



A STUDY ON AWARENESS IN STROKE PATIENTS ABOUT DISABILITY AND HOME-BASED EXERCISES AT KEMPEGOWDA INSTITUTE OF MEDICAL SCIENCES HOSPITAL AND RESEARCH CENTRE, BANGALORE.

Community Medicine

Dr. Shivani Kumari MPT

Dr. Prem Kumar B.N. PhD

ABSTRACT

Purpose: To know the existing knowledge of the stroke patients regarding disability and basic stroke care or home-based exercises in order to design appropriate intervention programs and to enhance stroke care and outcome. **Subjects and Methods:** In this study, 100 participants were recruited from KIMSH, Bangalore. The participants were asked to answer the question regarding stroke. The answers were recorded to assess the patients' knowledge about stroke, stroke care and importance of home-based exercise. All the collected data were analysed using SPSS 22.0. **Results:** participants were asked the questions and each correct response was given "1" score and wrong answer "0" score. The level of awareness was then classified into 3 categories: high level (more than 75%), average level (50-75%) and low level (<50%). Overall, 70 participants (70%) had average level of knowledge regarding disability and home-based exercises post-stroke. **Conclusion:** The participants had average level of awareness about disability and home-based exercises. Participants knowledge on stroke might be of great practicality for early gain of functional abilities post-stroke.

KEYWORDS

Stroke; disability awareness; risk factors; mRS; stroke care awareness; home based exercises.

INTRODUCTION

Stroke or brain attack is the sudden loss of neurological function caused by an interruption of the blood flow to the brain. Ischemic stroke is the most common type, affecting about 80 percent of individuals with stroke, and results when a clot blocks or impairs blood flow, depriving the brain of essential oxygen and nutrients. Haemorrhagic stroke occurs when blood vessels rupture, causing leakage of blood in or around the brain. The term cerebrovascular accident (CVA) is used interchangeably with stroke to refer to the vascular conditions of the brain.^[1]

According to the Global Burden of Diseases (GBD) study in 1990, stroke was the second leading cause of death worldwide. Subsequent efforts to update the Global Burden of Diseases study reported nearly 5.87 million stroke deaths globally in 2010, as compared to 4.66 million in 1990. This indicated a 26 per cent increase in global stroke deaths during the past two decades. With the rising proportion of mortality, stroke still remains the second leading cause of death worldwide.^[2]

The clinical features of stroke are variable. It depends upon the lesion (damage in the areas/ parts of brain) and severity of brain damage. The clinical signs and symptoms of stroke are Spasticity, Perceptual deficits, Cognitive deficits, Motor impairments, Incoordination, Sensory deficits, Difficulty in walking independently, etc.^[3] Especially, a difficulty to maintain a position (steadiness) as well as postural alignment and position (symmetry) within the base of support decrease the ability to shift weight to the paretic side during walking and dynamic stability.^[4]

Home-based exercises are prescribed by physiotherapist, is an integral part of post-discharge rehabilitation planning, with the intended goal of maintaining functional motor performance and enhancing functional progress.^[5]

The important component of home-based exercise programs for stroke patients posts hospital discharge include therapeutic exercises (strengthening, walking, task related, balance and gait exercises)^[6] education (positioning education, fall prevention, training in the use of assistive devices, ability to handle medication, caregiver education), pressure ulcer, nutrition and environmental (modification of the home environment).^[7]

The Modified Rankin Score (mRS) is a 6-point disability scale with possible scores ranging from 0 to 5. A separate category of 6 is usually added for patients who expire. The Modified Rankin Score (mRS) is the most widely used outcome measure in stroke clinical trials.^[8]

The benefits of questionnaire are they are relatively easy to analyse, a large sample of the given population can be contacted at relatively low cost, they are simple to administer, the format is familiar to most respondents, information is collected in a standardized way, they are

usually straight forward to analyse, they can be used for sensitive topics which users may feel uncomfortable speaking to an interviewer about.^[9]

Methods and Procedure

This is a cross-sectional questionnaire-based study with a sample size of 100 subjects. The Stroke awareness questionnaire that focusing basic stroke care prepared with the help of previous longitudinal studies or articles and with a neuro physician, health supervisors from community medicine department is administered to the participants and their responses are marked by the investigators to the data sheet. The questionnaire is divided into 3 parts; Part I: Socio demographic data (6 questions), Part II: Stroke Disability Awareness (18 questions) and Part III: Awareness about home-based exercise program (11 questions). All the collected data were analysed using SPSS 22.0.

Categories Of Questions In The Questionnaire

Part: I (Socio-Demographic Characteristics)

1. What is your name?
2. What is your age?
3. What is your religion?
 - I. Hinduism
 - II. Islam
 - III. Christian
 - IV. Jainism
 - V. Sikhism
 - VI. Buddhism
4. What is your educational status?
 - I. Literate/Illiterate
 - II. If literate, what is your level of education
 - III. Informal education, Primary level, Secondary level, Higher secondary level and above
5. What is your occupation?
 - I. Farmer
 - II. Housewife
 - III. Labor
 - IV. Service
 - V. Business
 - VI. Others (please specify)
6. Who will take care for you at home?
 - I. Spouse
 - II. Offspring
 - III. Relatives
 - IV. Others (please specify)

Part: II (Stroke Disability Awareness)

7. Have you heard about stroke?
 - I. Yes
 - II. No
8. Does anybody in your family had stroke?
 - I. Yes
 - II. No
9. Do you know which organ is involved in stroke? If yes. Which?

- I. Yes
- II. No
10. What could be the causative factors of stroke?
 - I. High BP
 - II. Diabetes
 - III. Smoking
 - IV. Too much alcohol
 - V. Too much stress
 - VI. None
11. Do you know the consequences/result of the stroke? What?
 - I. Yes
 - II. No
12. Do you know anything about the changes in the physical appearance following stroke? What?
 - I. Yes
 - II. No
13. Do you think that you can function as before and effectively during post stroke stage?
 - I. Yes
 - II. No
14. Do you know what happens to the joints/muscle post stroke? What?
 - I. Yes
 - II. No
15. Does your behavior changes after stroke? What?
 - I. YES
 - II. NO
16. Till what extent do you think that you might be dependent upon others or caregiver?
 - I. Modified Rankin Scale-
17. When should you be mobilized for home exercise at first?
 - I. Mobilize after the condition improve
 - II. Must be in complete bed rest
 - III. Mobilized as early as possible
 - IV. Mobilized after a week of stroke
18. Do you need to use any device for ambulation?
 - I. Yes
 - II. no
- (If yes, which one- crutches, stick, walker, canes)
19. Do you think you can live alone without any help from another person? This means being able to bath, use the toilet, shop, prepare or get meals.
 - I. Yes
 - II. No
20. Do you think you can walk from one room to another without help from another person?
 - I. Yes
 - II. No
21. Can you sit up in bed without any help?
 - I. Yes
 - II. No
22. What is the appropriate position for you?
 - I. Lying on affected side
 - II. Upright sitting position
 - III. Lying on unaffected side
 - IV. Supine position
23. What is the required frequency to change the position of patient? Why?
 - I. 1 hourly
 - II. 2 hourly
 - III. 3 hourly
 - IV. 4 hourly
24. Do you think you feel less abled? Why?
 - I. Yes
 - II. No

Part III: - Awareness About Home Based Exercise Program

25. Have you heard of home-based exercise?
 - I. Yes
 - II. No
26. Will you participate in home-based exercise?
 - I. Yes
 - II. No
27. The reasons for participating in home-based exercise program
 - I. Comfortable in-home environment
 - II. Cost effective
 - III. Saves time
28. The reason for not participating in home-based exercise
 - I. Prefer continued hospitalization or outpatient rehabilitation

- II. More medical expenses
29. Does the HEP explained to you before discharge satisfactory?
 - I. Yes
 - II. No
30. Does the HEP sufficiently explained and demonstrated to you by physiotherapist?
 - I. Yes
 - II. No
31. Do you follow the HEP as instructed by Physical therapist at least for 2 weeks from the day of discharge?
 - I. Yes
 - II. No
32. Do you belief that the home exercises are beneficial to improve your recovery?
 - I. Yes
 - II. no
33. Do you belief that the HEP will help you to be functionally independent and improve activities of daily living?
 - I. Yes
 - II. No
34. During HEP what will you do if experienced any adverse effects such as shoulder pain, back pain, spasm, and swelling?
 - I. Consult health care professionals
 - II. Take pain killers
35. What made you to perform the exercises regularly?
 - I. For better health or recovery
 - II. For improvement/improvement in strength
 - III. To carry out ADL's
 - IV. To be functionally independent
 - V. Advised by consultant
 - VI. Return to work

RESULTS

The questionnaire-based study was done among 100 participants. In the study, there were 35 females (35%) and 65 males (65%). Age distribution of the participants studied were between age group <40 years and 80 years. 3 participants (3%) were below 40 years of age i.e., 1 female (2.9%) and 2 males (3.1%). 35 participants (35%) were within 40-50 years of age i.e., 11 females (31.4%) and 24 males (36.9%). 24 participants (24%) were within 51-60 years of age i.e., 8 females (22.9%) and 16 males (24.6%). 13 participants (13%) were within 61-70 years of age i.e., 4 females (11.4%) and 9 males (13.8%). 20 participants (20%) were within 71-80 years of age i.e., 9 females (25.7%) and 11 males (16.9%). 5 participants (5%) were below 80 years of age i.e., 2 females (5.7%) and 3 males (4.6%).

30 participants (30%) were illiterate out of which 14(40%) were females and 16(24.6%) were males. 33(33%) participants are literate, wherein 9(25.7%) were females and 24(36.9%) were males. 23 participants had done primary schooling wherein 9(25.7%) were females and 14(21.5%) were males. 12(12%) participants had done secondary level schooling out of which 3(8.6%) were females and 9(13.8%) were males. Only 2(3.1%) males had higher education but not females. 21 participants (21%) were housewives.

20 participants (30.8%) were engaged in service i.e., cleaners, sales person, lawyer were males. 36 participants (36%) were indulged in business wherein 5 were females (14.3%) and 31 were males (47.7%). 7 participants were farmers (7%) wherein 5 were females (14.3%) and 2 were male (3.1%). 5 participants were teachers wherein 2 were females (5.7%) and 3 were males (4.6%). 11 participants belong to different group of occupations.

56 participants (56%) had an idea about stroke, 15 participants (15%) had someone in the family who had stroke. 50 participants (50%) had an idea about the organ involved in stroke, 78 participants (78%) could answer about the causative factor of stroke being high BP. 54 participants (54%) knows about the "Consequences/result of the stroke". 48 participants (48%) know "Changes in the physical appearance of the patient following stroke".

24 participants (24%) said they can function as before and effectively during post stroke stage. 59 participants (59%) know what happens to the joints/muscle post stroke". 83 participants (83%) said about the "Behaviour changes after stroke".

In the Modified Rankin scale which depicts that no significant disability despite symptoms and able to carry out all usual duties and

activities. 7 participants (7%) scored 2, 70 participants (70%) scored 3, 23 participants (23%) scored 4. None of the participant scored 5 in the Modified Rankin Scale.

65 participants (65%) "Mobilized after the condition improves", 18 participants (18%) mentioned that he "Must be in complete bed rest". 6 participants (6%) mentioned that it is wise to, "Mobilize as early as possible". 11 participants (11%) mentioned that he should be, "Mobilized after a week of stroke".

58 participants (58%) need to use any device for ambulation, 28 participants (28%) can live alone without any help from another person. 27 participants (27%) can walk from one room to another without help from another person. 38 participants (38%) can sit up in bed without any help. 4 participants (4%) changed position every 1 hourly. 72 participants (72%) in every 2 hourly, 20 participants (20%) in every 3 hourly. 4 participants (4%) felt it was better to change the position every 4 hourly. 43 participants (43%) felt that they might feel less abled.

47 participants (47%) heard of home-based exercises; 79 participants (79%) participate in home-based exercises. 28 participants (28%) will participate in HBEP as it is comfortable in-home environment, 75 participants (75%) replied it is cost effective. 83 participants (83%) were explained and demonstrated well to them by physiotherapist. 92 participants (92%) will follow the HEP as instructed by the physical therapist at least 2 weeks from the day of discharge. 73 participants (73%) belief that the home exercises are beneficial to improve their recovery. 73 participants (73%) said HEP will help them to be functionally independent and improve ADL'S. 34 participants (34%) said they will perform exercises regularly for their better health and recovery, 80 participants (80%) for better improvement or improvement in strength, 65 participants (65%) carry out ADL'S, 28 participants (28%) want to be functionally independent, 66 participants (66%) said advised by consultant and 84 participants (84%) want to return to their work.

Hence, our study has demonstrated an average level of awareness amongst majority of participants interviewed in different areas of basic care and home-based exercise program.

DISCUSSION

Stroke is one of the most important causes of death and long-term disability around the world and developing countries. Majority of stroke patient's complaint of activity limitations and participation restrictions.^[10] It is reported that approximately 50% of subjects after stroke remain dependent on others for some activities, 54% show limitations in carrying out activities of daily living, and 65% report restrictions in reintegration into community activities.^[11] Stroke is associated with a considerable burden of disability and loss of quality-adjusted life years. Increased knowledge of stroke risk factors in the population may lead to improved prevention of stroke.^[12] The success of primary preventive measures and timely medical attention immediately following a stroke is influenced by the public's knowledge and perception of stroke and its risk factors.^[13]

The purpose of this study was to assess the knowledge of the stroke participants regarding disability and home-based exercises in order to design appropriate intervention programs and to enhance stroke care and outcome. In this study, 120 participants were screened in which 100 participants were recruited based on the inclusion criteria and they were provided with a questionnaire.

The questionnaire used in this study had three parts. In the first part socio demographic data were taken that include gender, age, and occupation of the participants, their educational status and about their caretakers. Accordingly,

In this current study, age distribution of the participants was between less than forty years of age (< 40) to more than eighty years of age (>80), among whom there were 35 females (35%) and 65 males (65%). The educational level distribution of the participants include, 33 participants (33%) were literate, 2 participants (2%) with higher level of education, 12 participants (12%) with secondary level of schooling, 23 participants (23%) with primary level of schooling and 30 participants (30%) were illiterate.

Participants were involved in occupations like business i.e., 36 participants (36%) among whom 5 were females (5%) and 31 were

males (31%), 21 participants (21%) were housewives, 20 participants were involved in services like plumber, mechanics, assistants, shopkeeper and others were farmer (7%) and teachers (5%) and 11 participants (11%) were others (i.e., unemployed, retired).

Care taker of the participants were either spouse, offspring or relatives. In this study, 45 of them (45%) were spouse, 32 of them were offspring's (32%) and 23 were relatives (23%).

Second part of the questionnaire include questions about the stroke disability i.e., participants knowledge and awareness about the disease risk factors and its consequences.

In the current study 56 participants (56%) had heard about stroke with a familial history of (15%). Almost half of the participants (50/100) knew that the brain is involved in stroke. Similarly in a study conducted by Kaddumukasa M., kayima J, et al., (2017), suggested that half of the study Participants (228/440) was able to recognize that brain was involved Organ. Over 2/3 of the participants (345/440) had a stroke more than once.^[13]

Survey Participants were able to name >1 established risk factors for stroke. The most frequently named risk factor was high BP (78%) followed by diabetes (36%), smoking (16%), too much alcohol (12%), too much stress (11%) and none (4%). Similarly in a study conducted by Nordhorn.M J, Christian H., et al (2015), suggested that the most frequently named risk factor was hypertension (43%) then Stress (18%).^[12]

54 participants (54%) explained that they had loss of ability to walk, had one sided paralysis, sudden weakness of the legs and the arms and sudden feeling of dizziness and fainting as the most recognized consequences of stroke. Our result is supported by a recent survey conducted by Osahon T.P, and emmanuel N.E, (2018), explained that sudden weakness and numbness of the leg/arms was the most identified symptoms of stroke (71.4%), while 50% accounts for one sided paralysis, as the most recognized consequences of stroke.^[14]

The modified Rankin Scale (MRS) is a clinician reported measure of global disability that has been widely applied for evaluating recovery from stroke and as a primary end point in RCTs of emerging acute treatments.^[15] In this study none of the participants scored 1 for the stroke participants in the mRS which depicts that no significant disability despite Symptoms & able to carry out all usual duties and activities, 7 participants (7%) scored 2 to the stroke Survivors which signifies, slight disability, able to look own affairs. 70 participants (70%) scored the 3 depicts moderate disability and 23 participants (23%) with score 4 i.e., moderately severe disability, unable to walk without assistance.

A large and diverse literature supports the view that the mRS is a valid and clinically relevant instrument for assessing recovery from stroke. In a study conducted by, Banks J.L, Charles A. (2015), suggested inter-rater reliability with the mRS is moderate & improves structured interviews, strong test-re-test reliability had been proved.^[15]

In the current study, 58 participants (58%) said that they need devices for ambulation. 28 participants (28%) said they can live alone without any help from another person while 27 participants (27%) mentioned that they can walk from one room to another without another person's help.

65 participants (65%) replied that they must mobilized after the condition improves while 18 participants (18%) said to take complete bed rest, only few participants (6%) said they must mobilize as early as possible. In contrast 11 participants (11%) mentioned that they should be mobilized after a week of stroke. The current study is supported by a similar study conducted by Olkowski.B, F, Shah SO, (2016), suggested that early mobility programs showed reduced complications associated with immobility in the ICU.^[16]

80 participants (80%) replied that supine position was ideal for the positioning and rest while none of the participants (0%) lied on the affected side, 14 participants (14%) on unaffected side and 6 participants (6%) in upright sitting position. In contrast few participants (14%) considered that lying on unaffected side is better. Similarly, in a study conducted by Brown L.D, Lynda D, et al (2008), suggested that acute stroke patients with some disability spend the vast majority of their sleep in the supine position. In this study most of the

participants (72%) changed their position after every 2 hourlies.^[17]

Third part of the questionnaire contains questions related to participant's knowledge and awareness about home-based exercises.

In the current study, 47% of participants knew about home-based rehabilitation, 79% agreed on the need for it while few participants (28%) said they are comfortable in-home environment, it was cost effective (75%) and saves time (36%) for participating in home-based exercise program. Similarly in a study conducted by lee H, and Seon H lee (2021) in Korea suggested that only 26.5% of patients knew about home-based exercises and 75% population was interested in participating as it likely to be less burden visiting hospital. In contrast, this study suggested that the current scenario most of the participants (75%) preferred continued hospitalization or out-patient rehabilitation while 92% agreed to follow HBEP for at least 2 weeks from the day of discharge.^[7]

In the current study, 73 participants (73%) believed that the home exercises are beneficial to improve recovery, and helped to be functionally independent, and improves activities of daily living. These results were similar to the finding of a studies conducted by Priyanka B, Kivijery (2021), suggested that 96 participants (96%) had agreed that home exercise program enhance their functional recovery and independence in ADLs. 93 participants felt that HEP does not results any adduce effect such a pain muscle spasm & joint smelling.^[5]

In the current study, 56 participants (56%) replied that they would consult health care professionals if experienced any adverse effects while 44 participants (44%) will take pain killers for the same.

Participants were asked about what made them to exercise regularly, they replied that they want to return to work (84%), for improvement / strength (80%), 34 participants (34%) will do for better hearth or recovery, 65 participants want to carry out ADL's and 66 participants will do as it was advised by consultant.

Limitations

- Multiple-choice questions were given to the respondents in which only limited options are available to study participants and he/she can guess the answer, unlike open-ended questions.
- Follow up was not taken to know the knowledge level of the participants.

Recommendations

- Follow up of the participants can be taken in order to assess the awareness of the participants.
- Further large-scale study with in-depth analysis of individual care-item may reveal better understanding of patient's knowledge and help institute appropriately targeted intervention for better stroke patients' care and outcome.

CONCLUSION

Our study has demonstrated an average level of awareness amongst majority of the participants interviewed in different areas of disability and exercises awareness of stroke participants. This study has reported that the study population has an average awareness about stroke, about associated signs and symptoms, risk factors, prevention and treatment options post stroke. Educational and awareness programs at the community level involving campaigns, informal education, mass media, schools, universities and governmental agencies are needed in order to improve stroke awareness among the targeted population.

REFERENCES

- 1) O'Sullivan SB, Schmitz TJ, Fulk GD, Physical Rehabilitation. 6thed. Philadelphia: Jaypee Brothers; 2007. 15th chapter. Stroke; p. 645-719.
- 2) Kamalakannan S, Gudlavalleti ASV, Gudlavalleti VSM, Goenka S, Kuper H. Incidence & prevalence of stroke in India: A systematic review. Indian J Med Res. 2017 Aug;146(2):175-185. doi: 10.4103/ijmr.IJMR_516_15. PMID: 29265018; PMCID: PMC5761027.
- 3) Neha C, Singh VJ, Sumandeep K. Efficacy of Balance and Gait Re- Education under Single and Dual Task Conditions in Post Stroke Hemiparetic Patients. International Journal of Innovative Research & Development 2015; 4(6):289-29.
- 4) Duncan PW, Zorowitz R, Bates B, Choi JY, Glasberg JJ, Graham GD, Katz RC, Lambert K, Reker D. Management of Adult Stroke Rehabilitation Care: a clinical practice guideline. Stroke. 2005 Sep;36(9): e100-43. doi: 10.1161/01.STR.0000180861.54180.FF. PMID: 16120836.
- 5) Priyanka B, Vijaya K, Abharam J, chakrapani M, Misri Z. K. adherence to home-based neuro-rehabilitation exercise program in stroke survivors. Bangladesh Journal of Medical Science. 2021, Vol. 20 Issue 1, p145-153. 9p.
- 6) Pui KC, Nordin MNA, Aziz AF. The effectiveness of home-based therapy on functional outcome, self-efficacy and anxiety among discharged stroke survivors. Medicine (Baltimore). 2020 Nov 20; 99(47): e23296. doi:10.1097/MD.00000000000023296.

- PMID: 33217861; PMCID: PMC7676535.
- 7) Lee H, Lee SH. Analysis of Home-Based Rehabilitation Awareness, Needs and Preferred Components of Elderly Patients with Hip Fracture Surgery in South Korea. Int J Environ Res Public Health. 2021 Jul 18; 18(14):7632. Doi: 10.3390/ijerph18147632. PMID: 34300083; PMCID: PMC8306015.
- 8) Modified Rankin Scale. [Internet] 2019. [Cited 7 April 19]. Available from: URL: <https://manual.jointcommission.org/releases/TJC2016B/DataElem0569.html>. (Accessed on May 2022)
- 9) An evaluation toolkit for e-library developments. Evalued [Internet] 2006. [Cited 2018 March 16]. Available from: URL: <http://www.evalued.bcu.ac.uk/tutorial/4a.htm>. (Accessed on Apr 2023).
- 10) Urimubenshi G. Activity limitations and participation restrictions experienced by people with stroke in Musanze district in Rwanda. Afr Health Sci. 2015 Sep;15(3):917-24. doi: 10.4314/has.v15i3.28. PMID: 26957982; PMCID: PMC4765476.
- 11) Pinheiro MB, Polese JC, Machado GC, Faria CDCM, Hirochi TL, Teixeira-Salmela LF. The Ability to Manage Stairs for Chronic Stroke Survivors Improves with Increases in Physical Activity Levels. J Nov Physiother 2013; 3.
- 12) Nordhorn MJ, Nolte CH, Rossmagel K, Jungehülsing GJ, Reich A, Roll S, et al. Knowledge about risk factors for stroke: a population-based survey with 28,090 participants. Stroke. 2006 Apr; 37(4):946-50. doi: 10.1161/01.STR.0000209332.96513.82. PMID: 16514090.
- 13) Kaddumukasa M, Kayima J, Nakibuuka J, Mugenyi L, Ddumba E, Blixen C, et al. A cross-sectional population survey on stroke knowledge and attitudes in Greater Kampala, Uganda. Cogent Med. 2017; 4(1):1327129. doi:10.1080/2331205X.2017.1327129. PMID: 31098388; PMCID: PMC6516782.
- 14) Osahon PT, Ekanem EN. Assessment of Stroke Awareness Among Public Servants in a Study Population in Nigeria. Trop J Nat Prod Res 2018; 2(6):278-281.
- 15) Banks JL, Marotta CA. Outcomes validity and reliability of the modified Rankin scale: implications for stroke clinical trials: a literature review and synthesis. Stroke. 2007 Mar;38(3):1091-6. doi: 10.1161/01.STR.0000258355.23810.c6. PMID: 17272767.
- 16) Olkowski BF, Shah SO. Early Mobilization in the Neuro-ICU: How Far Can We Go? Neurocrit Care. 2017 Aug;27(1):141-150. doi: 10.1007/s12028-016-0338-7. PMID: 28000130.
- 17) Brown DL, Lisabeth LD, Zupancic MJ, Concannon M, Martin C, Chervin RD. High prevalence of supine sleep in ischemic stroke patients. Stroke. 2008 Sep;39(9):2511-4. doi: 10.1161/STROKEAHA.107.513572. PMID: 18617656; PMCID: PMC2695786.