

UNIVERSITY STUDENTS' KNOWLEDGE AND PERCEIVED ADEQUATE CONDUCT IN CASES OF ACUTE STROKE

CONHECIMENTO DOS ESTUDANTES UNIVERSITÁRIOS E PERCEÇÃO DA CONDUTA ADEQUADA EM CASOS ACIDENTE VASCULAR CEREBRAL

Vanessa Figueiredo MONTELEONE¹; Cassia PRAMIO²; Eraldo Schunk SILVA³; Mauro Pedro da CUNHA⁴; Lucia Elaine Ranieri CORTEZ⁵

1. Medicine's Academic at Cesumar University, UniCesumar, Maringá, Paraná; 2. Medicine's Academic at Cesumar University, UniCesumar, Maringá, Paraná. Brasil. cassiapramio@hotmail.com; 3. Statistician and professor of the Bachelor's Degree in Statistics; Master's Degree in Biostatistics at the State University of Maringá, Maringá, Paraná; 4. Neurologist; counselor and professor at Cesumar University, UniCesumar, Maringá, Paraná; 5. Counselor and Health promotion master's degree professor Cesumar University, UniCesumar, Maringá, Paraná, Brasil.

ABSTRACT: The ability of the general population to recognize the initial symptoms of acute stroke is important for the prevention of neurological damage. The objective of this study was to investigate the knowledge held by university students in health fields and what they perceived was adequate conduct after recognizing that someone is having an acute stroke. The students took a semi-structured, two-part questionnaire, with the first part referring to social and demographic data and the second containing a description of stroke's typical clinical presentation and open-ended questions about it. Of the participants, 86.24% were able to recognize stroke. When comparing the initial and final years, the students in their final years had approximately a 10% increase in stroke recognition. Regarding the perceived correct conduct, it was observed that 84.60% of the students in the initial years would have the right conduct compared to 89.32% of the students in the final years. Even though a high percentage of students demonstrated some knowledge about stroke it is important that we aspire to further educate them about the subject, enabling them to eventually contribute to the general population's education and to promote health.

KEY WORDS: Conduct. Knowledge. Neurology. Stroke.

INTRODUCTION

Stroke is the primary cause of disabilities in the world and it reduces the mobility of more than half of survivors who are 65 years of age or older (GO et al., 2013). The general population's ability to recognize its initial symptoms is of utmost importance for preventing neurological sequelae. Approximately 87% of strokes are ischemic, a type of stroke where the blood flow to the brain is blocked (GO et al., 2013).

Treatment with recombinant tissue plasminogen activator (rt-PA) is proven to be capable of reducing sequelae. However, the delayed recognition of stroke symptoms and delayed arrival at treatment centers are obstacles for the use of this therapy due to the therapeutic window of only 4.5 hours. Growing evidence indicates intravenous rt-PA administered within the first 4.5 hours of the onset of symptoms as the standard of care treatment (HACKE et al., 1995; HACKE et al., 1998; WAHLGREN et al., 2007) and a variety of studies have shown that the efficacy of reperfusion is time dependent (SAVER, 2006). As a general marker, the interval of 60 minutes or less between onset of symptoms and treatment is associated with lower

mortality rates and lower rates of symptomatic intracranial hemorrhage (FONAROW et al., 2011).

There is an important delay in the recognition of typical signs and symptoms of stroke by the general population as well as inadequate initial conduct. Studies show that 50% of patients arrive within 3 hours and 25% of patients arrive within 3 to 6 hours of the onset of symptoms. The American Heart Association (AHA) in conjunction with American Stroke Association (ASA) created the F.A.S.T. mnemonic (Face Drooping; Arm Weakness; Speech Difficulty; Time to call 9-1-1) to help educate and give the general public the ability to recognize stroke, therefore enabling quick access to the appropriate care.

Health sciences university students acquire knowledge about various pathologies, including stroke, over time. The recognition of the occurrence of a stroke, the adequate general public orientation about its signs and symptoms, its classification as an emergency and appropriate initial conduct are very important, consequentially resulting in smaller rates of neurological disabilities, therefore, improving the survivor's quality of life and diminishing the costs of rehabilitation.

The objective of this study was to evaluate health science university students' knowledge about

signs, symptoms, and appropriate conduct in cases of stroke.

MATERIAL AND METHODOS

This study was done at a university located in the north region of Paraná state, Brazil, and it was approved by the university's Research Ethics Committee, protocol number 898.509, on 11/27/2014. The participants were university students, enrolled in one of the following programs: Biomedicine, Biological Sciences, Cosmetology/Esthetician, Dentistry, Medicine, Nursing, Nutrition, Phonoaudiology, Pharmacy, Physical Education, Physiotherapy, Psychology or Veterinary Medicine.

The students were first introduced to this research and its objectives during a class period and then asked to participate. To participate, the students were required to sign the informed consent form (ICF). The convenience sample methodology was chosen due to time and resource constraints, easier operational application and the necessity to elicit justifications, hypotheses and insights for future studies. However, with the intent of interviewing a statistically significant number of students, a minimal sample size was calculated, using a confidence interval of 95% ($\alpha=0.05$), $p=0.05$ and a margin of error of 2%. The minimal sample size was, in this case, $n=1542$, far surpassed by our actual sample size of $n=2653$ students. Even with a sample size 72% higher than the minimal sample size, this study has some possible limitations regarding representativeness due to selection bias.

When dividing students by years of study, those in four-year programs were considered underclassman when in their first or second year and upperclassman when in their third or fourth year of study. Those in 5-year programs were considered underclassman if in their first, second or third year and upperclassman when in their fourth or fifth year of study.

The students answered a semi-structured, two-part questionnaire, elaborated by Pontes-Neto et al. (2008). The first part had questions to gather socio-demographic data including gender, age, college major, profession, marital status, place of birth, city of residence and health insurance information. The second part consisted of the description of an individual having classic stroke symptoms plus open-ended questions related to the case. The aforementioned questions were not only meant to evaluate the participants' ability to recognize the typical clinical presentation of a stroke strokes but to also evaluate their perceived

correct conduct, if they had previous exposure to such events and their knowledge about treatment options, the medical specialty that treats it, risk factors and the meaning of the word stroke. The students interviewed answered the questionnaires out of their own will, without previous knowledge about the study subject or the clinical case. Data was gathered from March through July of 2015.

The answers deemed correct when identifying the pathology described in the clinical case were cerebrovascular accident (CVA) and stroke. Regarding conduct, the participants that answered that they "would call an ambulance" or "take the patient to the hospital" were deemed correct since they recognized the situations as an emergency in need of a fast response.

The data base was constructed in an Excel spreadsheet and analyzed by the Statistical Analysis Software (SAS, *version* 9.3). Data descriptions were done by the means of simple frequency tables and cross tabulations. The association between the correct recognition and correct conduct in cases of stroke was verified by the Fischer's exact test. All the tests utilized as the rejection rule for hypothesis H_0 , a confidence interval of 95% ($\alpha=0.05$), meaning $p\text{-value} \leq 0.05$.

RESULTS

The total number of participants was 2653, with 1976 (74.57%) of these were female and 674 (25.43%) were male. The majority of students (47.12% $n=1245$) were between the ages of 20 and 24, 35.88% ($n=952$) were between the ages of 17 and 19, 9.84% ($n=260$) were 25 to 29 years old, and 7% ($n=185$) were 30 years of age or older. The percentage of unmarried students (90.19%) surpassed the percentages of married (9.32%) and divorced (0.49%) students. The majority (73.17%) of students did not work, 23.40% worked in non-healthcare fields and 3.42% already worked as healthcare professionals (Table 1).

In regards to the interviewed students' courses of study, 13.98% ($n=371$) studied Dentistry, 11.80% ($n=313$) studied Physiotherapy, 11.31% ($n=300$) studied Cosmetology, 11.23% ($n=298$) studied Physical Education, 11.08% ($n=294$) studied Psychology, 9.76% ($n=259$) studied Medicine, 7.5% ($n=199$) studied Biomedicine, 7.39% ($n=196$) studied Veterinary Medicine, 4.86% ($n=129$) studied Nutrition, 3.66% ($n=97$) studied Biological sciences, 3.13% ($n=83$) studied Pharmacy, 2.45% ($n=65$) studied Nursing, and 1.85% ($n=49$) studied Phonoaudiology.

Table 1. Interviewed North Parana university healthcare students' characteristics (gender, age, marital status and occupation), 2015.

Variable	Number of students	(%)
Gender		
Female	1976	74.57
Male	674	25.43
Age groups		
17 to 19 years old	952	35.88
20 to 24 years old	1245	47.12
25 to 29 years old	260	9.84
30 or more years old	185	7.00
Marital status		
Married	246	9.32
Single	2380	90.19
Divorced	13	0.49
Occupation		
Student	1923	73.17
Works in the healthcare field	90	3.42
Other occupations	615	23.40

A majority of the students, 39.02%, were in their first year, 28.14% in their second year, 19.20% in their third year, 12.12% in their fourth year, and 1.52% in their fifth year. It is important to note that Medicine is a new program at the university studied and there are still no students in the fifth and sixth year. In regards to the class period, 1172 students (44.39%) had classes during the night period, 826 (31.29%) had classes in both the morning and afternoon periods, and 642 (24.32%) had classes only during the morning period.

From the total number of students, 1618 (61.33%) had a private insurance plan while 1019 (38.67%) did not have a private insurance plan.

Regarding recognition of the described pathology, most of the individuals interviewed (58.16%, n=1543) answered that the patient was having a cerebrovascular accident (the scientifically accurate term, translated to "*Acidente vascular*

cerebral" in Portuguese) and 27.44% (n=728) used the more colloquial term stroke ("*derrame*" in Portuguese). Both were deemed correct, bringing the total percentage of correct answers to 86.24%. The remaining students incorrectly answered heart attack (4.82%, n=128), paralysis (4%, n=106), seizures (0.64%, n=17), other (1.51%, n=40) or don't know (3.43%, n=91) (Table 2).

The results showed that 82.57% (n=1466) of the underclassman correctly identified the stroke while 91.70% (n=807) of upperclassman correctly identified it. It was observed that there was a significant association ($p < 0.0001$) between the year of study and the ability to recognize a stroke. Among the underclassman, the percentage of students that mentioned other unrelated diseases as the pathology described in the clinical case was 17.43% compared to only 8.30% among the upperclassman (Table 3).

Table 2. Pathology recognition among interviewed students from a university in North Paraná, 2015.

Pathology	n	%
Cerebrovascular accident (CVA)	1543	58.16
Stroke	728	27.44
Heart attack	128	4.82
Paralysis	106	4.00
Seizure	17	0.64
Others	40	1.51
Don't know	91	3.43

Table 3. Recognition of stroke and perceived correct conduct among health field underclassman and upperclassman at a university in north Paraná, 2015.

Pathology	Grade				p-value
	Underclassman		Upperclassman		
	N	%	n	%	
Stroke/CVA	1464	82.57	807	91.70	0.0000*
Others	309	17.43	73	8.30	
Conduct					
Correct	1500	84.60	786	89.32	0.0008*
Incorrect	273	15.40	94	10.68	

*Significant with a confidence interval of 95%.

It should be emphasized that some students, when asked to identify the described pathology, correctly answered CVA. However, when questioned about the meaning of the acronym, would wrongly explain it as a disease related to the heart, using terms like “Cardiovascular Accident” and “Vascular Cardio accident” or would answer that they did not know what the acronym meant (Table 4).

A significant association between recognition of stroke and the student’s year of study (underclassmen or upperclassmen) was observed in the Pharmacy ($p= 0.005$), Physiotherapy ($p=$

0.0026), Medicine ($p= 0.0018$), Nutrition ($p= 0.0454$) and Psychology ($p= 0.0079$) programs. There was an increase in the percentage of correct identifications of stroke when comparing upperclassmen to the underclassmen. It should be noted that only in the Physical Education program was there a decrease in the percentage of recognition of stroke when comparing upperclassman to the underclassman (Table 5).

Table 4. Knowledge of the meaning of the acronym CVA among healthcare students at a university in north Paraná, 2015.

What does CVA mean?	n	%
Cerebrovascular accident	1930	71.96
Associated with heart disease	159	5.93
Did not know	593	22.11

Table 5. Knowledge about stroke among upperclassman and underclassman, by course, in a north Parana university, 2015.

Course/recognition	Grade				p-value
	Underclassman		Upperclassman		
	n	%	n	%	
Biomedicine					
Stroke	114	87.69	65	94.20	0.2150
Others	16	12.31	4	5.80	
Cosmetology					
Stroke	159	78.33	84	86.60	0.1150
Others	44	21.67	13	13.40	
Biological Sciences					
Stroke	59	84.29	24	88.89	0.7510
Others	11	15.71	3	11.11	
Physical Education					
Stroke	191	85.65	62	82.67	0.5767
Others	32	14.35	13	17.33	
Nursing					
Stroke	34	87.18	26	100.00	0.0777
Others	5	12.82	0	0.00	
Pharmacy					
Stroke	33	68.75	33	94.29	0.005*
Others	15	31.25	2	5.71	

Physiotherapy

Stroke	167	83.08	106	94.67	0.0026*
Others	34	16.92	6	5.36	

Phonoaudiology

Stroke	26	89.66	20	100.00	0.2602
Others	3	10.34	0	0.00	

Medicine

Stroke	130	92.86	119	100.00	0.0018*
Others	10	7.14	0	0.00	

Veterinary Medicine

Stroke	108	77.14	46	82.14	0.5638
Others	32	22.86	10	17.86	

Nutrition

Stroke	82	77.36	22	95.65	0.0454*
Others	24	22.64	1	4.35	

Dentistry

Stroke	217	88.21	117	93.60	0.1414
Outros	29	11.79	8	6.40	

Psychology

Stroke	144	72.73	83	86.46	0.0079*
Others	54	27.27	13	13.54	

* Significant in a confidence interval of 95%.

As mentioned before, not all the “CVA” answers to the recognition question should be automatically considered as correct. Some participants that answered with the acronym CVA defined it as being a disease related the heart, which can explain the high percentage of correct answers among the underclassman (Table 4).

When analyzing the conduct perceived correct by students if confronted with the situation describe in the clinical case, it was observed that 1596 (60.15%) would call an ambulance, 690 (26%)

would take the individual to the hospital, 228 (8.59%) would take the individual to the doctor, 96 (3.61%) would take other actions like lay the person on a bed, hold their tongue, or perform first aid, and 43 (1.62%) did not know what action to take (Table 6).

Table 6. Conduct among healthcare students of all grades in a university in north Paraná, 2015.

Conduct	n	%
Call an ambulance	1596	60.15
Take to the hospital	690	26.0
Take to the doctor	228	8.59
Others	96	3.61
Don't know	43	1.62

Regarding the correct conduct, the answers “call an ambulance” and “take to the hospital” were deemed correct due to the fact that they are considered emergency responses. Any other answer was considered incorrect. A significant association between the right conduct and the year of study ($p=0.0008$) was observed in this analyses. 84.60% of underclassman described the correct conduct compared to 89.32% of the upperclassman (Table 3).

When analyzing the various conducts adopted by students, taking into consideration their courses and year of study, there was a small increase in correct answers for conduct when comparing the upperclassman with the underclassman (Table 7). This association was statistically significant in a confidence interval of 95% for the Biomedicine ($p=0.0185$) and Biological sciences ($p=0.0313$) programs.

Table 7. Fischer's exact test between student's perceived correct conduct and year of study, in a university in north Paraná, 2015.

Course/conduct	Grade				p-value
	Underclassman		Upperclassman		
	n	%	n	%	
Biomedicine					
Correct	101	77.69	63	91.30	0.0185*
Incorrect	29	22.31	6	8.70	
Cosmetology					
Correct	167	82.27	78	80.41	0.7503
Incorrect	36	17.73	19	19.59	
Biological Sciences					
Correct	59	84.29	27	100.00	0.0313*
Incorrect	11	15.71	0	0.00	
Physical Education					
Correct	196	87.89	68	90.67	0.6750
Incorrect	27	12.11	7	9.33	

Nursing

Correct	34	87.18	25	96.15	0.3887
Incorrect	5	12.82	1	3.85	

Pharmacy

Correct	38	79.17	32	91.43	0.2205
Incorrect	10	20.83	3	8.57	

Physiotherapy

Correct	168	83.58	95	84.82	0.8726
Incorrect	33	16.42	17	15.18	

Phonoaudiology

Correct	22	75.86	18	90.00	0.2771
Incorrect	7	24.14	2	10.00	

Medicine

Correct	136	97.14	115	96.64	1.0000
Incorrect	4	3.36	4	2.86	

Veterinary Medicine

Correct	114	81.43	49	87.50	0.3992
Incorrect	26	18.57	7	12.50	

Nutrition

Correct	90	84.91	20	86.96	1.0000
Incorrect	16	15.09	3	13.04	

Dentistry

Correct	202	82.11	104	83.20	0.8854
Incorrect	44	17.89	21	16.80	

Psychology

Correct	220	89.07	45	95.74	0.1919
Incorrect	27	10.93	2	4.26	

* Significant in a confidence interval of 95%.

DISCUSSION

It is expected that among healthcare students in higher education knowledge about pathologies like stroke will be quantifiably superior to that of the general population due to more extensive study on the subject. The influence that professionals in the healthcare field can have, as shapers of opinion, is important in the sense that they are qualified to alert the population and inform them about appropriate actions in health emergencies. Regarding stroke, among the factors that contribute to the delayed search for medical help we can emphasize the lack of the general population's knowledge about it (BECKER et al., 2001) and the failure to recognize its symptoms and the need for a quick response (JONES et al., 2010). Furthermore, there is general denial about the condition and misplaced hope that the symptoms will resolve on its own (EUROPEAN STROKE ORGANIZATION, 2008).

It was observed in this study that 86.24% of students in the healthcare field were able to recognize stroke when described in a clinical case. Even though a majority of students did recognize it, a higher percentage would be ideal, considering that these students have the potential to raise the stroke awareness of the general population. In a study done in the city of Pelotas – RS, Brazil, only 28.2% of the population had any knowledge about signs and symptoms of stroke and knowledge about stroke was considered optimal in only 0.4% of the population (COSTA et al., 2008). Mansur (2011) indicated that the percentage of individuals that could identify at least one sign/symptom of stroke varied from 25% to 79.9%. Other studies show that knowledge about initial signs and symptoms of stroke amongst the general populations is low (FALAVIGNA et al., 2009; SILVA et al., 2012; OBEMBE et al., 2014; PONTES NETO, 2014). Moreover, individuals with the least severe cases, and therefore those with better prognosis, tend to delay in seeking medical care, losing the therapeutic window which is paramount for a positive outcome in the natural evolution of the disease (COSTA et al., 2008). Few campaigns about strokes emphasize the importance of early intervention and characterize it as an emergency (COSTA et al., 2008).

It was also observed in this study that the four healthcare fields most related to prevention, initial care, treatment and rehabilitation of stroke (Medicine, Nursing, Physiotherapy and Phonoaudiology) had great results when recognizing stroke, being that Medicine, Nursing and

Phonoaudiology upperclassman achieved a percentage of recognition of a 100%. In comparison, a study done with all students at a Nigerian University, found that there was a significant difference in the ability to recognize the disease among the various students, where those enrolled in the Clinical Sciences, Dentistry, Basic Medical Sciences and Pharmacy courses had the best results (SILVA et al., 2012).

There was a general increase in the recognition of stroke percentages when comparing the upperclassman with the underclassman, indicating that more years of study had influence in the results. Other studies also showed that the main indicator of a more extensive knowledge about the subjects is an individual's educational level (MANSUR, 2011; FALAVIGNA et al., 2009; SILVA et al., 2012; OBEMBE et al., 2014; PONTES NETO, 2014; RAMÍREZ-MORENO et al., 2016). Moreover, it is important to again emphasize the fact that some participants may have chosen CVA as the answer, but incorrectly associated the acronym to heart problems or did not know its meaning. A study done in the city of Porto, Portugal also indicated a strong tendency for participants to identify cardiovascular signs/symptoms as being those of a stroke (MANSUR, 2011).

Low rates of recognition of a stroke's initial signs and symptoms can result in the delayed search for adequate medical care (MORRIS et al., 1999; SCHROEDER et al., 2000). When patients recognize the initial symptoms and urgently look for help, they can reduce the level of disabilities associated with stroke (MILNER; LEWIS; ELLIS, 2008). It is observed that the majority of those interviewed would have the right conduct when confronted with someone having a stroke, since they would either call an ambulance or take the patient to the hospital, recognizing the situation as an emergency that needs to be managed fast. A study done with the general population in West Bengal (India) showed that many families of patients experiencing a stroke not take the symptoms seriously and waited for the individual to heal on their own. It also indicated that most of the interviewed population would not pursue medical care for minor symptoms like headaches, dizziness or unilateral weakness (DAS et al., 2007).

Limited strokes' signs/symptoms knowledge affects the ability to raise the general population and patients' awareness about the condition (SILVA et al., 2012). Although there is an increase in the percentage of right conduct-takers among the upperclassman when compared to the

underclassman, it was a small increase when we view each course separately, what may indicate a deficit in the some of the courses' teaching approach to the subject. The incorporation of stroke education as a subject in the medical school's curriculum resulted in better knowledge about the topic (MILNER; LEWIS; ELLIS, 2008). The success of such programs suggests that more information about stroke's risk factors and typical signs and symptoms should be associated to the training of healthcare professionals and students (MILNER; LEWIS; ELLIS, 2008).

Since this study was done in a classroom setting it may have an information bias. It is possible that during the application of the questionnaire some students traded information and this therefore affected the assessment of individual knowledge.

CONCLUSIONS

Healthcare field students have superior knowledge about the signs and symptoms of a stroke and about the appropriate conduct in stroke cases. However, because they are future healthcare professionals and will have the ability to influence the general population's awareness about the topic, it is important that they achieve even higher levels of knowledge as a group and as individuals.

The establishment of educational programs for these students specifically focused on the recognition of stroke, the appropriate conduct to be adopted and the inclusion of early use of rt-PA as a treatment option will enable them to increase stroke awareness and knowledge in the general population.

The increase in awareness will be especially beneficial to patients and families of patients with higher risk for cerebrovascular accidents and will contribute to diminish the morbidity and mortality rates of this pathology.

RESUMO: O reconhecimento dos sintomas iniciais pela população leiga é importante na prevenção de sequelas decorrentes do AVC. O objetivo desse trabalho foi verificar o conhecimento e conduta dos universitários em casos de AVC. Foi aplicado um questionário semi-estruturado aos estudantes, sendo este referente a dados sócios demográficos e a um caso clínico básico, onde o paciente apresentava sintomas clássicos de um AVC com perguntas discursivas onde se averiguava sobre o reconhecimento da doença. Dos participantes, 86,24% souberam reconhecer um AVC e comparando-se por séries mostrou que nas finais há um incremento em torno de 10%. Observou-se que 84,60% dos alunos das series iniciais, e 89,32% das finais teriam uma conduta correta. Apesar da maioria apresentar conhecimento do AVC, bem como a conduta a ser utilizada, a importância de que este número seja maior, uma vez que, poderão contribuir para a educação da população e a promoção da saúde.

PALAVRAS-CHAVE: Acidente vascular cerebral. Neurologia. Conhecimento. Conduta.

REFERENCES

- AGYEMAN, O.; NEDELTCHEV, K.; ARNOLD, M.; FISCHER, U.; REMONDA, L.; ISENEGGER, J.; SCHROTH, G.; MATTLE, H. P. Time to Admission in Acute Ischemic Stroke and Transient Ischemic Attack. *Stroke*, v. 37, p. 963-966, 2006. <https://doi.org/10.1161/01.STR.0000206546.76860.6b>
- BECKER, K.; FRUIN, M.; GOODING, T.; TIRSCHWELL, D.; LOVE, P.; MANKOWSKI, T. Community-Based Education Improves Stroke Knowledge. *Cerebrovascular Diseases*, v. 11, n. 1, p. 34-43, 2001. <https://doi.org/10.1159/000047609>
- COSTA, F.; OLIVEIRA, S.; MAGALHÃES, P.; COSTA, B.; PAPINI, R.; SILVEIRA, M.; LANG, M. The Pelotas adult population knowledge about stroke. *Brazilian Journal of Neurosurgery*, v. 19, n. 1, p. 31-37, 2008.
- DAS, K.; MONDAL, G.; DUTTA, A.; MUKHERJEE, B.; MUKHERJEE, B. Awareness of warning symptoms and risk factors of stroke in the general population and in survivors stroke. *Journal of Clinical Neuroscience*, v. 14, n. 1, p. 12-16, 2007. <https://doi.org/10.1016/j.jocn.2005.12.049>

EUROPEAN STROKE ORGANISATION (ESO) EXECUTIVE COMMITTEE. Guidelines for management of ischaemic stroke and transient ischaemic attack. **Cerebrovascular Diseases**, v. 25, p. 457-507, 2008. <https://doi.org/10.1159/000131083>

FALAVIGNA, A.; TELES, A.; VEDANA, V.; KLEBER, F.; MOSENA, G.; VELHO, M. C.; MAZZOCCHIN, T.; SILVA, R. C. da; LUCENA, L. F.; SANTIN, J. T.; ROTH, F. Awareness of stroke risk factors and warning signs in southern Brazil. **Arquivos de Neuro-Psiquiatria**, v. 67, n. 4, p. 1076-1081, 2009. <https://doi.org/10.1590/S0004-282X2009000600022>

FONAROW, G. C.; SMITH, E. E.; SAVER, J. L.; REEVES, M. J.; BHATT, D. L.; GRAU-SEPULVEDA, M. V.; OLSON, D. M.; HERNANDEZ, A. F.; PETERSON, E. D.; SCHWAMM, L. H. Timeliness of Tissue-Type Plasminogen Activator Therapy in Acute Ischemic Stroke: Patient Characteristics, Hospital Factors, and Outcomes Associated With Door-to-Needle Times Within 60 Minutes. **Circulation**, v. 123, n. 7, p. 750-758, 2011. <https://doi.org/10.1161/CIRCULATIONAHA.110.974675>

GO, A. S.; MOZAFFARIAN, D.; ROGER, V. L.; BENJAMIN, E. J.; BERRY, J. D.; BORDEN, W. B.; BRAVATA, D. M.; DAI, S.; FORD, E. S.; FOX, C. S.; FRANCO, S.; FULLERTON, H. J.; GILLESPIE, C.; HAILPERN, S. M.; HEIT, J. A.; HOWARD, V. J.; HUFFMAN, M. D.; KISSELA, B. M.; KITTNER, S. J.; LACKLAND, D. T.; LICHTMAN, J. H.; LISABETH, L. D.; MAGID, D.; MARCUS, G. M.; MARELLI, A.; MATCHAR, D. B.; MCGUIRE, D. K.; MOHLER, E. R.; MOY, C. S.; MUSSOLINO, M. E.; NICHOL, G.; PAYNTER, N. P.; SCHREINER, P. J.; SORLIE, P. D.; STEIN, J.; TURAN, T. N.; VIRANI, S. S.; WONG, N. D.; WOO, D.; TURNER, M. B. Heart Disease and Stroke Statistics--2013 Update: A Report From the American Heart Association. **Circulation**, v. 127, n. 1, e6-e245, 2013. <https://doi.org/10.1161/CIR.0b013e318282ab8f>
<https://doi.org/10.1161/CIR.0b013e31828124ad>

HACKE, W.; KASTE, M.; FIESCHI, C.; VON KUMMER, R.; DAVALOS, A.; MEIER, D.; LARRUE, V.; BLUHMKIS, E.; DAVIS, S.; DONNAN, G.; SCHNEIDER, D.; DIEZ-TEJEDOR, E.; TROUILLAS, P. Randomised double-blind placebo-controlled trial of thrombolytic therapy with intravenous alteplase in acute ischaemic stroke (ECASS II). **The Lancet**, v. 352, n. 9136, p. 1245-1251, 1998. [https://doi.org/10.1016/S0140-6736\(98\)08020-9](https://doi.org/10.1016/S0140-6736(98)08020-9)

HACKE, W.; KASTE, M.; FIESCHI, C.; TONI, D.; LESAFFRE, E.; VON KUMMER, R.; BOYSEN, G.; BLUHMKI, E.; HÖXTER, G.; MAHAGNE, M.; HENNERICI, M. Intravenous Thrombolysis With Recombinant Tissue Plasminogen Activator for Acute Hemispheric Stroke. **JAMA**, v. 274, n. 13, p. 1017-1025, 1995. doi:10.1001/jama.1995.03530130023023. <https://doi.org/10.1001/jama.1995.03530130023023>

JONES, S. P.; JENKINSON, A. J.; LEATHLEY, M. J.; WATKINS, C. L.; Stroke knowledge and awareness: an integrative review of the evidence. **Age Ageing**, v. 39, n. 1, p. 11-22, 2010. <https://doi.org/10.1093/ageing/afp196>

MANSUR, K. F. O que sabe o cidadão sobre o Acidente Vascular Cerebral: inquérito numa população urbana. 2011. 86f. Dissertação (Mestrado em Saúde Pública) – Faculdade de Medicina e Instituto de Ciências Biomédicas de Abel Salazar, Universidade do Porto, Porto, 2011. Disponível em: <http://hdl.handle.net/10216/22149> Acesso em: 15/12/2015.

MILNER, A.; LEWIS, W.; ELLIS, C. Knowledge of Stroke Risk Factors and Early Warning Signs of Stroke among Students Enrolled in Allied Health Programs: A Pilot Study. **Journal of Allied Health**, v. 37, n. 4, e296–e315, 2008.

MORRIS, D.; ROSAMOND, W.; HINN, A.; GORTON, R. Time Delays in Accessing Stroke Care in the Emergency Department. **Academic Emergency Medicine**, v. 6, n. 3, p. 218-223, 1999. <https://doi.org/10.1111/j.1553-2712.1999.tb00159.x>

- OBEMBE, A.; OLAOGUN, M.; BAMIKOLE, A.; KOMOLAFE, M.; ODETUNDE, M. Awareness of Risk Factors and Warning Signs of Stroke in a Nigeria University. **Journal of Stroke and Cerebrovascular Diseases**, v. 23, n. 4, p. 749-758, 2014. <https://doi.org/10.1016/j.jstrokecerebrovasdis.2013.06.036>
- PONTES NETO, O. M. Stroke awareness in Brazil: what information about stroke is essential? **Arquivos de Neuro-Psiquiatria**, v. 72, n. 12, p. 909-910, dec. 2014. <https://doi.org/10.1590/0004-282X20140197>
- PONTES-NETO, O. M.; SILVA, G. S.; FEITOSA, M. R.; FIGUEIREDO, N. L.; FIOROT JR, J. A.; ROCHA, T. N.; MASSARO, A. R.; LEITE, J. P. Stroke Awareness in Brazil Alarming Results in a Community-Based Study. **Stroke**, v. 39, n. 2, p. 292-296, feb. 2008. <https://doi.org/10.1161/STROKEAHA.107.493908>
- RAMÍREZ-MORENO, J.; ALONSO-GONZÁLEZ, R.; PERAL PACHECO, D.; MILLÁN-NUÑEZ, M.; ROA-MONTERO, A.; CONSTANTINO-SILVA, A.; AGUIRRE-SÁNCHEZ, J.J. Effect of socioeconomic level on level knowledge of stroke in the general population: A social inequality gradient. **Neurología**, v. 31, n. 1, p. 24-32, feb. 2016. <https://doi.org/10.1016/j.nrl.2014.06.004>
- SAVER, J. L. Time is brain—quantified. **Stroke**, v. 37, n. 1, p. 263-266, 2006. <https://doi.org/10.1161/01.STR.0000196957.55928.ab>
- SCHROEDER, E.; ROSAMOND, W.; MORRIS, D.; EVENSON, K.; HINN, A. Determinants of Use of Emergency Medical Services in a Population With Stroke Symptoms: The Second Delay in Accessing Stroke Healthcare (DASH II) Study. **Stroke**, 2000, v. 31, n. 11, p. 2591-2596, 2000.
- SILVA, I.; JUNQUEIRA, C. M.; CORTES, P. C.; CARDOSO, R. F.; MARQUES, C.; TEIXEIRA, F. C.; PEREIRA, A. B. C. N. G.; CARVALHO, C. V. A. Knowledge about stroke in Vassouras-RJ: Analysis between population of urban área and rural area. **Neurobiologia**, v. 75, n. 3-4, jul./dec. 2012.
- WAHLGREN, N.; AHMED, N.; DÁVALOS, A.; FORD, G.; GROND, M.; HACKE, W.; HEBBERICI, M. G.; KASTE, M.; KUELKENS, S.; LARRUE, V.; LEES, K. R.; ROINE, R. O.; SOINNE, L.; TONI, D.; VANHOOREN, G. Thrombolysis with alteplase for acute ischaemic stroke in the Safe Implementation of Thrombolysis in Stroke-Monitoring Study (SITS-MOST): an observational study. **The Lancet**, v. 369, n. 9558, p. 275-282, 2007. [https://doi.org/10.1016/S0140-6736\(07\)60149-4](https://doi.org/10.1016/S0140-6736(07)60149-4)