

## Functional independence index of patients submitted to multiprofessional rehabilitation program after cerebrovascular accident

### *Índice de independência funcional de pacientes pós-acidente vascular cerebral submetidos a um programa de reabilitação multiprofissional*

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**ABSTRACT:** A cerebrovascular accident (CVA) can cause death or motor and functional consequences of variable intensity. This study analyzed the rate of functional independence of patients after a cerebrovascular accident and a multi professional rehabilitation program. This was a retrospective research analyzing the medical charts of middle cerebral artery stroke survivors, admitted to a public hospital at Curitiba-Paraná between 2014 and 2019. The participants were analyzed at admission and discharge using the Modified Rankin Scale (mRS). The Chi-Squared test, Mann-Whitney test and Wilcoxon tests were applied, considering  $p < 0.05\%$ . The sample was composed of 64 patients, mainly men (56%), with a mean age of 59 years old. The main stroke sequelae were motor deficit (98%), dysarthria (51%), aphasia (46%), pain (45%) and urinary incontinence (42%). There was a significant difference between the mRS scores at admission and discharge, with greater functional independence after the proposed rehabilitation program ( $p < 0.001$ ). It is concluded that participation in the program led to increased autonomy in self-care and daily activities for the patients.

**Keywords:** Stroke; Physical and rehabilitation medicine; Comorbidity; Activities of daily living.

**RESUMO:** Acidente Vascular Cerebral (AVC) pode causar óbito ou sequelas motoras e funcionais de intensidade variável. O objetivo do estudo foi avaliar o índice de independência funcional de pacientes pós-Acidente Vascular Cerebral submetidos a um programa de reabilitação multiprofissional. Trata-se de estudo retrospectivo por meio de revisão dos prontuários de sobreviventes de lesão vascular na artéria cerebral média, admitidos entre 2014 e 2019 em hospital público de Curitiba - Paraná, e que foram analisados na admissão e na alta por meio da Escala de Rankin modificada (mRS). Foram aplicados teste Qui-Quadrado, Mann-Whitney e Wilcoxon, considerando  $p < 0,05\%$ . A amostra, composta por 64 pacientes, teve predomínio masculino (56%), faixa etária média de 59 anos, e apresentou como sequelas principais déficit motor (98%), disartria (51%), afasia (46%), dor (45%) e incontinência urinária (42%). Houve diferença significativa entre os escores aferidos por meio da mRS na admissão e na alta, com maior independência funcional após realização do programa de reabilitação proposto ( $p < 0,001$ ). Conclui-se que a participação no programa refletiu em ganho de autonomia no autocuidado e na realização de atividades diárias pelos pacientes.

**Palavras-chave:** Acidente vascular cerebral; Medicina física e reabilitação; Comorbidade; Atividades cotidianas.

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## INTRODUCTION

A cerebrovascular accident (CVA) is a debilitating event that reduces patients' quality of life and independence<sup>1</sup>. It is caused by a focal reduction of blood flow in the territory of an artery that feeds part of the brain, causing cell death<sup>2</sup>. In 85% of cases, strokes are ischemic, meaning they result from an arterial obstruction caused by thrombi or emboli in determined areas of the brain, among which the middle cerebral artery (MCA) is the most affected<sup>3</sup>. The classic presentation includes hemiparesis or hemiplegia on the contralateral side of the body, ataxia, dysarthria, visual changes, and vertigo<sup>4</sup>.

The incidence of stroke increases directly in relation to the elevation of systolic and diastolic arterial blood pressure. Arterial hypertension is the most significant risk factor for CVA, whether isolated or associated with diabetes mellitus, dyslipidemia, obesity, physical inactivity, previous stroke or transient ischemic attack (TIA), nonvalvular atrial fibrillation, smoking, sickle cell anemia, advanced age, sleep apnea, and other factors<sup>5</sup>.

About 15% of stroke patients die from complications within the first 3 months after the event, and survivors have sequelae of varying intensity<sup>6</sup>. It is estimated that 25% to 74% of the 50 million stroke survivors in the world cope with physical, cognitive, or emotional deficits, requiring some assistance or being fully dependent in their activities of daily living. The World Health Organization (WHO) characterizes disability as the outcome of a dynamic and complex interaction between health conditions (injuries, diseases, etc.), personal factors (lifestyle, age, level of education, etc.), and environmental factors<sup>7</sup>.

The modified Rankin Scale (mRS) is widely used to measure functional abilities impaired by a stroke, as it is an easy and fast to apply instrument with a reliability index of 0.45<sup>8</sup>. This instrument evaluates and monitors the evolution of the clinical picture, allowing to classify neurological impairment according to dependence in daily activities and to plan the treatment approach<sup>8,9</sup>.

The mRS classifies disability and dependence in activities of daily living after a stroke into six degrees. Grade zero indicates individuals with no symptoms; grade one indicates patients who have symptoms but are able to carry out their previous usual activities; grade two indicates individuals who are unable to carry out all previous usual activities but are able to meet their physiological needs without assistance. Grade three patients require some help with their personal needs but are able to walk without assistance; when unable to walk without assistance and to attend to physiological needs, they are classified as grade four. Grade five indicates bedridden individuals who are usually incontinent and, finally, grade six corresponds to death<sup>8</sup>.

Considering the prevalence of stroke and the individual, social and economic impact of its sequelae, this

study evaluated the profile and functional independence index of patients after a middle cerebral artery stroke and multidisciplinary treatment in a rehabilitation hospital.

## METHODOLOGY

This is a retrospective study carried out through the analysis of electronic medical records of patients admitted between January 2014 and December 2019 in a twelve-month multi-professional rehabilitation program in a public hospital in Curitiba - Paraná.

The sample was intentional and selected consecutively and by convenience. Adults of both genders with sequelae of middle cerebral artery ischemic stroke were included. Participants were evaluated with the modified Rankin Scale (mRS) at admission and at discharge from this program. Patients who did not complete the treatment due to abandonment or death, who already had physical disabilities associated with another cause, who had a hemorrhagic complication and those with incomplete medical records were excluded.

The following data were collected: gender, age at the stroke, time of rehabilitation, time between the stroke and the beginning of rehabilitation, associated comorbidities (diabetes mellitus, systemic arterial hypertension, atrial fibrillation, obesity, dyslipidemia and others), polypharmacy, use of antiplatelet drugs or anticoagulants before the stroke, affected cerebral hemisphere, stroke sequelae (dysphagia, motor deficit, dysarthria, aphasia, urinary incontinence, epilepsy, mental confusion, pain and depression), smoking, family history of thrombus (stroke, infarction or deep vein thrombosis) and modified Rankin scale classification. The mRS<sup>8,9</sup> is used in this rehabilitation center to assess the patient's condition and determine the level of neurological impairment on admission and its evolution with improvement or not at discharge. An improvement of 1 point on the scale is considered a favorable result.

The multidisciplinary team of the institution is composed of a social worker, a nurse, a physical therapist, a speech therapist, an occupational therapist, a neurologist, a psychologist, and a nutritionist. The protocol of this center is applied to patients in a stable clinical condition that can not be worsened by rehabilitation, and who had a deficit or neurological sequelae caused by the last neurological event, affecting their independence on locomotion, activities of daily living, language, and/or eating. Participants needed to be able to attend appointments for an expected duration of one year or until reaching mobility and independence in activities of daily living. For those with a stable condition, an additional time of treatment of 1 month was provided in order to achieve this goal. Then, patients were discharged, and their families received guidance to care for them at home.

Categorical variables (gender, race, smoking, age

below 60 years, family history of thrombus, comorbidities, use of continuous medication, polypharmacy, use of acetylsalicylic acid before the stroke, use of anticoagulants before the stroke, affected hemisphere, stroke sequelae, mRS score before and after rehabilitation) were presented as absolute frequency (f) and percentage (%). Continuous variables (age, time between stroke and beginning of rehabilitation, and time of rehabilitation) were presented as mean  $\pm$  standard deviation. Descriptive statistical analysis was conducted in the Microsoft Office Excel® 2019 program.

The Chi-square test or Fisher's Exact Test were used, as appropriate, to assess the associations between the dichotomous variables of interest and the outcome (improvement or not). Non-parametric Mann-Whitney tests were used to assess whether there was a difference between the admission and discharge from rehabilitation, as the data collected did not follow a normal distribution, according to the D'Agostino & Pearson test. The comparison between the patients' grades at the beginning and end of treatment was evaluated by the non-parametric Wilcoxon test (ZAR, 2009). Statistical analyzes were performed using the GRAPHPAD PRISM statistical program. The significance level was set at 5% ( $\alpha = 0.05$ ).

The study was approved by the Ethics and Research Committee of the Health Department of the State of Paraná on July 5, 2019 under opinion number 3,341,276 (CAAE:

11829719300000093). The study followed Resolution 466/2012 of the National Health Council.

## RESULTS

After applying the inclusion criteria, 64 participants were included in the sample, of which 36 (56.2%) were men and 28 (43.7%) were women, 57 (89%) were Caucasian and 35 (54.7%) were aged 60 or older (age group: 20 to 84 years old). The mean age of patients who started the rehabilitation treatment was 59.4 years, with a median of 63 years, mode of 64 years, and standard deviation of  $\pm 16.12$  years for both genders (Table 1). The analysis of the age of men and women at the time of the stroke revealed a level of significance of 59.7% for men (standard deviation = 19.93) and 58.9% for women (standard deviation = 12.69), with  $p = 0.85$ , demonstrating no age difference between men and women at the time of the stroke.

Among the comorbidities prior to the stroke, the most common was dyslipidemia, present in 47 (73.4%) patients, of which 26 (40.6%) were men and 21 (32.8%) were women. Systemic arterial hypertension affected 44 (68.7%) patients, of which 27 (42.2%) were male and 17 (26.5%) were female. Fifteen (23.4%) patients had diabetes mellitus, of which 9 (14%) were men and 6 (9.4%) were women, and only 3 (4.7%) men in the sample had a diagnosis of atrial fibrillation (Table 1).

**Table 1** - Characterization of patients who had a stroke regarding age at the time of the event, the hemisphere affected, and stroke sequelae

Age group at the time of the stroke	male		female		total	
	n	%	n	%	no	%
<50 years	8	12.5	9	14	17	26.5
50-59 years	8	12.5	4	6.2	12	18.7
60-69 years	14	21.8	1	1.5	15	23.3
70-79 years	3	4.7	11	17.2	14	21.9
$\geq 80$ years	3	4.7	3	4.7	6	9.4
<i>Total</i>	<i>36</i>	<i>56.2</i>	<i>28</i>	<i>43.6</i>	<i>64</i>	<i><math>\approx 100</math></i>
Affected hemisphere	male		female		total	
	n	%	n	%	no	%
Right	9	14	16	25	25	39
Left	23	35.9	16	25	39	60.9
<i>Total</i>	<i>32</i>	<i>50</i>	<i>32</i>	<i>43.7</i>	<i>64</i>	<i><math>\approx 100</math></i>
Variables*	male		female		total	
	n	%	n	%	no	%
Atrial fibrillation	3	4.7	0	0	3	4.7
Diabetes mellitus	9	14	6	9.4	15	23.4
Systemic Arterial Hypertension	27	42.2	17	26.5	44	68.7
Dyslipidemia	26	40.6	21	32.8	47	73.43

\* Note for calculation: as the same patient may have more than one comorbidity, the total will exceed the number of patients in the sample (64).

At the time of the stroke, 21 (34%) patients were smokers. The assessment of family history of stroke, acute myocardial infarction and deep vein thrombosis showed that 36 (56%) of the patients had a family history of at least one of these factors.

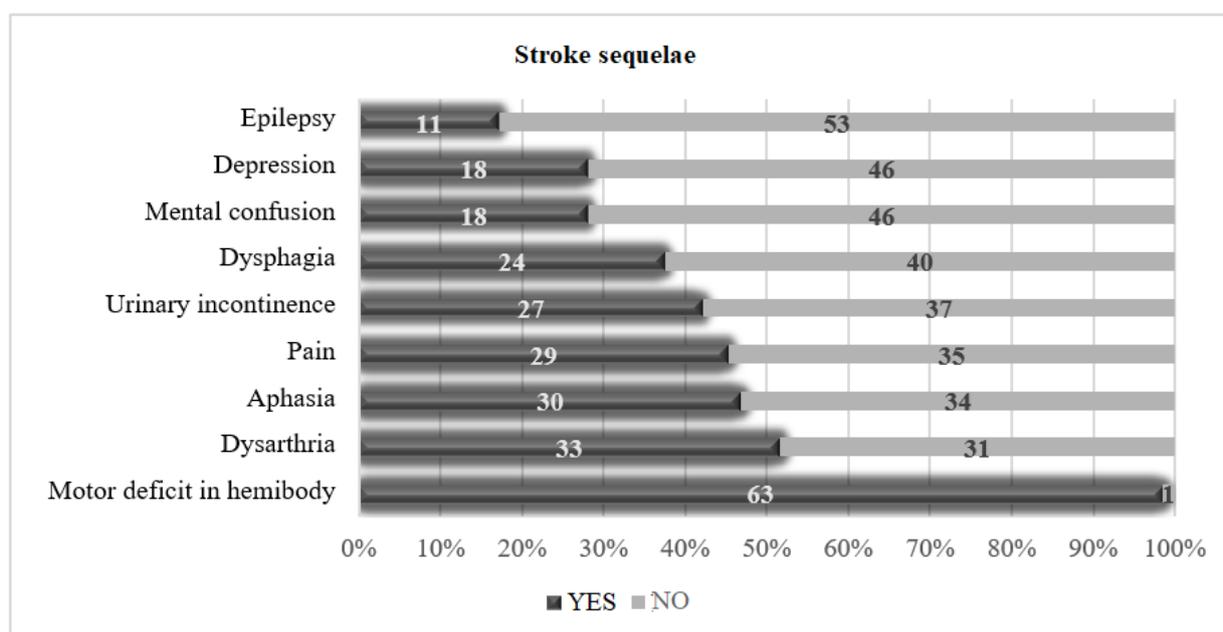
As for the post-stroke comorbidities investigated in the present study, 9 (14%) patients did not have any of them (5 men and 4 women). A total of 15 (23.4%) patients (9 men and 6 women) had one comorbidity, 26 (40.6%) patients had two comorbidities (14 men and 12 women), 13 (20.3%) patients (9 men and 4 women) had three comorbidities and only 1 (1.5%) male patient had four comorbidities.

The median time taken before beginning rehabilitation was 2 months (IQR=1 to 5 months), with a minimum of 0 months, that is, immediately after the

stroke, and a maximum of 28 months. As for the time on rehabilitation, the median was 9 months (IQR=5 to 14 months), with a minimum of 0 months and a maximum of 50 months.

About 57 (89%) patients used up to 3 daily continuous medications and 39 (60%) were on polypharmacy, that is, used four or more medications every day. Among the medications used before the stroke, 37 (59%) patients used antiplatelet drugs and 8 (12.5%) used oral anticoagulants.

Regarding the physical and mental effects of stroke, 63 (98%) patients had motor deficit in a hemibody, 33 (51%) had dysarthria, 30 (46%) had aphasia, 29 (45%) had pain, 27 (42%) had urinary incontinence, 24 (37.5%) had dysphagia, 18 (28%) had mental confusion, 18 (28%) had depression, 11 (17%) had epilepsy (Figure 1).



**Figure 1** – Characterization of patients who had a stroke according to its sequelae

At admission, 40 (62.5%) patients had a modified Rankin Scale (mRS) score of 4. At discharge, 43 (67%) patients had an improvement of at least one point in the mRS score compared to baseline, 19 (29.6%) had no change, and 2 (3%) had worse functional independence than at admission. (Table 2). The statistical data regarding the Rankin Scale score at admission showed a minimum value of 1, first quartile (25th percentile) of 4, median (50th percentile) of 4, third quartile (75th percentile) of 4 and maximum value of 5. At discharge, the mRS score

had a minimum value of 1, first quartile (25th percentile) of 3, median (50th percentile) of 3, third quartile (75th percentile) of 4 and maximum value of 5.

At admission, the median Rankin score was 4 (IIQ=0), with a minimum value of 1 and a maximum of 5. At discharge, the median value was 3 (IIQ=1), with a minimum value of 1 and maximum of 5. The p-value shown in Table 2 was calculated using the Wilcoxon non-parametric hypothesis test, also known as the Wilcoxon signed-rank test.

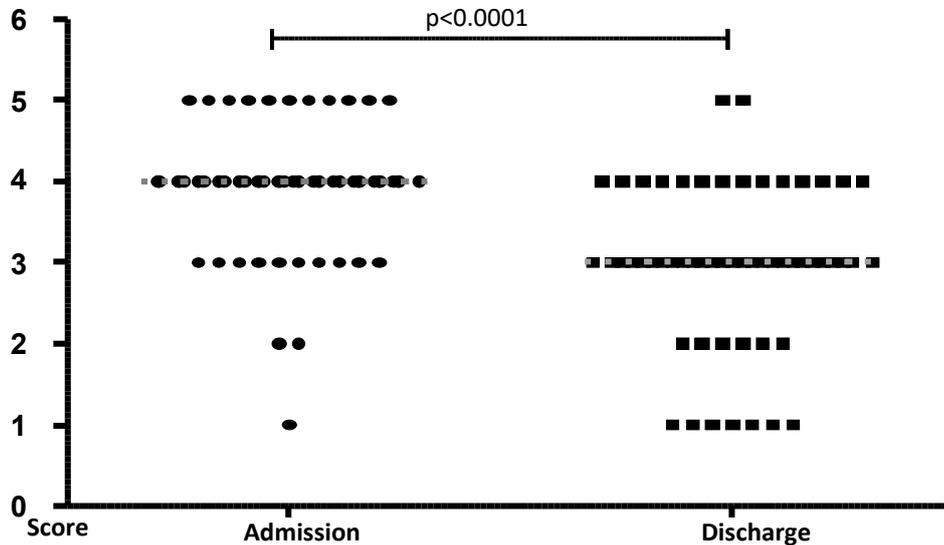
**Table 2** – Median, minimum, quartile, and maximum Rankin scale values of 64 patients at admission and discharge

Rank	Median	Minimum	Quartile 1	Quartile 3	Maximum	p
Admission	4	1	4	4	5	<0.001
Discharge	3	1	3	4	5	

mRS = Modified Rankin Scale

The data show a significant difference between admission and discharge mRS grades, with lower values at discharge, as shown in Table 2. For better understanding

and elucidation, Figure 2 shows the distribution of patients according to admission and discharge Rankin score.



Note: Balls and squares represent the quantity of patients. Grey balls represent the median

Figure 2 – Distribution according to Rankin grade at admission and discharge of the 64 patients with stroke sequelae

## DISCUSSION

This study focused on cases of ischemic strokes of the middle cerebral artery, as they are the most frequent stroke type<sup>3</sup>. The sample had more males (56.2%), which is similar to other Brazilian studies which found a prevalence of men of 55% and 58%<sup>10,11</sup>. At younger ages, women have a higher risk of stroke due to pregnancy and puerperium. It is estimated that the incidence of stroke associated with pregnancy and puerperium varies between 25 and 34 cases per 100 000 deliveries. These cases are probably related to arterial hypertension, but other factors may affect the risk of stroke during pregnancy, such as hemodynamic changes, hypercoagulability, and possible changes in the cerebral arterial system<sup>12</sup>. However, in general, prevalence is even higher in men<sup>10,11</sup>.

Regarding the age group, the event affected the population over 60 years of age (54.7%), with a mean age of 59 years old. This age is lower than that found in a study conducted in Minas Gerais, in which the mean age was 64.3 years old<sup>11</sup>. The reduction may have been caused by the percentage of participants (26.6%) under 50 years old at the time of stroke, a rate higher than that found in previous studies, which estimate that young adults represent approximately 10% of stroke cases<sup>13</sup>.

The growth in the percentage of young adults among ischemic stroke patients has been reported in previous studies<sup>12,14</sup> and may be a consequence of the increase in diseases such as Diabetes Mellitus and obesity among this

population<sup>15,16</sup>. Among the patients under 50 years old in this study, one had Systemic Lupus Erythematosus and was using Combined Oral Contraceptives, attributed as the cause, and the others had no associated comorbidity or possible causal factor. The predominance of white individuals (87.5%) was compatible with the racial makeup of the South region of the country<sup>17</sup>.

The World Health Organization (WHO) estimates that about 62% of strokes are attributable to high blood pressure<sup>18</sup>. In this study, 68% of patients had systemic arterial hypertension and 75% had dyslipidemia, which are factors strongly associated with ischemic strokes<sup>19</sup>, as they are atherogenic factors.

An international case-control study encompassing 22 countries and 3000 patients, known as INTERSTROKE, revealed that ten modifiable risk factors accounted for 90% of the risk of stroke. These factors included hypertension, smoking, waist-to-hip ratio, diet, physical activity, diabetes mellitus, alcohol intake, stress and depression, cardiac disease, and ratio of apolipoprotein B to A1<sup>9</sup>.

In addition, another known risk factor for ischemic stroke is Atrial Fibrillation (AF). This heart disease leads to dysfunction in the left atrium, causing stasis of blood and, consequently, thrombus formation and embolization of the brain, resulting in acute arterial occlusion and tissue ischemia<sup>20</sup>. It is estimated that 15% of strokes are attributed to cardioembolic events secondary to AF. In the present sample, 4.7% of the patients had a diagnosis of AF before the stroke. Among these, one was using antiplatelet drugs,

one was using anticoagulants, and one was using both before the stroke, aiming to prevent new events.

Even though the prevalence of smoking is decreasing, it still represents an important modifiable risk factor for cardiovascular diseases. In this sample, 21 patients (34%) had a smoking habit at the time of the stroke. It is estimated that the risk of stroke increases by 2 to 4 times among smokers<sup>21</sup>. According to Vigitel/2019, 9.8% of adults are smokers in Brazil, with 12.3% of men and 7.7% of women with this habit<sup>22</sup>. Smoking even one cigarette a day is associated with a 25% increase in the risk of stroke when compared to non-smokers<sup>23</sup>.

Polypharmacy<sup>24</sup>, which was detected in 60% of the patients in the present study, can be interpreted as a possible reflection of concomitant chronic non-communicable diseases<sup>25</sup>, increased life expectancy, and greater availability of medicines on the market<sup>26</sup>.

In this sample, the mean time before starting rehabilitation was 141 days. The longest time before starting rehabilitation was 865 days and the shortest was 2 days. Ideally, rehabilitation therapy should be initiated immediately after the clinical stabilization of the patient. The real impact of stroke must be considered not only in terms of incidence and mortality rates, but also in terms of disability, which requires long-term care<sup>27</sup>. These heterogeneous numbers can probably be attributed to the high demand for this health care service, the low number of vacancies and the difficulties to follow the protocol.

The mean treatment period was 314 days, which corresponds to the maximum 12-month treatment offered by the institution, due to its high demand. After this period, the family members receive instructions to continue the stimulation and exercises with the patient at home and keep their outpatient follow-up. Teamwork and social support network are important factors for patients to keep improving their physical and psychological state.

Regarding the physical and mental effects of strokes, it is estimated that 35% of patients will develop cognitive disorders up to three months after the stroke<sup>28</sup> and that 28% to 79% of stroke survivors will have urinary incontinence, with detrusor hyperactivity as the most common type of incontinence found in urodynamic studies<sup>29</sup>. In the present sample, 42% of the patients developed urinary incontinence and 28% had some degree of cognitive impairment. Difficulty retaining urine can be a result of damage to neurological pathways or be secondary to cognitive deficit

and difficulty in locomotion and communication. Urinary incontinence has a direct impact on the patient's well-being, as it may lead to embarrassment, costs with disposable diapers, social isolation, and decreased quality of life.

The functional independence index of the mRS aims to measure the degree of disability and dependence in activities of daily living<sup>8</sup>, serving as an instrument to evaluate functional recovery after a stroke<sup>30</sup>. A study carried out by Park. et al.<sup>31</sup> found that 41.4% of patients with mRS 4 progressed to mRS 3 after rehabilitation. Among the patients treated in this study, 65.8% of those with mRS 4 at the time of admission had an mRS of 3 or less at discharge, which was a clinically positive outcome.

The Ministry of Health recommends early rehabilitation, as proper recovery can reduce disabilities and promote early return to activities<sup>32</sup>. Patients who received care in centers specialized in brain injury rehabilitation had better functional independence when compared to non-specialized centers<sup>33</sup>.

Some of the limitations of this research are its small sample size, its restriction to a single public center, and the absence of a control group. However, the results obtained show that, despite the various previous comorbidities, the differences in time of beginning of rehabilitation and in the rehabilitation time, most patients had an improvement in the clinical picture after the stroke. The multiprofessional rehabilitation strategy did not lead to full recovery, but it reduced dependence on family members and caregivers, promoting improvement in autonomy and quality of life.

Prospective studies should be conducted to analyze the variation of outcomes in relation to physical activity, obesity, and social factors. Studies that demonstrate the differences between hospital and home rehabilitation can also help to provide better care and search for expanded patient care.

## FINAL CONSIDERATIONS

The results obtained reveal that the rehabilitation program led to improvement in the rates of functional independence of patients after middle cerebral artery stroke.

Preventive strategies associated with modifiable risk factors, early diagnosis and treatment of stroke, and access to specialized centers can contribute to adequate care for cases, minimizing consequences.

**Participation of the authors:** *Gabriela Luiza Gentilini*: participated in the elaboration of the research project and study design, as well as in the design of the type of study, the definition of the data collection location, data collection, and preparation of spreadsheets related to data collection. *Larissa Nicolini de Santa*: participated in the elaboration of the research project and study design, data collection and analysis, and elaboration and interpretation of graphs and tables for data presentation. *Monica Baratto Vedovatto*: participated in the elaboration of the research project and study design, data collection, literature review and review of scientific articles for the elaboration of the discussion, and comparative analysis of the data. *Paula Hirai*: participated in the elaboration of the research project and study design, as well as in the design of the type of study, definition of the data collection location, data collection, elaboration of spreadsheets related to data collection. *Valquíria Custodio Klaumann*: participated in the elaboration of the research project and study design, data collection, literature review and review of scientific articles for the elaboration of the discussion, and comparative data analysis. *Kátia Sheylla Malta Purim*: participated in the elaboration of the research project and study design, literature review and review of scientific articles for the elaboration of the discussion and comparative data analysis, and data interpretation.

## REFERENCES

1. Norrving B, Kissela B. The global burden of stroke and need for a continuum of care. *Neurology*. 2013;80(3 Suppl.2):5-12. <https://doi.org/10.1212/WNL.0b013e3182762397>
2. Sacco RL, Kasner SE, Broderick JP, Caplan LR, Connors JJ, Culebras A, et al. An updated definition of stroke for the 21st century: A statement for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2013;44(7):2064-89. <https://doi.org/10.1161/STR.0b013e318296aeca>
3. Piassaroli CAP, de Almeida GC, Luvizotto JC, Suzan ABBM. Modelos de reabilitação fisioterápica em pacientes adultos com sequelas de AVC isquêmico. *Rev Neurocienc*. 2012;20(1):128-37. <https://doi.org/10.34024/rnc.2012.v20.10341>
4. Gibson CL, Attwood L. The impact of gender on stroke pathology and treatment. *Neurosci Biobehav Rev*. 2016;67:119-24. <https://doi.org/10.1016/j.neubiorev.2015.08.020>
5. Guzik A, Bushnell C. Stroke epidemiology and risk factor management. *Contin Lifelong Learn Neurol*. 2017;23(1):15-39. <https://doi.org/10.1212/CON.0000000000000416>
6. Urban PP, Wolf T, Uebele M, Marx JJ, Vogt T, Stoeter P, et al. Occurrence and clinical predictors of spasticity after ischemic stroke. *Stroke*. 2010;41(9):2016-20. <https://doi.org/10.1161/STROKEAHA.110.581991>
7. Carmo JF, Oliveira ERA, Morelato RL. Incapacidade funcional e fatores associados em idosos após o acidente vascular cerebral em Vitória – ES, Brasil. *Rev Bras Geriatr Gerontol*. 2016;19(5):809-18. <https://doi.org/10.1590/1809-98232016019.150215>
8. de Brito RG, Lins LCRF, Almeida CDA, Neto ESR, de Araújo DP, Franco CIF. Instrumentos de avaliação funcional específicos para o acidente vascular cerebral. *Rev Neurociencias*. 2013;21(4):593-9. <https://doi.org/10.34024/rnc.2013.v21.8145>
9. Brasil F. Avaliação da funcionalidade de pacientes com sequelas de acidente vascular cerebral através da escala de Rankin. *Fisioter Bras*. 2018;19(5):1-8. <https://doi.org/10.33233/fb.v19i5.2622>
10. Rodrigues ESR, Castro KAB, Rezende AAB, Herrera SDSC, Pereira AM, Takada JAP. Fatores de risco cardiovascular em pacientes com acidente vascular cerebral. *Amaz Sci Heal*. 2013;1(2):21-8. Disponível em: <http://ojs.unirg.edu.br/index.php/2/article/view/472>
11. Mourão AM, Vicente LCC, Chaves TS, Sant'Anna RV, Meira F de C, Xavier RM de B, et al. Perfil dos pacientes com diagnóstico de AVC atendidos em um hospital de Minas Gerais credenciado na linha de cuidados. *Rev Bras Neurol*. 2017;53(4):12-6. <https://doi.org/10.46979/rbn.v53i4.14634>
12. Correia JP, Figueiredo AS, Costa HM, Barros P, Veloso LM. Investigação etiológica do acidente vascular cerebral no adulto jovem. *Med Interna (Bucur)*. 2018;25(3):213-23. <https://doi.org/10.24950/rspmi/revisao/200/3/2018>
13. Henriques M, Henriques J, Jacinto J. Acidente vascular cerebral no adulto jovem: a realidade num Centro de Reabilitação. *Rev Soc Port Med Física Rehabil*. 2015;27(1):9-13. <http://dx.doi.org/10.25759/spmfr.180>
14. Renna R, Pilato F, Profice P, Della Marca G, Broccolini A, Morosetti R, et al. Risk factor and etiology analysis of ischemic stroke in young adult patients. *J Stroke Cerebrovasc Dis*. 2014;23(3):1-7. <https://doi.org/10.1016/j.jstrokecerebrovasdis.2013.10.008>
15. Mamed SN, Ramos AMDO, De Araújo VEM, De Jesus WS, Ishitani LH, França EB. Perfil dos óbitos por acidente vascular cerebral não especificado após investigação de códigos garbage em 60 cidades do Brasil, 2017. *Rev Bras Epidemiol*. 2019;22(Suppl 3). <https://doi.org/10.1590/1980-549720190013.supl.3>
16. Flegal KM, Kruszon-Moran D, Carroll MD, Fryar CD, Ogden CL. Trends in obesity among adults in the United States, 2005 to 2014. *JAMA*. 2016;315(21):2284-91. <https://doi.org/10.1001/jama.2016.6458>
17. Lotufo PA, Bensenor IJM. Raça e mortalidade cerebrovascular no Brasil. *Rev Saude Publica*. 2013;47(6):1201-4. <https://doi.org/10.1590/S0034-8910.2013047004890>
18. Soler EP, Ruiz VC. Epidemiology and risk factors of cerebral ischemia and ischemic heart diseases: similarities and differences. *Curr Cardiol Rev*. 2010;6(3):138-49. <https://doi.org/10.2174/157340310791658785>
19. O'Donnell MJ, Xavier D, Liu L, Zhang H, Chin SL, Rao-Melacini P, et al. Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): a case-control study. *Lancet*. 2010;376(9735):112-23. [https://doi.org/10.1016/S0140-6736\(10\)60834-3](https://doi.org/10.1016/S0140-6736(10)60834-3)
20. Boehme AK, Esenwa C, Elkind MSV. Stroke risk factors, genetics, and prevention. *Circ Res*. 2017;120(3):472-95. <https://doi.org/10.1161/CIRCRESAHA.116.308398>
21. Instituto Nacional de Câncer (INCA). Doenças relacionadas ao tabagismo. Rio de Janeiro; 2020. Disponível em: <https://www.inca.gov.br/observatorio-da-politica-nacional-de-controle-do-tabaco/doencas-relacionadas-ao-tabagismo>
22. Instituto Nacional de Câncer (INCA). Dados e números da prevalência do tabagismo. Rio de Janeiro; 2020. Disponível em: <https://www.inca.gov.br/observatorio-da-politica-nacional-de-controle-do-tabaco/dados-e-numeros-prevalencia-tabagismo>
23. Hackshaw A, Morris JK, Boniface S, Tang JL, Milenkovi D. Low cigarette consumption and risk of coronary heart disease and stroke: meta-analysis of 141 cohort studies in 55 study reports. *BMJ*. 2018;360:1-15. <https://doi.org/10.1136/bmj.j5855>
24. Nascimento RCRM, Álvares J, Junior AAG, Gomes. Isabel Cristina, Silveira MR, Costa EA, et al. Polifarmácia: uma realidade na atenção primária do Sistema Único de Saúde. *Rev Saude Publica*. 2017;51(2:19s):1-12. <https://doi.org/10.11606/S1518-8787.2017051007136>
25. Schmidt MI, Duncan BB, E Silva GA, Menezes AM, Monteiro

- CA, Barreto SM, et al. Doenças crônicas não transmissíveis no Brasil: carga e desafios atuais. *Lancet*. 2011;377(9781):1949-61. [https://doi.org/10.1016/S0140-6736\(11\)60135-9](https://doi.org/10.1016/S0140-6736(11)60135-9)
26. Marković-Peković V, Škrbić R, Petrović A, Vlahović-Palčevski V, Mrak J, Bennie M, et al. Polypharmacy among the elderly in the Republic of Srpska: extent and implications for the future. *Expert Rev Pharmacoecon Outcomes Res*. 2016;16(5):609-18. <https://doi.org/10.1586/14737167.2016.1115347>
27. Anderle P, Rockenbach SP, de Goulart BNG. Reabilitação pós-AVC: identificação de sinais e sintomas fonoaudiológicos por enfermeiros e médicos da Atenção Primária à Saúde. *Codas*. 2019;31(2):1-7. <https://doi.org/10.1590/2317-1782/20182018015>
28. Pantoni L, Gorelick P. Advances in vascular cognitive impairment 2010. *Stroke*. 2011;42(2):291-3. <https://doi.org/10.1161/STROKEAHA.110.605097>
29. Tuong NE, Klausner AP, Hampton LJ. Uma revisão da incontinência urinária pós-AVC. *Can J Urol Int*. 2016;23(3):8265-70. Disponível em: <https://www.canjurol.com/abstract.php?ArticleID=&version=1.0&PMID=27347618>
30. Filippo TRM, Alfieri FM, Daniel CR, Souza DR de, Battistella LR. Modelo de reabilitação hospitalar após acidente vascular cerebral em país em desenvolvimento. *Acta Fisiátrica*. 2017;24(1):44-7. <https://doi.org/10.5935/0104-7795.20170009>
31. Park YH, Jang JW, Park SY, Wang MJ, Lim JS, Baek MJ, et al. Executive function as a strong predictor of recovery from disability in patients with acute stroke: a preliminary study. *J Stroke Cerebrovasc Dis*. 2015;24(3):554-61. <https://doi.org/10.1016/j.jstrokecerebrovasdis.2014.09.033>
32. Brasil. Ministério da Saúde, Secretaria de Atenção à Saúde, Departamento de Ações Programáticas Estratégicas. Diretrizes de atenção à reabilitação da pessoa com acidente vascular cerebral. Brasília: Brasília; 2016. Disponível em: [https://bvsms.saude.gov.br/bvs/publicacoes/diretrizes\\_reabilitacao\\_acidente\\_vascular\\_cerebral.pdf](https://bvsms.saude.gov.br/bvs/publicacoes/diretrizes_reabilitacao_acidente_vascular_cerebral.pdf)
33. Stein J, Bettger JP, Sicklick A, Hedeman R, Magdon-Ismail Z, Schwamm LH. Use of a standardized assessment to predict rehabilitation care after acute stroke. *Arch Phys Med Rehabil*. 2015;96(2):210-7. <https://doi.org/10.1016/j.apmr.2014.07.403>

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