

STROKE: COST TO THE HEALTHCARE SYSTEM IN RIO GRANDE DO SUL STATE, BRAZIL, 2007 – 2017

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ABSTRACT

Stroke is a cerebrovascular disease with a high incidence, ischemic heart disease, and stroke are the leading causes of death and disability worldwide, accounting for a total of 15.2 million deaths in 2016. They have remained the leading cause of death in the world over the past 15 years. Aim: To describe the financial amount paid by the Unified Health System for stroke hospitalizations in the Rio Grande do Sul State (RS, Brazil) from 2007 to 2017. Methods: Secondary data were collected from the Hospital Information System, a database that aggregates data from all hospital admissions paid by the Brazilian national public healthcare system (Unified Healthcare System - SUS). Findings: Considering 2007 as a database, in 2017 there was an increase of 11,9% in the number of hospitalizations for stroke, 26.1% in relation to the total paid by SUS for hospitalizations and 12,7% of the average amount paid. The highest number of hospitalizations (10,119) occurred in 2016, the highest total cost (US\$ 5,188,404.28) in 2014, and the average amount paid for hospitalization was higher in 2012 (US \$ 612.21). Mortality rates ranged from 16.74% in 2007 to 13.45% in 2017, with a downward trend. Conclusion: The increase of 11.9% in the number of hospitalizations for stroke and 26.1% in relation to the costs total paid for SUS for hospitalizations was expected, considering the ongoing demographic and epidemiological transition.

KEYWORDS: Health Management. Unified Health System. Stroke. Health economy.

INTRODUCTION

The rise in overall health sector spending was directly related to universalization programs; population ageing and changes in morbidity and mortality profiles; redefinition of the medical technology field and insertion of new health professions; changes in security and insurance structures and, the end of the first decade of the 2000s onwards, the growth of expenses related to population migrations of dispossessed regions for industrialized countries.^[1] Situations that required special attention regarding health expenditures, whether by national health systems, health insurance providers, public or private health service providers, or users of both.

Stroke is defined as the interruption of cerebral blood flow by occlusion (ischemic stroke) or rupture of an artery, causing blood leakage in the brain (hemorrhagic stroke). It is one of the leading causes of death, acquired disability and hospitalizations worldwide.^[2,3] According to the World Health Organization projection for 2030,

the stroke would remain the second leading cause of death, reaching 12.2% of estimated world deaths.^[4]

The Brazilian National Health Survey, a household-based epidemiological survey conducted in 2013, estimated 2,231,000 people with stroke and 568,000 with severe disability in Brazil. Point prevalence was 1.6% in men and 1.4% in women, and disability 29.5% in men and 21.5% in women.^[5] In 2016, the Brazilian public national healthcare system registered 188,200 hospitalizations for treatment of ischemic and hemorrhagic stroke, in addition to 40,000 deaths from the disease.^[6]

In addition to policies and actions aimed at Noncommunicable Diseases, Brazil has, since 2012, a decree with the criteria for enabling hospitals as the Emergency Care Center for Patients with Stroke in the Unified Health System.^[3] The Guidelines on Care for the Rehabilitation of People with Strokes started in 2013,^[7] as well as the Manual of Stroke Care Routines.^[8]

Brazil is currently a reference in the treatment of stroke for other countries in Latin America and already has a Care Line in stroke as a public health policy.^[6] However, studies addressing various aspects of hospital admissions by a diagnosis of stroke, such as cost of admissions, stay and lethality time, among others, are reduced.^[9,10] Epidemiological studies involving frequency, distribution of hospitalizations by sex and age group, hospital morbidity and mortality are more common,^[2,11,12,13,14] than studies about actions in primary care or rehabilitation.^[15]

This study aims to describe the financial amount paid by the Unified Health System for stroke hospitalizations in the State of Rio Grande do Sul (RS, Brazil) from 2007 to 2017.

METHODS

Brazil is divided into 26 states and the Federal District, with an estimated 2019 population of 210,147,125 people, Human Development Index of 0.699 (2010) and average life expectancy at birth of 75.5 years. The state of Rio Grande do Sul (RS) is located in the extreme south of Brazil, has 497 municipalities, an estimated population of 11,377,239 people (5th most populous in Brazil), Human Development Index of 0.746 and life expectancy at birth of 77.8 years.

The Brazilian public national healthcare system (Unified Health System - SUS, *in Portuguese*) is grounded in the concepts of the universality of access, comprehensiveness of care and equity of health actions. Involving a mix of public and private services, it is structured in a regionalized and hierarchical network of services, is free of charges at all levels for the care, including the provision of drugs in clinical protocols and a list of essential drugs.

The population studied was all inhabitants from the state of Rio Grande do Sul who had hospitalizations with the first listed diagnosis as "stroke", in the period 2007 – 2017 (n= 92,179 hospitalizations).

Secondary data were collected from the Hospital Information System, a database that aggregates data from all hospital admissions paid by the Unified Health System. These data were systematized according to year, place of hospitalization (Rio Grande do Sul), number of hospitalizations, the value of hospitalizations per year and per hospitalization, the total cost of hospitalizations, length of stay, mortality rate and stroke deaths in 2007 to 2017. The data obtained were entered into a spreadsheet, and descriptive statistics were used for data management.

The total annual amount has been converted to US dollars. For this conversion, the annual value was obtained from the daily values average. It is important to note that the Brazilian currency (real) suffered a significant depreciation against the dollar in the period under study. In 2007, 1.948 real was equivalent to one dollar, which amounts to 3.193 real in 2017.

The study has no conflict of interest. The authors made use of public databases whose information is aggregated, without the possibility of individual identification; therefore, there was no need to be submitted to the Ethics Committee.

RESULTS AND DISCUSSION

Table 1 lists the hospital admissions frequency for the basic diagnosis of ICD-10 stroke (non-specified hemorrhagic or ischemic stroke), the total amounts paid by the Unified Health System (SUS) and the amount average per hospitalization, referring to all hospitalizations that occurred in the state of Rio Grande do Sul, per year, in the period 2007-2017.

Table 1: Hospital admissions frequency for the basic diagnosis of ICD-10 stroke (non-specified hemorrhagic or ischemic stroke), the total amounts paid by the Brazilian public national health system (Unified Health System) and the amount average per hospitalization - State of Rio Grande do Sul, Brazil, 2007-2017.

The total amount paid per year divided by total hospitalizations			
Year	Total amount paid (US \$)	Admission/year	Amount/Admissions (US \$)
2007	3,097,757.62	8,571	361.42
2008	2,653,222.19	5,371	493.99
2009	3,772,375.66	7,245	520.69
2010	4,282,707.09	7,249	590.80
2011	4,713,357.35	7,749	608.25
2012	5,034,787.52	8,224	612.21
2013	4,871,092.14	8,758	556.19
2014	5,188,404.28	9,775	530.78
2015	3,671,331.91	9,527	385.36
2016	3,692,365.84	10,119	364.89
2017	3,905,397.99	9,591	407.19
Total	44,882,799.58	92,179	486.91

Source: 16, modified by the authors.

Considering 2007 as a base, in 2017 there was an increase of 11,9% in the number of hospitalizations for stroke, 26.1% in relation to the total paid by SUS for hospitalizations and 12,7% of the average amount paid. The year 2016 was atypical in the series, especially regarding the increase in the total number of hospitalizations. Even so, one can notice a progressive increase in the total cases; a significant reduction in the amounts paid in the period 2015-2017, compared to the previous three years; and a decrease in the average amount paid per admission, since 2012 (with a slight increase in 2017).

Data regarding the number of hospitalizations and costs varied over the period. Thus, 2016 was the year with the highest number of hospitalizations (10,119), 2014 had the highest total cost (US \$ 5,188,404.28), and the average amount paid for hospitalization was higher in 2012 (US \$ 612.21). At the other extreme, the lowest number of hospitalizations (5,371) and the total amount paid (US \$ 2,653,222.19) occurred in 2008, although the lowest average amount was paid in 2007 (US \$ 361.42).

A study conducted in 2016 with 173 patients in two Brazilian private hospitals, including medical and non-medical costs for a year, found a median cost of US \$ 3,827, much higher than that shown in this historical series, restricted to the period of hospitalization (VIEIRA, SAFANELLI, ARAUJO, 2019). In turn, a study involving a public hospital found a total one-year cost of \$ 1,307.11, with \$ 1,095.11 reimbursed by the SUS (SAFANELLI, VIEIRA, ARAUJO, 2019). Both studies found a direct correlation between cost and length of stay.

From 92,179 hospitalizations, 45,068 (48.9%) were male patients and 47,111 (51.1%) female patients. Data were similar to other studies.^[12,17]

The number of hospitalizations by age group and gender (male and female) are shown in tables 2 and 3, respectively. Among men, 70.6% hospitalized were aged 60 or more years old, with a predominance of 60 to 69 years old (29.5%). Among women, 73.3% were aged 60 or more years old, with a predominance of 70 to 79 years old (26.9%), followed very closely by age of 80 or older (26, 0%).

Table 2: Frequency of hospitalizations from stroke - male and age group.

Year	0 a 9	10 a 19	20 a 29	30 a 39	40 a 49	50 a 59	60 a 69	70 a 79	80 ou +	Total
2007	2	11	31	79	294	770	1.215	1.189	596	4.187
2008	1	9	16	52	240	492	780	693	340	2.623
2009	3	12	21	75	242	743	994	1.003	518	3.611
2010	2	10	18	65	233	681	990	912	547	3.458
2011	1	8	35	53	244	711	1.068	982	571	3.673
2012	1	12	28	89	262	820	1.172	1.055	597	4.036
2013	3	13	39	92	303	797	1.226	1.110	612	4.195
2014	0	10	29	103	333	999	1.484	1.275	650	4.883
2015	5	19	27	113	333	934	1.391	1.221	644	4.687
2016	3	12	42	100	317	934	1.528	1.312	726	4.974
2017	3	9	38	94	279	886	1.420	1.316	696	4.741
Total	24	125	324	915	3.080	8.767	13.268	12.068	6.497	45.068

Source: 16, modified by the authors.

Table 3: Frequency of hospitalizations from stroke - female and age group.

Year	de 0 a 9	10 a 19	20 a 29	30 a 39	40 a 49	50 a 59	60 a 69	70 a 79	80 ou +	Total
2007	2	10	38	99	324	614	867	1.297	1.133	4.384
2008	2	8	28	76	263	402	593	749	627	2.748
2009	2	8	43	112	296	516	723	971	963	3.634
2010	1	13	42	96	317	560	742	1.033	987	3.791
2011	7	8	51	136	339	563	842	1.044	1.086	4.076
2012	2	22	50	143	326	587	768	1.148	1.142	4.188
2013	2	16	38	149	341	704	925	1.217	1.171	4.563
2014	1	12	57	144	404	713	1.022	1.265	1.274	4.892
2015	3	7	53	136	381	751	1.042	1.257	1.210	4.840
2016	0	19	48	150	392	743	1.095	1.357	1.341	5.145
2017	0	10	63	119	355	656	1.076	1.271	1.300	4.850
Total	22	133	511	1.360	3.738	6.809	9.695	12.609	12.234	47.111

Source: 16, modified by the authors.

The average length of stay and mortality rate are listed in table 4. The largest number of hospitalizations occurred in 2016 (10,119 admissions), with the highest average length of stay in 2007 (8.8 days). That is, there was no direct relationship between the number of

hospitalizations and the average number of days hospitalized.

Mortality rates ranged from 16.74% in 2007 to 13.45% in 2017, with a downward trend.

Table 4: Hospitalizations for stroke in the Rio Grande do Sul (total and average hospital stay).

Hospitalizations for stroke			
Year	Frequency	average stay (days)	Mortality rate (%)
2007	8.571	8,8	16,74
2008	5.371	8,7	14,91
2009	7.245	8,1	14,77
2010	7.249	7,9	14,58
2011	7.749	7,9	13,63
2012	8.224	8,0	13,75
2013	8.758	8,5	13,71
2014	9.775	8,3	12,70
2015	9.527	8,3	12,43
2016	10.119	8,2	13,50
2017	9.591	8,0	13,45

Source: 16, modified by the authors.

CONCLUSION

The data found in this study regarding the demographic profile (gender, age) of patients admitted between 2007 and 2017 by the basic diagnosis of stroke are similar to previous studies conducted in Brazil. The increase of 11.9% in the number of hospitalizations for stroke and 26.1% in relation to the total paid for SUS for hospitalizations was also expected, considering the ongoing demographic and epidemiological transition.

The average length of stay ranged from 7.9 to 8.8 days and hospital mortality between 16.74% and 13.45%. Unfortunately, the data involving hospital mortality and financial cost (total paid by the health system) and length of stay could not be compared with other studies conducted in the country. Different methodological approaches, the scope of studies and computed variables prevented such comparison, besides the small number of published papers.

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