



Patterns of Post-Stroke Infections and Associated Care Practices Among Ischemic and Hemorrhagic Stroke Survivors in Bangladesh: A Comparative Cross-Sectional Study

Muhammad Abdul Momen Khan¹, Sultana Amena Ferdoucy², Mamun Ur Rashid³, Jannatul Ferdous⁴, Nasreen Jahan⁵, Mohammad Abdullah Al Masud⁶

¹Professor (Interventional Neurology), Department of Neurology, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh;

²Associate Professor, Department of Radiology & Imaging, Dr. M R Khan Shishu Hospital & ICH, Mirpur-2, Dhaka, Bangladesh;

³Assistant Project Director, DGHS, CBHC&DGDA, Mohakhali, Dhaka, Bangladesh; ⁴Assistant Professor, Department of Paediatrics, National Institute of Neurosciences and hospital, Dhaka, Bangladesh; ⁵Assistant Professor, Department of Microbiology, National Institute of Neurosciences and Hospital, Dhaka, Bangladesh; ⁶Assistant Professor (Anaesthesia), Upazila Health Complex, Shibpur, Narsingdi, Bangladesh, attached to 250 Bedded District Hospital, Narsingdi, Bangladesh

Abstract

Background: Stroke is a leading cause of disability and mortality in the world. Infections can be a frequent complication after a stroke and may affect recovery from a stroke, particularly with hemorrhage. **Objective:** The purpose of the present study was to compare demographic characteristics, clinical risk factors, and the prevalence of post-stroke infections among patients with ischemic stroke, intracerebral hemorrhage (ICH), and subarachnoid hemorrhage (SAH) and to describe infection-related care practices among affected patients. **Methodology:** This comparative cross-sectional study conducted at inpatient department of neurology, Shaheed Suhrawardy Medical College & Hospital, Dhaka, Bangladesh, from January 2025 to December 2025. In all, 384 consecutive patients with stroke were included. A structured interview schedule and medical record review were used to gather data on the variables related to a person's demographic information, vascular risk factors, stroke type, and post-stroke infections. Stroke was categorized as ischemic or as hemorrhagic (ICH and SAH). **Results:** There were 384 stroke survivors, including 291 (75.8%) ischemic stroke, 73 (19.0%) intracerebral hemorrhage (ICH), and 20 (5.2%) subarachnoid hemorrhage (SAH) patients. The mean age of patients with ischemic stroke was significantly older than patients with ICH and SAH ($p < 0.001$). There was a significant difference between stroke subtypes in terms of hypertension ($p = 0.006$) and smoking ($p = 0.010$). There was a significant difference in post-stroke infection rate between patients with ICH (84.9%) and SAH (85.0%) versus those with ischemic stroke (45.4%) ($p < 0.001$). The frequency of oral infection was also significantly different between stroke subtypes ($p < 0.001$) but was similar for urinary tract infection, upper respiratory tract infection, pneumonia, and bed sore infection. Poor oral hygiene was the most prevalent level of care among patients with oral infection (47.5%), while the use of an indwelling urinary catheter (85.7%) and nasogastric tube feeding (71.4%) were common among patients with urinary tract infection and pneumonia, respectively of the infected patients. **Conclusion:** Survivors of a hemorrhagic stroke were more likely to have an infection than survivors of an ischemic stroke, and oral infection was common. Further work to enhance oral hygiene, optimize urinary catheter use, and improve strategies for aspiration prevention may help decrease preventable infection. [Bangladesh Journal of Infectious Diseases, June 2026;13(1):354-359]

Keywords: Stroke; ischemic stroke; intracerebral hemorrhage; subarachnoid hemorrhage; post-stroke infection

Correspondence: Dr. Mamun ur Rashid, Assistant Project Director, DGHS, CBHC & DGDA, Mohakhali, Dhaka, Bangladesh; Cell No.: +8801731161921; Email: dr.mamunpir@gmail.com; ORCID: <https://orcid.org/0009-0000-0653-8950>

©Authors 2026. CC-BY-NC

Introduction

Stroke is one of the leading causes of death and disability globally, and the burden of stroke is growing in low- and middle-income countries like Bangladesh. Post-stroke complications are an important field of study in Bangladesh, where limited stroke service delivery and delayed presentation, along with a high burden of vascular risk factors, result in poor outcomes^{1,2}. Post-stroke infectious complications have been recognized as clinically significant due to the risk of further hospitalization, disability, and increased mortality or risk of re-hospitalization^{3,4}.

There are two major types of strokes: ischemic and hemorrhagic. Hemorrhagic stroke is further divided into intracerebral hemorrhage (ICH) and subarachnoid hemorrhage (SAH). ICH is the most common type of hemorrhagic stroke and makes up the bulk of hemorrhagic strokes and is typically linked to high blood pressure-related rupture of small cerebral vessels. Infections after a stroke are significant

complications that can exacerbate the effects of the stroke and extend the duration of hospitalization^{3,5}.

The most frequent post-stroke infections are pneumonia, urinary tract infection, bloodstream infection, and, less commonly, meningitis or ventriculitis. Pneumonia is frequently the most common infection following ischemic stroke and hemorrhagic stroke, frequently associated with altered mentation, dysphagia, aspiration, immobility, and invasive devices⁶.

Intracerebral haemorrhage patients are at greater risk of developing post-stroke infections, especially during the acute phase of the stroke. Intraventricular haemorrhage has also been shown to be an important predictor of infectious complications⁵. Previous studies have shown that infections after intracerebral hemorrhage are associated with longer intensive care and hospital stays, a greater need for supportive interventions, and poorer functional outcomes.

Most of the evidence is derived from the setting of hospital admission and neurocritical care; however, there is limited evidence available from Bangladesh, particularly patients managed in the follow-up/outpatient setting.

This is because of variation in swallowing assessment, antibiotic use, catheter use, hygiene, and follow-up routines among the local infection patterns⁷.

A comparative study of the infective complications among ischemic stroke and hemorrhagic stroke patients is required in Bangladesh to identify the

common types of infective complications, clinical predictors, and the outcome in our environment.

This evidence can help clinicians recognize at an early stage who is at risk and thus recommend preventive measures, particularly for pneumonia and other preventable infections.

Methodology

Study Design and Setting: The present study was a comparative cross-sectional study that was carried out during the period January 2025 to December 2025 at the Inpatient Department of Neurology, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh. The objective of this study was to compare the prevalence and the trends of post-stroke infections in patients with ischemic stroke (IS), intracerebral hemorrhage (ICH) and subarachnoid hemorrhage (SAH) and to determine infection-specific care practices associated with post-stroke infections in inpatient care.

Study Population: During the study period, 384 consecutive patients with stroke were enrolled in the neurology outpatient clinic. Diagnosis of stroke was confirmed clinically and with computed tomography or magnetic resonance imaging.

Selection Criteria: Adult patients with an age of more than or equal to 18 years, ischemic stroke, intracerebral hemorrhage (ICH), and subarachnoid hemorrhage (SAH), all confirmed clinically and with neuroimaging; patients who were diagnosed as a case of stroke with manifestation of infection at least 48 hours of admission and patients who had given written informed consent were included in this study.

Patients aged less than 18 years, ICU patients at the time of recruitment, patients with transient ischemic attack (TIA), stroke mimics or other non-stroke neurological disorders or patients with incomplete clinical data or who refused to participate were excluded from this study.

Data Collection: A pretested and structured questionnaire and existing medical records were used during the data collection for this study. Information on demographic characteristics such as age, gender, residence, education level, and income category, vascular risk factors (hypertension, diabetes mellitus, dyslipidaemia, and smoking), stroke subtype, and post-stroke infections was recorded.

Post-stroke infections (PSTI) such as urinary tract infection (UTI), upper respiratory tract infection (URTI), pneumonia, bed sore infection, and oral infection were recorded as clinical signs and when medical records were available. Data were also

gathered on infection-related care practices such as oral hygiene, urinary catheter use, feeding method and care practices for preventing pressure sores.

Statistical Analysis: The data were typed, cleaned, and analyzed in Python 3.12. Continuous variables were expressed as mean $\pm$ standard deviation (SD), and categorical variables were expressed as frequencies and percentages. Comparisons of demographic and clinical characteristics of ischemic stroke, ICH, and SAH patients were carried out using one-way ANOVA for continuous variables and Pearson's chi-square test for categorical variables. Pearson's chi-square test was also used to evaluate associations between infection-specific care practices and post-stroke infections. The p-value was determined on a two-tailed basis, and a p-value < 0.05 was considered statistically significant.

Ethical Considerations: The study was conducted after securing ethical clearance through the Institutional Review Board (IRB) of Shaheed Suhrawardy Medical College Hospital. All participants gave written informed consent before participating. The participants' confidentiality and anonymity were respected throughout the study, and all the data collected were solely for research purposes, following the principles of the Declaration of Helsinki.

Results

A total of 384 stroke patients were included in the study. Among the enrolled subjects, 291(75.8%) had ischemic stroke, 73(19.0%) cases had intracerebral hemorrhage (ICH) and 20(5.2%) cases had subarachnoid hemorrhage (SAH).

There were 291(75.8%) patients with ischemic stroke, 73(19.0%) patients with intracerebral hemorrhage (ICH) and 20(5.2%) patients with subarachnoid hemorrhage (SAH). There were significant differences among the three groups in mean age; ischemic stroke patients were older than ICH and SAH patients ($p < 0.001$). There were no differences between the stroke subtypes in terms of sex ($p = 0.8804$), residence ($p = 0.7771$), education level ($p = 0.9970$), or income category ($p = 0.8104$) (Table 1).

The clinical features of patients with stroke-by-stroke subtype was recorded. The prevalence of hypertension was significantly higher in patients with intracerebral hemorrhage (75.3%) compared with patients who had ischemic stroke (55.0%) and subarachnoid hemorrhage (65.0%) ($p = 0.0058$).

There was also a significant difference between smoking habits in the 3 stroke subtypes ($p = 0.0095$). There were no significant differences between the study groups in the prevalence of diabetes ($p = 0.3754$) or dyslipidaemia ($p = 0.0729$) (Table 2).

Table 1: Demographic Characteristics of Stroke Patients by Stroke Subtype (N = 384)

Variables	Ischemic (n=291)	ICH (n=73)	SAH (n=20)
Age (Years) Mean $\pm$ SD	62.4 $\pm$ 9.8	58.1 $\pm$ 10.3	52.7 $\pm$ 12.4
Gender			
• Female	151(51.9%)	36(49.3%)	11(55.0%)
• Male	140(48.1%)	37(50.7%)	9(45.0%)
Residence			
• Rural	146(50.2%)	39(53.4%)	9(45.0%)
• Urban	145(49.8%)	34(46.6%)	11(55.0%)
Education			
• Illiterate	70(24.1%)	17(23.3%)	4(20.0%)
• Primary	75(25.8%)	20(27.4%)	5(25.0%)
• Secondary	83(28.5%)	22(30.1%)	6(30.0%)
• Higher Secondary	63(21.6%)	14(19.2%)	5(25.0%)
Income			
• Low	102(35.1%)	29(39.7%)	8(40.0%)
• Middle	108(37.1%)	28(38.4%)	8(40.0%)
• High	81(27.8%)	16(21.9%)	4(20.0%)

P value of Hypertension=0.0058; P value of Diabetes=0.3754; P value of Dyslipidaemia=0.0729; P value of Smoking=0.0095; HTN=Hypertension; DM=Diabetes Mellitus; Dyslipid = Dyslipidemia; Chi-square test was performed to see the level of significance

Table 2: Clinical Characteristics of Stroke Patients (N=384)

Risk Factors	Ischemic (n=291)	ICH (n=73)	SAH (n=20)
HTN	160(55.0%)	55(75.3%)	13(65.0%)
DM	31(10.7%)	11(15.1%)	1(5.0%)
Dyslipid	34(11.7%)	2(2.7%)	2(10.0%)
Smoking	66(22.7%)	5(6.8%)	4(20.0%)

P value of Hypertension=0.0058; P value of Diabetes=0.3754; P value of Dyslipidaemia=0.0729; P value of Smoking=0.0095; HTN=Hypertension; DM=Diabetes Mellitus; Dyslipid = Dyslipidemia; Chi-square test was performed to see the level of significance

Patients could experience more than one type of post-stroke infection. There was a significant difference in post-stroke infection across the 3 groups ($p < 0.001$), with higher proportions of patients with intracerebral hemorrhage (84.9%) and subarachnoid hemorrhage (85.0%) compared to

ischemic stroke (45.4%). There was also a significant difference between stroke subtypes for oral infection ($p < 0.001$). The prevalence of UTI ($p = 0.212$), upper respiratory tract infection (URTI) ($p = 0.073$), pneumonia ($p = 0.755$), and bed sore infection (BSI) ($p = 0.655$) was not significantly different (Table 3).

Table 3: Prevalence and Types of Post-Stroke Infection (N=384)

Infection Type	Ischemic (n=291)	ICH (n=73)	SAH (n=20)
Post-Stroke Infection	132(45.4%)	62(84.9%)	17(85.0%)
UTI	47(16.2%)	10(13.7%)	6(30.0%)
URTI	44(15.1%)	7(9.6%)	6(30.0%)
Pneumonia	28(9.6%)	5(6.8%)	2(10.0%)
Bed Sore Infection	31(10.7%)	6(8.2%)	3(15.0%)
Oral Infection	56(19.2%)	47(64.4%)	15(75.0%)

Urinary tract infection =UTI; Upper respiratory tract infection=URTI; P value of Post-Stroke Infection=0.001; P value of UTI=0.212; P value of URTI=0.073; P value of Pneumonia=0.755; P value of Bed Sore Infection=0.655; P value of Oral Infection=0.001; Chi-square test was performed to see the level of significance

Table 3: Distribution of Study Population according to Discharge Type

Specific Infection	Frequency	Percent
Oral Infection (n =118)		
• Poor Oral Hygiene	56	47.5
• Irregular Oral Hygiene	47	39.8
• Regular Oral Hygiene	15	12.7
UTI (n = 63)		
• Indwelling urinary catheter	54	85.7
• Condom catheter/Diaper	9	14.3
URTI (n = 57)		
• Oral feeding	42	73.7
• Nasogastric (NG) tube feeding	15	26.3
Pneumonia (n = 35)		
• Nasogastric (NG) tube feeding	25	71.4
• Oral feeding	10	28.6
Bed Sore Infection (n = 40)		
• Pneumatic bed	9	22.5
• Non-pneumatic bed/Frequent posture change	31	77.5

The vast majority of PSI patients were reported to have used some type of antimicrobial treatment. In patients who had oral infection ($n = 118$), the most common oral care practice was poor oral hygiene (47.5%), followed by irregular (39.8%) and regular (12.7%) oral hygiene. A total of 63 patients had urinary tract infection (UTI), 85.7% of whom had an indwelling urinary catheter and 14.3% a condom catheter or diaper. When patients with upper respiratory tract infection (URTI) ($n = 57$) were entered, 73.7% were on oral feeding and 26.3% were NG tube feeding. Nasogastric tube feeding was reported in 71.4% of patients with pneumonia ($n = 35$) with the remaining 28.6% receiving oral feeding. In cases of bed sore infection ($n = 40$), 77.5% of patients used a non-pneumatic bed or posture change often, while 22.5% used a pneumatic bed (Table 4).

Discussion

The present study showed that ischemic stroke was the most common stroke type, followed by intracerebral hemorrhage (ICH) and subarachnoid hemorrhage (SAH), which corroborates with previous studies conducted in Bangladesh as well as other countries⁸⁻¹¹. Patients who suffered ischemic stroke were significantly older than those with ICH and SAH. Hypertension was a significant factor with ICH patients, demonstrating a higher prevalence of this, as is well established as the most important modifiable risk factor of intracerebral hemorrhage¹¹⁻¹⁵. Smoking was also found to be very different in stroke subtypes, while diabetes mellitus and dyslipidemia were found to be non-significant when compared to each other or to smoking.

One of the most important findings of this study was the high prevalence of post-stroke infection among the patients who suffered from hemorrhagic stroke versus those with ischemic stroke. The results are in accord with earlier reports, indicating that patients with bleeding strokes tend to have infectious complications during poststroke recovery¹⁶⁻¹⁷. Poor oral hygiene was most common among patients with oral infection, while an indwelling urinary catheter was most common among patients with UTI and nasogastric tube feeding among patients with pneumonia. The results of this study paralleled previous research that focused on the need for proper maintenance of oral hygiene, catheter care, and monitoring patients with enteral nutrition for possible post-stroke infections¹⁸⁻²⁰.

This study did not aim to prove causality, but rather revealed a distribution of care practices that suggest some important post-stroke care practices that could

be modified. Many patients had oral infection and poor oral hygiene; many patients had UTI and nasogastric tube feeding, and many patients had pneumonia. The results indicate measures to improve oral care practices, reduce unnecessary catheterization, and prevent aspiration should be considered to bolster the infection prevention strategy used in outpatient stroke care. In conclusion, there was a significantly greater amount of post-stroke infection in patients with hemorrhagic stroke compared to patients with ischemic stroke. Applying stronger infection prevention strategies, including proper oral hygiene, urinary catheter care, and safe use of nasogastric tubes in stroke patients in Bangladesh, could have a positive effect on decreasing preventable infections and improving outcomes.

There are some limitations of the study. It was performed in a single tertiary care hospital with a cross-sectional design, which may limit the generalizability of the findings and prevent causal relationships. A larger multicenter prospective study is recommended to confirm these findings.

Conclusion

Intracerebral hemorrhage (ICH) patients and subarachnoid hemorrhage (SAH) patients were significantly more likely to have post-stroke infections when compared to ischemic stroke survivors. Oral infection was the only type of infection to vary significantly by stroke subtype. Most patients with oral infection had poor oral hygiene; those with urinary tract infection had an indwelling urinary catheter; and those with pneumonia had nasogastric tube feeding. The findings argue for the need to improve oral care, proper use of catheters, and safe feeding strategies in the provision of routine post-stroke care, especially in those with hemorrhagic stroke. Future multicenter prospective studies on a larger scale are warranted to confirm these results.

Acknowledgements

None

Conflict of interest:

The authors have no conflicts of interest to disclose.

Financial Disclosure

The author(s) received no specific funding for this work.

Authors' contributions

Khan MAM, Ferdoucy SA, Rashid MU, Jahan N, Al Masud MA contributed from the protocol preparation, data collection up to report writing. Manuscript writing was performed by Ferdous J, Ferdoucy SA and Khan MAM contributed in statistical model selection and analysis. All the authors approved the final

manuscript.

Data Availability

Any questions regarding the availability of the study's supporting data should be addressed to the corresponding author, who can provide it upon justifiable request.

Ethics Approval and Consent to Participate

The Institutional Review Board granted the study ethical approval. Since this was a cross-sectional study, every study participant provided formal informed consent. Each method followed the appropriate rules and regulations.

Copyright: © Khan et al. 2026. Published by Bangladesh

Journal of Infectious Diseases. This is an open-access article and is licensed under the Creative Commons Attribution Non-Commercial 4.0 International License (CC BY-NC 4.0). This license permits others to distribute, remix, adapt and reproduce or changes in any medium or format as long as it will give appropriate credit to the original author(s) with the proper citation of the original work as well as the source and this is used for noncommercial purposes only. To view a copy of this license, please see:

<https://www.creativecommons.org/licenses/by-nc/4.0/>

How to cite this article: Khan MAM, Ferdoucy SA, Rashid MU, Ferdous J, Jahan N, Al Masud MA. Patterns of Post-Stroke Infections and Associated Care Practices Among Ischemic and Hemorrhagic Stroke Survivors in Bangladesh: A Comparative Cross-Sectional Study. *Bangladesh J Infect Dis* 2026;13(1):354-359

ORCID:

Muhammad Abdul Momen Khan:

<https://orcid.org/0009-0002-1341-1303>

Sultana Amena Ferdoucy:

<https://orcid.org/0009-0005-4417-6686>

Mamun Ur Rashid: <https://orcid.org/0009-0000-0653-8950>

Jannatul Ferdous:

Nasreen Jahan:

Mohammad Abdullah Al Masud:

Article Info

Received on: 1 June 2025

Accepted on: 12 October 2025

Published on: 1 June 2026

References

1. Venketasubramanian N, Mannan M. Stroke burden and stroke services in Bangladesh. *Cerebrovascular Diseases Extra*. 2021 Sep 1;11(2):69-71.
2. Mondal MB, Hasan AH, Khan N, Mohammad QD. Prevalence and risk factors of stroke in Bangladesh: A nationwide population-based survey. *Eneurologicalsci*. 2022 Sep 1;28:100414.
3. Lord AS, Lewis A, Czeisler B, Ishida K, Torres J, Kamel H, Woo D, Elkind MS, Boden-Albala B. The majority of 30-day readmissions after intracerebral hemorrhage are related to infections. *Stroke*. 2016 Jul;47(7):1768-71.
4. Aziz M, Bipasha N, Gupta U, Ramnarine IV, Redgrave J, Ali AN, Majid A, Bell SM. Stroke in Bangladesh: A narrative review of epidemiology, risk factors, and acute stroke services. *Journal of Cardiovascular Development and Disease*. 2025 Feb 5;12(2):58.
5. Lord AS, Langefeld CD, Sekar P, Moomaw CJ, Badjatia N, Vashkevich A, Rosand J, Osborne J, Woo D, Elkind MS. Infection after intracerebral hemorrhage: risk factors and association with outcomes in the ethnic/racial variations of intracerebral hemorrhage study. *Stroke*. 2014 Dec;45(12):3535-42.
6. Rahman R. Risk factors of hemorrhagic and ischemic stroke

- among hospitalized patients in Bangladesh: A case-control study. Bangladesh Medical Research Council Bulletin. 2016 Jan 1.
7. Bhowmik NB, Abbas A, Saifuddin M, Islam MR, Habib R, Rahman A, Haque MA, Hassan Z, Wasay M. Ischemic strokes: observations from a hospital-based stroke registry in Bangladesh. Stroke research and treatment. 2016;2016(1):5610797.
 8. Khaku AS, Tadi P. Cerebrovascular Disease. [Updated 2023 Aug 7]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2026 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK430927/>
 9. Grysiewicz RA, Thomas K, Pandey DK. Epidemiology of ischemic and hemorrhagic stroke: incidence, prevalence, mortality, and risk factors. Neurol Clin. 2008;26(4):871–895.
 10. Mondal MB, Hasan AH, Khan N, Mohammad QD. Prevalence and risk factors of stroke in Bangladesh: A nationwide population-based survey. Eneurologicalsci. 2022;28:100414.
 11. An SJ, Kim TJ, Yoon BW. Epidemiology, risk factors, and clinical features of intracerebral hemorrhage: An update. J Stroke. 2017;19(1):3–10.
 12. O'Donnell MJ, Chin SL, Rangarajan S, et al. Global and regional effects of potentially modifiable risk factors associated with acute stroke in 32 countries (INTERSTROKE): A case-control study. Lancet. 2016;388(10046):761–775.
 13. Mannan M, Venketasubramanian N. Stroke burden and stroke services in Bangladesh. Cerebrovasc Dis Extra. 2021;11(2):69–71.
 14. Unnithan AKA, Das JM. Hemorrhagic Stroke Overview. [Updated 2025 Dec 13]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2026 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK559173/>
 15. Greenberg SM, Ziai WC, Cordonnier C, et al. 2022 guideline for the management of patients with spontaneous intracerebral hemorrhage. Stroke. 2022;53(7):e282–e361.
 16. Busl KM. Healthcare-associated infections in the neurocritical care unit. Current neurology and neuroscience reports. 2019 Oct;19(10):76.
 17. Westendorp WF, Nederkoorn PJ, Vermeij JD, Dijkgraaf MG, de Beek DV. Post-stroke infection: a systematic review and meta-analysis. BMC neurology. 2011 Sep 20;11(1):110.
 18. Brady MC, Furlanetto DL, Hunter RV, Lewis SC, Milne V. Oral health care for patients after stroke. Stroke. 2011 Dec;42(12):e636-7.
 19. Hooton TM, Bradley SF, Cardenas DD, Colgan R, Geerlings SE, Rice JC, Saint S, Schaeffer AJ, Tambayh PA, Tenke P, Nicolle LE. Diagnosis, prevention, and treatment of catheter-associated urinary tract infection in adults: 2009 International Clinical Practice Guidelines from the Infectious Diseases Society of America. Clinical infectious diseases. 2010 Mar 1;50(5):625-63.
 20. Martino R, Foley N, Bhogal S, Diamant N, Speechley M, Teasell R. Dysphagia after stroke: incidence, diagnosis, and pulmonary complications. stroke. 2005 Dec 1;36(12):2756-63.