] minutes. Although 66.2% of the patients knew the warning signs of stroke, only 7.8% reported to know that stroke had a limited therapeutic time window (Table 1). Patients who were aware of stroke signs and symptoms and those who were not were similar in age, educational level, and household income.

Patients aware of stroke therapeutic time window had a trend towards a higher household income (median 1,103 [799, 3255] dollars/month vs. (median 639 [393, 983]) dollars/month ( $p=0.10$ ). Only 10.3% of the patients aware of stroke signs and symptoms reported receiving information from a health care provider (other sources included: television in 13.8%, family and friends in 20.7%, internet in 6.9%, and others in 48.3%). Patients with prior stroke were not more likely to know about stroke signs and symptoms.

Early arrivals were more likely to arrive by ambulance (34.5% vs. 11.6%,  $p=0.019$ ) and had more severe strokes (NIHSS 13 95%CI (11-20) vs. 5 95%CI (4-9),  $p < 0.01$ ) than late arrivals (Table 2). Stroke severity measured by the NIHSS was the only independent predictor of early arrival (OR 1.26; 95%CI 1.05 to 1.52 for each point of the scale) (Table 3). These results hold true if patients with unknown symptoms onset time are excluded from the analysis. In a sensitivity analysis evaluating only patients with ischemic stroke, again NIHSS was the only predictor if early arrival.

Table 1. Patient characteristics.

Characteristics	
Male gender n (%)	57 (54.8)
Age, years (mean)	64.15±16.20
Time of arrival at the ED, hours (median)	6.5 IQ [2-24]
Early arrival (%)	33.70
NIHSS (median)	11 IQ [5-20]
Education less than high school (%)	68.80
Household income/month, dollars (mean)	826±702
Knowledge the warning signs of stroke (%)	66.20
Knowledge limited therapeutic time window (%)	7.80
Arrived by ambulance (%)	24.70
Previous stroke (%)	15.70
Ischemic stroke (%)	86.30
Hemorrhagic stroke (%)	17.30

NIHSS: National Institutes of Health Stroke Scale.

**Table 2.** Predictors of early arrival (univariate analysis).

Characteristics	Early arrival (4.5 hs)	Late arrival (>4.5 hs)	p
Male gender (%)	60	54	0.57
Age, years (mean)	68±14.20	64±15.60	0.29
Household income/month, dollars (median)	893±695	807±565	0.26
Education less than high school	62%	75%	0.26
Knowledge the warning signs of stroke	67%	64%	0.75
NIHSS (median)	13 95%CI (11-20)	5 95%CI (4-9)	<0.01
Arrived by ambulance	34.5%	11.6%	0.02
Knowledge limited therapeutic time window	7.70%	7.10%	0.93
Previous stroke	20%	13%	0.41
Ischemic stroke	91%	88%	0.68

NIHSS: National Institutes of Health Stroke Scale.

## DISCUSSION

In the present study, we report the frequency of knowledge of warning signs and therapeutic time window for stroke among patients with stroke in an emergency department of the largest South American city. Although approximately two thirds of stroke patients reported knowledge of stroke warning signs, only few patients knew the importance of early arrival.

In our study, self-recognition of stroke symptoms by patients was higher (66%) than previously reported in different countries in the last decade (36% in the Cincinnati study<sup>9</sup>, 25% in the Indianapolis study<sup>10</sup> and 27% in an Indian study<sup>11</sup>). This might reflect the impact of stroke awareness campaigns organized by the Brazilian Stroke Society, Brazilian Stroke Network and Brazilian Academy of Neurology in the previous three years<sup>12</sup>.

Unfortunately, less than one quarter of our patients sought medical attention within 4.5 hours of becoming aware of stroke symptoms. In our study, the only independent predictor of early arrival was stroke severity, an association well established in the literature<sup>10,13</sup>. As in our series, other authors<sup>9,10</sup> found that ambulance transport was associated with early arrival and suggest that arriving by ambulance and stroke severity provide redundant information as patients with near-normal function tend to not call emergency medical services, while patients who do arrive by ambulance are more heterogeneous but overall have more severe functional limitations. In a previous study

of a Brazilian population with acute ischemic stroke, patients with more severe strokes, those with atrial fibrillation and those with lower blood pressure at hospital presentation were more likely to use emergency medical services<sup>14</sup>. Acute Ischemic stroke and intracranial hemorrhage may have different determinants for early admission. The small number of patients with intracranial hemorrhage in our series (14 patients) limits the evaluation of predictors of early arrival in this subgroup. However stroke subtype (ischemic or hemorrhagic) was not a predictor of early arrival and in a sensitivity analysis evaluating only patients with ischemic stroke, NIHSS again was the only predictor if early arrival.

Surprisingly, we found no association between knowledge of stroke signs and symptoms and early arrival. Similar studies in other countries also failed to find a relationship between early arrival and stroke symptoms knowledge<sup>9,10</sup>. This finding might be explained by the lack of awareness of stroke therapeutic time window in our patients. A striking finding in our series was the lack of relationship between having a previous stroke and early arrival. Patients with previous stroke were supposedly exposed to more explanations regarding stroke signs and symptoms and the importance of early arrival. This lack of association however suggests an important gap in patient education and also a lost opportunity in medical encounters.

In our series, patients who were aware of stroke signs and those who were not were similar in age, educational level, and household income. However patients aware of stroke therapeutic time window had a trend towards a higher household income. Most studies from developed and underdeveloped countries have found that knowledge about stroke varies positively with income and education<sup>6,7,15,16</sup>. The lack of association between household income and stroke symptoms awareness in our patients might be explained by the homogeneously low educational level and socioeconomic status of the population we evaluated.

This study has a number of limitations. First, some of our patients were not able to answer our survey due to aphasia or altered sensorium in which case we collected data with proxies or family members. Secondly, we currently have 14

**Table 3.** Predictors of early arrival (multivariate analysis).

Characteristics	OR (95%CI)	p
Age	0.95 (0.87-1.04)	0.30
NIHSS (median)	1.26 (1.05-1.52)	0.02
Arrival by ambulance	14.26 (0.80-253.95)	0.07
Knowledge about stroke symptoms	1.31 (0.11-15.33)	0.82
Knowledge about therapeutic time window	3.62 (0.15-82.53)	0.42

NIHSS: National Institutes of Health Stroke Scale.

beds and another reference hospital for stroke care located four blocks away. These facts probably explain the smaller than expected number of patients evaluated. Thirdly, this is a hospital-based study with a small sample size and might not exactly reflect patients with stroke in other parts of the country. Brazil is a continental country with large socioeconomics disparities, therefore our findings should be confirmed in other regions and socioeconomic strata. However, our study is the first in the country to prospectively evaluate not only stroke knowledge but also awareness of stroke therapeutic time window in a population of consecutive patients with

stroke in the largest Brazilian city and should be used as hypothesis generating.

In conclusion, knowledge about stroke symptoms was not a predictor of early arrival in this hospital-based series. Limited knowledge about the therapeutic time window for the treatment of acute ischemic stroke and lack of access to emergency medical services are possible explanations for these findings. Widespread public education about stroke in Brazil should focus on the importance of early arrival and can potentially increase the proportion of patients eligible for acute stroke treatments.

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