Comparing the Comprehensive Stroke Ward Versus Mixed Rehabilitation Ward—The Importance of the Team in the Acute Stroke Care in a Case–Control Study

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Abstract

Background and Purpose: Ischemic stroke is one of the most frequent causes of death in Brazil. Many measures have been taken to reduce this tragic outcome, and one of those is the implementation of stroke units in hospitals. The aim of the present study is to analyze the in-hospital complications for patients with ischemic stroke admitted in a comprehensive stroke ward (CSW) as compared to patients admitted in a mixed rehabilitation ward (MRW). **Methods:** A retrospective interventional study with historic controls of patients admitted to the Neurology Division between January 2010 and October 2013. Patients admitted between January 2010 and September 2012 were included in the MRW group, and patients admitted from October 2012 until October 2013 were included in the CSW group. Throughout the whole study period, the same team assisted all the patients. Both groups were paired in relation to age and gender. The rate of in-hospital complications, mortality, and independency on discharge were evaluated in both groups. **Results:** Each group was comprised of 91 patients. There were no statistically significant differences for any of the risk factors analyzed between the 2 groups nor for outcome measures—in-hospital complications, mortality, and independence on discharge. **Conclusion:** The present study demonstrated that in-hospital complications, independence on discharge, and mortality have similar rates in patients admitted to an MRW compared to patients admitted to a CSW, when the same staff provided them with specialized in-hospital care. **Evidence Level:** Case–control study—Evidence Level 3.

Keywords

stroke, hospital mortality, hospital units

Incidence rates for stroke in Brazil range between 62 and 92 per 100 000 inhabitants, with a poststroke mortality rate of 33% in the following 3 years.¹⁻³ Many measures have been taken in order to reduce this tragic outcome, including the implementation of stroke units (SUs) in hospitals. Stroke units are characterized by a multidisciplinary team composed of physicians, clinical nurses, physical therapists, occupational therapists, and speech and language therapists in a specific ward in order to provide specialized care to patients with stroke.^{4,5}

This model of organized inpatient care allows for better outcomes without increasing the in-hospital length of stay when compared to a general ward.⁶⁻¹¹ Stroke care could be distributed into 6 different models of in-hospital care: (1) an acute stroke ward, (2) a rehabilitation ward, (3) a comprehensive stroke ward (CSW), (4) a mixed rehabilitation ward

(MRW), (5) a mobile stroke team, and (6) a general medical ward.⁶ The first 3 are facilities dedicated to stroke care; the MRW is where a multidisciplinary team provides a rehabilitation service but not exclusively for patients with stroke; and the mobile stroke team is where a mobile multidisciplinary team provides care, without a specialized nursing staff.⁵

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The aim of the current study is to analyze the in-hospital complications for patients with ischemic stroke (IS) admitted to a CSW as compared to patients admitted to an MRW under the assistance of the same staff. The primary hypothesis is that patients with IS admitted to a CSW have lower in-hospital complications when compared to patients admitted to an MRW under the assistance of the same specialized staff and in the same physical area.

Methods

This study is a retrospective intervention study with historic controls. All procedures were done in accordance with the ethical standards of the institutional committee on human experimentation and had been approved by it in accordance with the Helsinki Declaration of 1975, as revised in 2000.

Patients with IS admitted to the Neurology Division between January 2010 and October 2013 were analyzed. Inclusion criteria were (1) IS diagnosis confirmed by brain computed tomography (CT) or brain magnetic resonance imaging, (2) admission to the neurological unit (either CSW or MRW) with less than 48 hours from symptom onset, and (3) complete data in the medical record and the hospital stroke data bank. Exclusion criteria were (1) admission to an intensive care unit at the onset of stroke (due to severity of neurological compromise) or to any other hospital unit before being transferred to the CSW or MRW; (2) diagnosis of transient ischemic attack (TIA), hemorrhagic stroke, or other disease (neurological or otherwise); (3) death within the first 24 hours of admission; and (4) discharge in the first 24 hours of admission. Initially, patients admitted between October 2012 and October 2013 were selected based on the inclusion and exclusion criteria. Following that initial group, we retrospectively evaluated patients who were admitted between January 2010 and September 2012 who were selected with the same criteria, pairing them for age and gender.

During all study period, the same team composed of a physician, clinical nurse, physical therapist, occupational therapist, and speech and language therapist assisted all patients. All procedures were based on current guidelines, and rigorous blood pressure control of patients submitted to thrombolysis was based on a local protocol.^{4,12-14}

After October 2012, the CSW was implemented in the same physical area as the MRW. Therefore, the patients admitted between January 2010 and September 2012 were included in the MRW group and patients admitted from October 2012 until October 2013 were included in the CSW group. In the CSW group, there was an early rehabilitation process (usually in the first 24 hours of admission) where physical therapist, occupational therapist, and speech and language therapist started care in the first 24 hours and kept it on a daily basis until discharge. The introduction of standardized protocols, continuous stroke training care of the staff, and monitoring of key performance indicators occurred after introduction of the CSW. In the MRW group, neurological team assisted

patients with different neurological diseases, whereas in the CSW group, only patients with stroke were assisted.

As the objective was to analyze the in-hospital complications and the early outcome, no long-term follow-up was done in the current study. We collected and analyzed the following variables for comparison between the 2 groups: (1) on admission—patient's age, gender, body mass index, previous risk factors (arterial hypertension, diabetes mellitus, coronary artery disease, dyslipidemia, smoking, alcoholism, history of an IS, history of a TIA, atrial fibrillation, and use of acetylsalicylic acid), National Institute of Health Stroke Scale (NIHSS) score on admission, and number of thrombolysis performed and (2) during the in-hospital stay—length of stay, etiology of IS according to the Trial of Org 10172 in Acute Stroke Treatment (TOAST) criteria, clinical complications (urinary tract infections, pneumonia, deep venous thrombosis, and pressure ulcer), in-hospital mortality rate, independency on discharge based on the modified Rankin score with a cutoff score of ≤ 2 , and hemorrhagic transformation (HT). The HT was characterized by any hemorrhagic finding in the control brain CT done between 24 and 36 hours after admission based on previous studies.^{15,16}

The primary outcome was the in-hospital complications compared in both groups. Each group was comprised of 91 patients, and there were no statistical differences for any of the risk factors as presented in Table 1.

Statistical analyses were performed with the Statistica 8.0 software; NIHSS was presented as median and first (Q1) and third (Q3) interquartile range (median [Q1-Q3]). Statistical significance was assessed by Student *t* test for continuous variables and Fisher exact or χ^2 test for qualitative variables. Statistical significance was set at a $P < .05$ value with a 0.95 confidence interval.

Results

Median NIHSS score on admission for the MRW group was 11 (6.75-17), whereas in the CSW group, it was 9 (3.75-13.25), $P = .03$. Sixty-eight (74.7%) patients were submitted to intravenous thrombolysis in the MRW group as compared to 38 (41.8%) patients in the CSW group ($P < .01$). There were no statistically significant differences for any of the other variables (summarized in Table 2).

As for clinical and neurological outcomes, including in-hospital complications, mortality rates, and level of independence on discharge, there was no statistically significant differences either for any of the variables, as presented in Table 3.

Discussion

The present study demonstrated that patients admitted to an MRW have similar rates of in-hospital complications, mortality, and level of independence on discharge when compared to patients admitted to a CSW, provided that the same staff team assists them.

Table 1. Previous Risk Factors for Both Ischemic Stroke Groups.

Group	MRW Group (n = 91)	CSW Group (n = 91)	P Value
Age, mean $\pm$ SD, years	63.8 $\pm$ 11.6	63.9 $\pm$ 11.5	.95
Female, n (%)	44 (48.4)	43 (47.3)	1
Previous risk factors			
BMI, mean $\pm$ SD	26.6 $\pm$ 4.3	26.5 $\pm$ 4.6	.88
AH, n (%)	71 (78)	62 (68.1)	.18
DM, n (%)	17 (18.7)	28 (30.8)	.08
Dyslipidemia, n (%)	17 (18.7)	28 (30.8)	.08
CAD, n (%)	15 (16.5)	10 (11)	.38
Smoking, n (%)	23 (25.3)	25 (27.5)	.86
Alcoholism, n (%)	11 (12.1)	6 (6.6)	.30
Previous IS, n (%)	16 (17.6)	14 (15.4)	.84
Previous TIA, n (%)	3 (3.3)	5 (5.5)	.72
Previous IS or TIA, n (%)	19 (20.9)	19 (20.9)	1
AF, n (%)	3 (3.3)	6 (6.6)	.49
Use of AAS, n (%)	23 (25.3)	23 (25.6)	1

Abbreviations: AAS, acetylsalicylic acid; AF, atrial fibrillation; AH, arterial hypertension; BMI, body mass index; CAD, coronary artery disease; CSW, comprehensive stroke ward; DM, diabetes mellitus; IS, ischemic stroke; MRW, mixed rehabilitation ward; SD, standard deviation; TIA, transient ischemic attack.

Table 2. Admission and In-Hospital Characteristics for Both Ischemic Stroke Groups.

Group	MRW Group (n = 91)	CSW Group (n = 91)	P Value
Median (Q1-Q3) NIHSS on admission	11 (6.75-17)	9 (3.75-13.25)	.03
Thrombolysis, n (%)	68 (74.7)	38 (41.8)	<.01
Length of stay, mean $\pm$ SD, days	10.2 $\pm$ 4.9	11.5 $\pm$ 10.8	.32
Etiology of ischemic stroke			.26
Large artery atherosclerosis, n (%)	19 (20.9)	20 (22)	
Cardioembolism, n (%)	34 (37.4)	23 (25.3)	
Small-vessel occlusion (lacune), n (%)	15 (16.5)	23 (25.3)	
Stroke of other determined etiology, n (%)	3 (3.3)	1 (1.1)	
Stroke of undetermined etiology, n (%)	20 (22)	24 (26.4)	

Abbreviations: CSW, comprehensive stroke ward; MRW, mixed rehabilitation ward; NIHSS, National Institute of Health Stroke Scale; SD, standard deviation.

Table 3. Prognostic Factors for Both Ischemic Stroke Groups.

Group	MRW Group (n = 91)	CSW Group (n = 91)	P Value
In-hospital death, n (%)	3 (3.3)	8 (8.8)	.212
Independence on discharge, n (%)	47 (53.4)	55 (66.3)	.119
Urinary tract infections, n (%)	5 (5.5)	3 (3.3)	.72
Pneumonia, n (%)	10 (11)	12 (13.2)	.821
Deep venous thrombosis, n (%)	0 (0)	0 (0)	1
Pressure ulcer, n (%)	2 (2.2)	1 (1.1)	1
Hemorrhagic transformation, n (%)	3 (3.3)	3 (3.3)	1

Abbreviations: CSW, comprehensive stroke ward; MRW, mixed rehabilitation ward.

It has been proposed that the implementation of an SU reduces the mortality and the level of dependence of patients with IS.^{6-11,17} However, in previous studies, the comparisons were made between SU care versus a general medical ward or a rehabilitation ward versus an MRW or an acute stroke ward versus an MRW or a CSW versus a mobile stroke team.^{6-10,18-20} Our study has a different model and is one of the first to consider the same attending multidisciplinary team, working in the same physical place, comparing results over

time following the implementation of a different model of assistance and ultimately only changing the designation of the assisting place.

In a recent meta-analysis, both models of intervention used in the current study (CSW and MRW) showed reductions in the risk of death, dependency, and institutionalization when compared to treatment provided in a general medical ward, but they had not been compared between themselves.⁶

Expert knowledge and the skills related to the assistance for patients with stroke differ greatly in a conventional general ward, an internal medicine-centric ward, or an emergency ward if compared to a neurological ward, as was the model environment used in the current study. This might have contributed to the results of studies that compared the quality of care provided in a SU versus that of a general medical ward.⁶⁻⁹ Nevertheless, our results do not disagree with previous studies, since success rates in the SU are the results of an organized, specialist team providing highly skilled stroke management, as provided in both periods of the current study.

There are some limitations to our study. We understand that our sample is limited. For this study, we first selected patients admitted after the implementation of the CSW, and on a second analysis, we included patients admitted prior to this period, paired for age and gender. We considered 2010 as the initial year because this year was when we started the management of patients with acute stroke in our hospital with recombinant tissue plasminogen activator (rtPA) in a continuous way up until now. This study is exclusive as it compares the CSW and the MRW models in the same physical area, showing that the impact of the stroke team had on the outcome of patients with acute stroke is of extreme importance.

There was a greater number of patients submitted to thrombolysis in the MRW group, when compared to the CSW group, and this could have influenced the number of complications and improve the outcome rates for patients admitted in the first period. The profile of patients changed because in the MRW phase, our hospital was the only public one in the city region to assist patients with stroke having thrombolysis therapy. This could have caused a selection bias in the MRW group, which prioritized the admission of this type of patient. After the implementation of the CSW, all patients with IS were referred to our service and there was an increase in the number of patients not submitted to thrombolysis. The exclusion of patients who died within the first 24 hours may have caused a selection bias, excluding more severe cases. In addition, the data of both groups were collected retrospectively in different time periods.

The sample analyzed, the number of observed results in those variables, and the results in the univariate models did not allow us to refine the statistical analysis based on either a multivariate method or other statistical methods.

The cost-effectiveness of the MRW compared to the CSW implementation was not analyzed, but one could warrant that the costs could be optimized when assisting just 1 disease, namely stroke. Once the outcomes were similar in both periods, we cannot affirm that either 1 of the 2 models of care would be superior to the other one considering the variables analyzed, as both models used the same team and physical area. These results show that probably a well-trained team is an important prognosis factor to stroke care, even with the absence of formalized protocols and early rehabilitation as presented in the MRW group.

The present study demonstrated that in-hospital complications, independence on discharge, and mortality have similar rates in patients admitted to an MRW as compared to patients admitted to a CSW, when the same staff provided multidisciplinary care. Attention should be given to the team who provides care for patients with stroke independent of the model of in-hospital care.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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