ORIGINAL ARTICLE

Intensive hospital rehabilitation model for patients with stroke in a developing country

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ABSTRACT

Intensive rehabilitation services with standardized treatment for stroke survivors are desirable once they contribute to the patients' functional improvement even in facilities with restricted financial resources. **Objective:** To verify whether the stroke program at our public inpatient Rehabilitation Center contributes to improvements in functional outcome. **Method:** This is a retrospective cross-sectional study of the first and last 100 neurological patients (2009-2010 and 2014-2015) admitted at the Lucy Montoro Rehabilitation Network (Morumbi Unit). For this study, the patients were analyzed at admission and at discharge by the modified Rankin Scale (mRS). After testing for normality, an unpaired t-test was on the patients' clinical and demographic characteristics. Intragroup analysis was performed by the nonparametric Wilcoxon test. The intergroup analysis used the Mann-Whitney nonparametric test. Functional outcome scores ≤ 3 at discharge were considered favorable. **Results:** The modified Rankin Scores (mRS) were assessed just before the initiation of the therapies and at the patients' discharge. Median mRS score at admission was 4 compared to 3 at discharge (p=0.0001), after 4 to 6 weeks in the stroke program. **Conclusions:** Short term, standardized intensive rehabilitation program with multidisciplinary therapies, in which the patient remains hospitalized, promote functional improvements of patients with stroke sequelae.

Keywords: Stroke, Rehabilitation Services, Inpatients, Outcome Assessment (Health Care)

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INTRODUCTION

Cerebrovascular accident (CVA or stroke) is currently the main mortality cause in Brazil. All around the world, 40% of the nearly 62 million survivors of stroke have some functional limitation, and among them, one third has severe disability.[1,2] Therefore, the stroke sequelae is a substantial public health issue, not only in Brazil, but around the world.

A growing variety of experimental approaches is currently being applied to systematize and raise awareness concerning the role of neuroplasticity in different rehabilitation techniques, consequently it is required that the existing treatments are improved and registered,[3-6] so that each treatment can be rated as a future choice of treatment method.

Hence, standardized evaluations for assessing functionality before and after rehabilitation programs are indeed necessary. One example is the Rankin scale, an assessment that is been widely applied for evaluating incapacity and the dependence degree of patients with stroke. This scale was developed in 1957 and had, initially, five categories, from no symptoms to severe disability. In 1988, the scale was revised and named "the Modified Rankin scale (mRS), and the categories ranged from 0 to 6. This last version is currently the most common scale for evaluating function of patients with stroke in clinical researches. As disability measurement, it is applied for evaluating the functional recovery as well as primary outcome of clinical research with patients with stroke.[7]

According to estimates of the World Health Organization (WHO) in 2009,[8] the undeveloped and developing countries present seven times higher Disability-adjusted Life Year (DALY), known as the number of years lived with disability, when compared to developed countries. Hence, institutional actions for extending rehabilitation programs to the greatest number of patients possible are required.

The rehabilitation facilities known as *Rede de Reabilitação Lucy Montoro*, established by the government of the state of Sao Paulo in Brazil, provide patients with multidisciplinary rehabilitation services.[9]

One of these facilities, the *Morumbi Unit*, in São Paulo, is part of the Institute of Physical Medicine and Rehabilitation (IMREA) of the *Hospital das Clínicas* – Faculty of Medicine of the University of Sao Paulo. This unit provide patients with individualized multidisciplinary and intensive physical rehabilitation program. It serves patients from the state of Sao Paulo as well as patients from all over Brazil.

It is, therefore, a reference institution for intensive rehabilitation programs for patients with stroke, which offers standardized treatment. Consequently, this facility is totally eligible for performing clinical investigation for the understanding how far the inpatient rehabilitation program contribute to the improvement of the patients.

OBJECTIVE

The objective of this study is to stablish how the rehabilitation program of the inpatient facility, the *Rede de Reabilitação Lucy Montoro* unit *Morumbi*, improves stroke patients functionality.

METHODS

This is a cross sectional and retrospective study that analyzed the first patients (2009-2010) and the last patients (2014-2015) with stroke sequelae hospitalized for a rehabilitation program in the *Rede de Reabilitação Lucy Montoro* unit *Morumbi*, Sao Paulo. This study was approved by the Ethics Review Board of the Hospital das Clínicas of the Faculty of Medicine of the University of Sao Paulo (CAAE: 27203714.0.0000.0068).

All participants undertook intensive and multidisciplinary rehabilitation program for six consecutive weeks, and received standard therapies as well as robotic and virtual reality therapies. The evaluation tool was the modified Rankin scale (mRS) that was applied at admission and discharge.[7] It was considered positive if the results were ≤ 3 at discharge.

The multidisciplinary rehabilitation approach of the *Rede de Reabilitação Lucy Montoro/IMREA* consists of weekly trainings with the following specialized services: physiotherapy, occupational therapy, physical conditioning, psychology, speech therapy, nutrition, nursing, and medical services. The week program is composed of sex 60-minute sessions of each service.

Along the physiotherapy sessions, the conventional therapies are usually composed of stretching and strengthening activities, mobility and functional training (active cycle ergometer for lower limbs, functional electrical stimulation (FES), orthostatism, balance and gait training, and body awareness exercises). Safety and activities of daily living (ADL) are also treated. Combined with these activities, whenever eligible for clinical research protocols, the patients would also receive some other type of therapy, such as robotic or virtual reality.

According to the Ranking scale, patients with scores 0 and 1 do not have sequelae or are considered as having the slightest sequelae, being, therefore, rated as independent. Scores 2 and 3 are given to patients with some sequelae, that can be considered as independent as before the stroke, once some adaptations and adjustments are made to their environment. These patients also have gait capacities. The patients with scores 4 and 5 in the mRS cannot walk on their owns and can be restricted to bed and constantly in need of a caregiver. The classification 6 of the mRS is only applied patients who died after the stroke.

The *Rede de Reabilitação Lucy Montoro/IMREA* has specific objectives for each classification of mRC.[10,11] However, individual goals has priority and demands that are noticed along the treatment are also considered objectives. The Ranking classification include the following therapy approaches:

Rankin 2: gait training with or without auxiliary devices, upper limb strengthening, ADL improvements, safe deglutition, and functional speech exercises;

Rankin 3: balance and therapeutic gait training, training on the use of mobility devices, general strengthening, spasticity treatment, and psychological support and pain treatment, whenever necessary.

Rankin 4-5: general strengthening, spasticity treatment, positioning in bed, training on the use of wheelchair, pressure ulcers prevention, deformity prevention, psychological support, pain treatment, and ADL improvements.

The data analysis firstly included a normality test, followed by t-test of the clinical and demographical characteristics of the patients at baseline. The comparisons within groups were performed with Wilcoxon statistical test, given the non-parametric characteristics of the data collected, whereas the comparisons between groups was tested with the Mann-Whitney statistical test. The results was considered statistically significant to any p-value <0.05. The data was analyzed by the statistical pack Statistica®, version 19.

RESULTS

The characteristics of the first and last groups of stroke patients (n=100) admitted to the rehabilitation program of the *Rede de Reabilitação Lucy Montoro/IMREA* are described in Table 1. All the subjects were admitted to the hospitalization rehabilitation program.

The table 2 shows the comparisons, intergroup and intragroup, of the mRS data at admission and discharge. There was significant progress when admissions and discharges are compared, regardless of the study group, however, there was no significant difference when both groups are compared, i.e. all patients were equally beneficiated by the rehabilitation program, but the progress of the first and last groups did not differ, according to the modified Rankin scale.

DISCUSSION

The WHO defines the rehabilitation as a set of measures that assist individuals achieve and maintain optimal functioning in interaction with their environments, by giving them the necessary tools and means to achieve the independence.[12,13]

Some studies have demonstrated that rehabilitation facilities specialized in treatments for patients with brain injuries provide better and faster functional recovery when compared to non-specialized services.[14,15]

The stroke patients treated at the *Rede de Reabilitação Lucy Montoro/IMREA*, a rehabilitation facility established at a major metropolitan area of a developing country, may still benefit, even at the chronic stages, differently from the findings of Chang et al.[14] and Stein et al.[15], whose patients aged 61.5 ± 14 and 72.2 ± 14 and undertook their rehabilitation services in South Korea and the USA, respectively. The high incidence of stroke in young adults is probably related to risk factors.[16] However, in both studies, the gender distribution and the stroke types were similar to the present study.

In regions with scarce resources, the intensive rehabilitation program of patients with stroke may be a suitable solution to rapidly improve the patient's functionality. Additionally, careful screening and early referrals are relevant for fast stroke recovery.

According to our results, there was functional improvements after the end of the rehabilitation program, which usually lasts from four to six weeks. The mRS has shown that the level of incapacity shifted from severe to moderate in both groups. In the study reported by Pak et al.[17] it is seen that after a rehabilitation program of three months 41.4% of their patients moved from Rankin 4 to Rankin 3, whereas in our study, this change was observed in 62% of the patients.

In another study conducted by our research group with other neurologic patients,[11] general improvements in the Functional Independence Measure (FIM) and mRS was observed after the rehabilitation program discharge, evidencing that the intensive rehabilitation program is relevant for a better result. Performance measurements for patients with stroke must consider the treatment for post-acute term; however, there are still insufficient specific indicators of quality or standards for stroke rehabilitation.[18]

The quality indicators were developed between January 2009 and February 2010, by an interdisciplinary board of healthcare professionals of rehabilitation facilities cooperating in the Berlin Stroke Alliance. The indicators were developed according to international recommendations and predefined methodological requirements. According to Grube et al.,[18] the indicators measure processes (9 indicators), outcomes (5 indicators), and rehabilitation structures (4 indicators). The domains of the indicators are completion of diagnostics, secondary prevention, cognition and affect, speech and swallowing, management of complications, sensorimotor functions and mobility, discharge status, and aftercare.

Patients with severe stroke, usually those with limited potential for improvements, achieved functional progress after intensive multidisciplinary rehabilitation care. In countries in which scarce budget is allocated in the health sector, where socioeconomic inequalities are significant, the patients with neurological disorders such as stroke may benefit from short term rehabilitation programs, even during the sub-acute period of their brain injury. Still the screening must be meticulous and the treatment must be early initiated, so that the program yields the best response with the lowest cost possible.[19]

We emphasize that, after the hospital discharge of the stroke patients, the referrals to rehabilitation programs must be done the earliest possible. However, due to precarious health systems in developing countries, such as Brazil, these patients rarely initiate the rehabilitation program short after the stroke event. By comparing both groups of our study, however not statistically significant, there is an important reduction of the time after stroke of the patients at admission. This may be due to greater awareness of the general population, greater access to healthcare services in our state, and the strengthening and the opportunities offered at the *Rede de Reabilitação Lucy Montoro/IMREA*. The early admission is important for the patients rehabilitation, as shown in previous studies.[20,21]

Even though this research has shown that stroke patients with greater severity achieved functional progress after receiving multidisciplinary rehabilitation care, our study have some limitations regarding the sample size and the lack of a comparator. Nevertheless, as Jorge et al.[11] claims, control groups, untreated or placebo, may raise concerns on ethics issues. Greater evidences could have been collected if other comparisons, such as upper and lower limbs capacities, gait and balance and other domains, however.

Table 1. Clinical and demographic characteristics

Characteristics	First group*	Last group*	p-value
Age (years)	57 (51-66)	57.5 (45-68)	0.76
Stroke type			
Ischemic stroke	64% (25)	81% (73)	0.0001
Hemorrhagic stroke	36% (14)	17% (15)	
Both		2% (2)	
Gender			
Male	57% (22)	43%(39)	0.24
Female	43% (17)	57%(51)	
Months after stroke	28 (10-172)	16 (9-30)	0.45

*Median

Table 2. Progress of the treatment, as measured by mRS

	Admission*	Discharge*	p-value
First group	4(3-4)	3(3-4)	0.0001
Last group	4(3-4)	3(2-4)	0.0001
p-value	0.71		

*Median

At last, we believe that the significant improvements measured by the modified Rankin scale, as demonstrated in our results, reflect the real conditions of the patients who are admitted to a rehabilitation service, as well as the real effect of an intensive and multidisciplinary rehabilitation program. This is an important step for validating the functional benefits the patients may receive, once they have access to our institution and our model of treatment, which is the hospitalized intensive and multidisciplinary rehabilitation program.

CONCLUSION

Patients with sequelae of stroke benefit from short term intensive multidisciplinary rehabilitation programs. This model of treatment, in which the patients is hospitalized along the rehabilitation program, yielded significant functional improvements for these patients.

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