

Mortality, Medical Complications, and Care Indicators among Stroke Inpatients at King Abdulaziz Medical City-Jeddah-Saudi Arabia

Waleed Khayyat¹, Yousef Al Talhi¹, Abdullah Alshareef¹, Ashraf Abou Elezz², Kareem Halfawi³, Saeed Alghamdi⁴, Hashem Alhashemi^{5,*}

1. Medical student at King Saud bin Abdulaziz University for Health Sciences_ Jeddah
2. Consultant of Phoniatics, ENT division, Department of Surgery, KAMC Jeddah.
3. Head of Speech Therapy, KAMC Jeddah
4. Consultant of Neurology, Department of Medicine, KAMC Jeddah, Assistant Professor at KSAU-HS.
5. Physical Medicine & Rehabilitation consultant, Department of Medicine, KAMC Jeddah, Assistant Professor at KSAU-HS

Abstract:

Objective: To assess mortality, medical complications, and care indicators among stroke patients admitted to general medical units at King Abdulaziz Medical City-Jeddah-Saudi Arabia.

Methods: This retrospective cohort study included all adult patients (>16 years) admitted to KAMC-Jeddah between January 1, 2014, and June 30, 2015, with acute stroke. Data regarding in-hospital stroke mortality and medical complications (pressure ulcer, pneumonia, venous thromboembolism dysphagia, and wheelchair dependency) and stroke care indicators (time-to-CT, carotid imaging, lipid profile, physical therapy, swallowing assessment, nutritional assessment, and length of stay) were collected.

Results: Patients included were 208. Acute stroke mortality was 19%, while wheelchair dependency, and dysphagia on discharge were 39% and 56% respectively in general medical units. The incidence of pressure ulcers, pneumonia, and venous thromboembolism was 17%, 14%, and 3%, respectively. Pneumonia (odds ratio [OR], 5.5; P = 0.002; 95% confidence interval [CI], 1.9–16), abnormal troponin level (OR, 4.4; P = 0.002; 95% CI, 1.7–11), hemorrhagic stroke (OR, 3.9; P = 0.015; 95% CI, 1.3–12), and pressure ulcers (OR, 3.0; P = 0.036; 95% CI, 1.1–8.0) were significantly associated with increased mortality.

Median time to CT scan was 117 minutes. Carotid imaging was performed for 67% of ischemic stroke patients, and 65% underwent fasting lipid profile assessment. Assessment by nutritionist, physiotherapist, and swallowing therapist was done for 90%, 76%, and 53% of stroke patients respectively. The median length of stay was 12 days.

Conclusion: Acute stroke mortality was 19 %, while wheelchair dependency, and dysphagia on discharge were 39% and 56% respectively in general medical units at KAMC Jeddah. Pneumonia, abnormal troponin, hemorrhagic stroke, and pressure ulcers are associated with increased mortality. Future research is needed to compare outcomes of stroke care between general units and specialized stroke units nationally.

Corresponding Authors: Hashem Alhashemi, KAMC Jeddah21423, PO box 9515, Medicine Department, Mailcode 6333, Fax:+00966122266666, Ext22765, Phone:+00966122266666 Ext22070, Email: hashemhh@yahoo.com, alhashemiha@ngha.med.sa.

Running Title: Stroke Care at KAMC-Jeddah-Saudi Arabia

Keywords: Stroke, mortality, medical complications, care indicators

Received: Jun 29, 2016;

Accepted : Jul 20, 2016;

Published : Aug 04, 2016;

Introduction:

Stroke is a major concern for public health authorities since it is the third leading cause of death and the first leading cause of disability globally. (1) The annual incidence of stroke in Saudi Arabia is 29.8, while the prevalence is 186 per 100,000 population. (2) In order to improve the quality of care for stroke patients, a comprehensive and continuous assessment of the care provided is needed to identify and address gaps in the delivered services. (3) Recent literature reviews of stroke in Saudi Arabia have urged for more research in this field nationally. (4, 5)

The objectives of the present study were to assess mortality, medical complications, and care indicators among stroke patients admitted to general medical units at King Abdulaziz Medical City in the western region of Saudi Arabia (KAMC-Jeddah).

Methods:

This was a retrospective cohort study of all adult patients admitted to the medical units at KAMC-Jeddah between January 1, 2014, and June 30, 2015, for acute stroke confirmed by computed tomography (CT) of the brain. Pediatric patients (those younger than 16 years old), patients with metastatic cancers, and patients with old strokes who were admitted for other medical reasons were excluded.

The study data collection tool was created after reviewing the literature and after screening patients'

records for the availability of the needed data. The data collection team consisted of three medical students who were trained to use the data collection tool. Data regarding in-hospital stroke mortality, medical complications, and care indicators among stroke inpatients from the time of admission until discharge were abstracted from the electronic health information system database used at KAMC-Jeddah.

Stroke medical complications reviewed were development of pressure ulcers, pneumonia, venothrombotic events, dysphagia, and wheelchair dependency. The stroke care indicators collected were time from emergency department triage to brain computed topography (CT), performance of carotid imaging (ultrasound or CT angiography), fasting lipid profile, troponin test, physical therapy, swallowing assessment, nutritional assessment, and length of stay (3, 6-9).

The study was approved by the institutional ethical review board (due to the retrospective design of the study, informed consents were not required).

Analysis was done using the Statistical Package for Social Sciences (SPSS), version 22.

The proportions of patients who died during hospitalization, sustained medical complications, and those who underwent the specified stroke care indicators were reported.

In addition, a logistic regression test was performed using stroke in-hospital mortality as the

dependent outcome variable and stroke patients' characteristics and complications as independent explanatory variables (stroke type, age, sex, pneumonia, pressure ulcers, abnormal troponin, and dysphagia). Estimated odds ratios with p values ≤ 0.05 were considered statistically significant.

Results:

The total number of patients who were admitted to KAMC-Jeddah with the diagnosis of stroke in this retrospective cohort was 278 patients. Pediatric patients (5 cases), patients with metastatic cancers (3 cases), and patients with old strokes (62 cases) were excluded. Thus, 208 patients overall were included in the study. Male to female ratio was 1.5:1, with an overall median age of 70 years old. Ischemic strokes (IS) represented 83% of all strokes. The prevalence of hypertension, diabetes mellitus, and ischemic heart disease was 70%, 61%, and 18%, respectively (Table 1).

Table 1. Patient characteristics

| Patient Characteristics | Total N = 208 | Ischemic N = 172 | Hemorrhagic N = 36 |
|-------------------------|------------------|---------------------|-----------------------|
| Age,* years | 70 | 71 | 64 |
| Females | 83 (40) | 70 (41) | 13 (36) |
| Males | 125 (60) | 102 (59) | 23 (64) |
| Hypertension | 146 (70) | 124 (72) | 22 (61) |
| Diabetes | 126 (61) | 108 (63) | 18 (50) |
| IHD | 38 (18) | 34 (20) | 4 (11) |

Data are presented as n (%) unless otherwise noted. *Median. Abbreviations: IHD, ischemic heart disease.

Mortality and post stroke medical complications:

Thirty-nine patients died during hospitalization, resulting in a mortality rate of 19%. The incidence of pressure ulcers, pneumonia, and venous thromboembolism was 17%, 14%, and 3%, respectively. Troponin level was measured for 90% of the patients, and abnormal levels (troponin >0.03 ng/mL) were found in 34% of them.

The proportion of patients with dysphagia decreased from 72% on admission to 56% at discharge. Similarly, the proportion of patients requiring tube feeding decreased from 51% on admission to 25% at

discharge. In addition, 39% of the patients were wheelchair-dependent on discharge (Table 2).

The logistic regression analysis to estimate risk of death associated with stroke characteristics and complications (stroke type, age, sex, pneumonia, pressure ulcers, abnormal troponin, and dysphagia) was significant for four factors. Pneumonia (odds ratio [OR], 5.5; P = 0.002; 95% confidence interval [CI], 1.9–16),

Table 2. Ambulatory and feeding status of stroke patients on Discharge

| Ambulation & Feeding | Total N = 169 | Ischemic N = 146 | Hemorrhagic N = 23 |
|----------------------|------------------|---------------------|-----------------------|
| Ambulation | | | |
| Independent | 35 (21) | 30 (21) | 5 (22) |
| Assistance | 51 (30) | 48 (33) | 3 (13) |
| Wheelchair | 66 (39) | 54 (37) | 12 (52) |
| Not Available | 17 (10) | 14 (10) | 3 (13) |
| Oral Feeding | | | |
| Regular | 75 (44) | 68 (47) | 7 (30) |
| Modified | 94 (56) | 78 (53) | 16 (70) |
| Tube Feeding | | | |
| NG | 31 (18) | 23 (16) | 8 (35) |
| PEG | 12 (7) | 10 (7) | 2 (9) |

In-hospital deaths are excluded from the cohort in this table. Data are presented as n & (%) . Abbreviations: NG, nasogastric; PEG, percutaneous endoscopic gastrostomy

abnormal troponin level (OR, 4.4; P = 0.002; 95% CI, 1.7–11), hemorrhagic stroke (OR, 3.9; P = 0.015; 95% CI, 1.3–12), and pressure ulcers (OR, 3.0; P = 0.036; 95% CI, 1.1–8.0) were found to be associated with increased mortality (Table 3).

Stroke care indicators:

The median time to brain CT was 117 minutes. Carotid imaging was performed in 67% of the patients with ischemic stroke (IS), while 65% of them underwent fasting lipid profile analysis.

Assessment by a swallowing therapist was performed for 53% of the patients, assessment by a physiotherapy was performed for 76% of the patients, and an assessment by a nutritionist was performed for 90% of the patients. The median length of stay for all stroke inpatients was 12 days. (Table 4).

Table 3. Death odds ratios for stroke-associated risk factors

| Mortality Predictor | OR | P-value | 95 % CI | |
|---------------------------|-----|---------|---------|------|
| High Troponin | 4.4 | 0.002 | 1.7 | 11.4 |
| Sex | 2 | 0.15 | 0.8 | 5.1 |
| Pneumonia | 5.5 | 0.002 | 1.9 | 16.2 |
| Dysphagia | 4 | 0.1 | 0.8 | 20.4 |
| Hemorrhagic stroke | 3.9 | 0.015 | 1.3 | 11.9 |
| Age | 0.4 | 0.1 | 0.2 | 1.2 |
| Pressure ulcers | 3 | 0.036 | 1.1 | 8.1 |

Abbreviations: OR, odds ratio; CI, confidence interval.

Table 4. Stroke care indicators

| Stroke Care Indicators | Total | Ischemic | Hemorrhagic |
|------------------------|----------|----------|-------------|
| | N = 208 | N = 172 | N = 36 |
| Time to CT*; m | 117 | 112 | 130 |
| Carotid Imaging | 126 (61) | 115 (67) | 11 (31) |
| Lipid Profile | 127 (61) | 111 (65) | 16 (44) |
| Physiotherapy | 159 (76) | 137 (80) | 21 (58) |
| Swallowing Assessment | 110 (53) | 84 (49) | 26 (72) |
| LOS in days* | 12 | 12 | 10 |

Data are presented as n (%) unless otherwise noted. *Median. Abbreviations: CT, computed tomography; m, minutes; LOS, length of stay.

Discussion:

Study findings with respect to the prevalence of IS, male-to-female ratio, patients' age, and the prevalence of hypertension, diabetes mellitus, and ischemic heart disease are similar to previously published studies performed in other countries. (3, 6-11)

Inpatient mortality in this study was 19%, while other stroke studies showed mortality rates ranging from 3% to 33%, depending on the country of origin and the level of care. Mortality rates were generally lower for patients who were admitted to stroke units. (8, 9, 12, 13)

Admission of stroke patients to stroke units results in 6% absolute risk reduction in mortality and dependency, while the absolute risk reduction for thrombolysis is 13%. Therefore, admission to a stroke unit can have a huge impact on stroke outcomes because most patients can benefit from it while only 10% of them can benefit from thrombolysis. (14-16) Due to the overwhelming body of evidence in favor of stroke care units, KAMC-Jeddah will start a stroke unit in the near future. (12, 17-19)

The incidence of pressure ulcers was 17%, while outcome studies from stroke units have reported a much lower incidence, ranging from 0.3% to 3%. (20-22) The incidence of pneumonia was 14%. Rates reported in previous studies ranged from 6% to 13%. (9, 22)

Regarding the estimated odds of death, several previous studies similarly showed increased risk of death with pneumonia, abnormal troponin level, hemorrhagic stroke and pressure ulcers following stroke. (20, 23, 24)

All patients underwent CT screening within 24 hours, with a median time to CT of 117 minutes. Other studies have shown that the majority of patients (86%) were screened within 24 hours, with a median time of 72 minutes. (3,6)

Only 1% of patients received intravenous tissue

plasminogen activator. This rate is lower than that reported from other centers with stroke units/teams (4–10%) and it is due to the lack of the availability of an interventional neuroradiologist during the on call time all year long. (7-9, 25)

Previous similar studies reported performing carotid imaging and fasting lipid analyses for secondary prevention of stroke in up to 80% of patients. (3, 6, 7, 9, 26) However, in this study, carotid imaging and fasting lipid analysis were performed in 67% and 65% of IS patients, respectively. This discrepancy probably reflects the need for improvement in the area of secondary stroke prevention at KAMC Jeddah.

An elevated troponin level (>0.03 ng/mL) was observed in 34% of patients. Other studies have reported a similar incidence of elevated troponin level, ranging from 18% to 34%. (27,28) An association between elevated troponin level and increased mortality in acute stroke has been identified in several studies. (28-30)

Swallowing service referrals were initiated for 110 patients (53%), and 64 patients (31%) had complete assessments performed by the swallowing team. The rest were not eligible for swallowing assessment due to a low Glasgow coma scale score and/or the presence of medical complications. This rate is comparable to that reported in previous studies (57–62%). (3, 6)

On reviewing patients' records, it was noticed that the dysphagia screening performed prior to swallowing service referral was not clearly described. This was due to a lack of standardization in dysphagia screening procedures at KAMC-Jeddah.

The reduction in rates of modified feeding and tube feeding from admission to hospital discharge (26%) reflects both the natural functional recovery following dysphagia and the quality of care provided for patients with post-stroke dysphagia.

Physiotherapy assessment was performed for 76% of patients. Rates reported in other studies ranged from 90% to 100%. (3, 20) This finding was presented to the Rehabilitation services department at KAMC-Jeddah for feedback. Their suggestion was that more patients would benefit from physiotherapy in the future if all patients were screened on admission by a physiotherapist instead of waiting for a referral from the medical team.

In this study, 39% of patients were unable to walk at discharge; other studies in developed and developing countries reported that the proportion of patients who were unable to walk after acute stroke ranged from 22% to 64%. (3,8)

The median length of stay for stroke patients in other studies was 4 days. (3, 9) In this study, the median length of stay was 12 days. This difference was due to a lack of collaboration between KAMC-Jeddah and rehabilitation centers in Jeddah. As a result, patients stayed for a longer period of time in the acute care

| Data Title | Data source |
|-------------------------|--------------------------|
| Hypertension | Physician notes |
| Diabetes | Physician notes |
| Ischemic Heart Disease | Physician notes |
| Pressure Ulcer | Nursing notes |
| Pneumonia | Physician notes |
| Type of Stroke | Medical imaging |
| Venous Thromboembolism | Medical imaging |
| Carotid Imaging | Medical imaging |
| Lipid Profile | Laboratory value |
| Troponin Level | Laboratory value |
| Clinical Nutrition | Clinical nutrition notes |
| Swallowing Assessment | Swallowing team notes |
| Ambulation on Discharge | Physiotherapy notes |
| Ambulation on Discharge | Physiotherapy notes |

center.

Regarding study strengths and weaknesses, the retrospective design was the main weakness of the study. Following stroke inpatient prospectively would have yielded better and comprehensive data about more stroke care indicators like anti-platelet therapy, anti-

coagulation, and treatment for high cholesterol. The study has two strength points. The first is that it reflects the mainstream stroke care since there are very few stroke care units in the Kingdom. The second is being the first national stroke outcome study with estimated odds of death due to stroke characteristics and complications.

Conclusion:

Acute stroke mortality and wheelchair dependency in general medical units at KAMC Jeddah were 19 % and 39% respectively. Pneumonia, abnormal troponin levels, hemorrhagic stroke, and pressure ulcers are associated with increased mortality.

Future research is needed to compare stroke care outcomes between general units and stroke units nationally.

Acknowledgement:

We would like to thank Mr. Khalid Falatah, from Rehabilitation services department and Ms. Jane Tompson from nursing for their help in framing the indicators and for providing feedback.

Appendix:

References

1. Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJ. Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. *The Lancet*. 2006;367 (9524):1747-1757.
2. Al-Rajeh S, Larbi EB, Bademosi O, Awada A, Yousef A, al-Freih H, et al. Stroke register: experience from the eastern province of Saudi Arabia. *Cerebrovasc Dis* 1998;8:86–9.
3. George MG, Tong X, McGruder H, Yoon P, Rosamond W, Winquist A, et al. Paul Coverdell National Acute Stroke Registry Surveillance—four

- states, 2005–2007. *Morbidity and Mortality Weekly Report Surveillance Summary*. 2009;58(7):1-23.
4. Robert AA, Zamzami MM. Stroke in Saudi Arabia: a review of the recent literature. *The Pan African Medical Journal*. 2014;17:14.
 5. Benamer HT, Grosset D. Stroke in Arab countries: a systematic literature review. *Journal of the Neurological Sciences*. 2009;284(1-2):18-23.
 6. Hall RE, Khan F, Bayley MT, Asllani E, Lindsay P, Hill MD, et al. Benchmarks for acute stroke care delivery. *International Journal for Quality in Health Care*. 2013;25(6):710-718.
 7. Kapral MK, Laupacis A, Phillips SJ, Silver FL, Hill MD, Fang J, et al. Stroke care delivery in institutions participating in the Registry of the Canadian Stroke Network. *Stroke*. 2004;35(7):1756-1762.
 8. Damasceno A, Gomes J, Azevedo A, Carrilho C, Lobo V, Lopes H, et al. An epidemiological study of stroke hospitalizations in Maputo, Mozambique: a high burden of disease in a resource-poor country. *Stroke*. 2010;41(11):2463-2469.
 9. Nilanont Y, Nidhinandana S, Suwanwela NC, Hanchaiphiboolkul S, Pimpak T, Tatsanavivat P, et al. Quality of acute ischemic stroke care in Thailand: a prospective multicenter countrywide cohort study. *Journal of Stroke and Cerebrovascular Diseases*. 2014;23(2):213-219.
 10. Eastwood SV, Tillin T, Chaturvedi N, Hughes AD. Ethnic differences in associations between blood pressure and stroke in South Asian and European men. *Hypertension*. 2015;66(3):481-488.
 11. Cossi MJ, Gobron C, Preux P-M, Niama D, Chabriat H, Houinato D. Stroke: prevalence and disability in Cotonou, Benin. *Cerebrovascular Diseases*. 2012;33(2):166-172.
 12. Hankey GJ, Warlow CP. Treatment and secondary prevention of stroke: evidence, costs, and effects on individuals and populations. *Lancet*. 1999; 354:1457–63.
 13. Thomson TD, Taylor WJ. Evidence for inpatient rehabilitation as an effective intervention. *Hosp Med*. 2005 ;66(4):200-4.
 14. Fuentes B, Díez-Tejedor E. Stroke units: many questions, some answers. *Int J Stroke*. 2009 ;4(1):28-37.
 15. van Almenkerk S, Smalbrugge M, Depla MF, Eefsting JA, Hertogh CM. What predicts a poor outcome in older stroke survivors? A systematic review of the literature. *Disability and Rehabilitation*. 2013;35(21):1774-1782.
 16. Ngeman A, Andersen G, Hundborg HH, Svendsen ML, Johnsen SP. In-hospital medical complications, length of stay, and mortality among stroke unit patients. *Stroke*. 2011;42(11):3214-3218.
 17. Seenan P, Long M, Langhorne P. Stroke units in their natural habitat: systematic review of observational studies. *Stroke*. 2007;38(6):1886-1892.
 18. Collaborative systematic review of the randomised trials of organised inpatient (stroke unit) care after stroke. *Stroke Unit Trialists' Collaboration*. *British Medical Journal*. 1997;314(7088):1151-1159.
 19. Stroke Unit Trialists' Collaboration. Organised inpatient (stroke unit) care for stroke. *Cochrane Database of Systematic Reviews*. 2013,9:CD000197.
 20. Indredavik B, Rohweder G, Naalsund E, Lydersen S. Medical complications in a comprehensive stroke unit and an early supported discharge service. *Stroke*. 2008;39(2):414-420.
 21. Rohweder G, Ellekjær H, Salvesen Ø, Naalsund E, Indredavik B. Functional outcome after common poststroke complications occurring in the first 90 days. *Stroke*. 2015;46(1):65-70.
 22. Steiner M, Brainin M, Austrian Stroke Registry for Acute Stroke Units. The quality of acute stroke units on a nation-wide level: the Austrian Stroke Registry

- for acute stroke units. *European Journal of Neurology*. 2003;10(4):353-360.
23. Iihara K, Nishimura K, Kada A, Nakagawara J, Ogasawara K, Ono J, et al. Effects of comprehensive stroke care capabilities on in-hospital mortality of patients with ischemic and hemorrhagic stroke: J-aspect study. *PLoS One*. 2014;9(5):e96819.
24. Nimptsch U, Mansky T. Stroke unit care and trends of in-hospital mortality for stroke in Germany 2005–2010. *International Journal of Stroke*. 2014;9(3):260–265.
25. Wei JW, Heeley EL, Wang JG, Huang Y, Wong LK, Li Z, et al. Comparison of recovery patterns and prognostic indicators for ischemic and hemorrhagic stroke in China: the ChinaQUEST (Quality Evaluation of Stroke Care and Treatment) registry study. *Stroke*. 2010;41(9):1877-1883.
26. Messé SR, Pervez MA, Smith EE, Siddique KA, Hellkamp AS, Saver JL, et al. Lipid profile, lipid-lowering medications, and intracerebral hemorrhage after tPA in Get With The Guidelines–Stroke. *Stroke*. 2013;44(5):1354-1359.
27. Scheitz JF, Nolte CH, Laufs U, Endres M. Application and interpretation of high-sensitivity cardiac troponin assays in patients with acute ischemic stroke. *Stroke*. 2015;46(4):1132-1140.
28. Kerr G, Ray G, Wu O, Stott DJ, Langhorne P. Elevated troponin after stroke: a systematic review. *Cerebrovascular Diseases*. 2009;28(3):220-226.
29. Faiz KW, Thommessen B, Einvik G, Omland T, Rønning OM. Prognostic value of high-sensitivity cardiac troponin T in acute ischemic stroke. *Journal of Stroke and Cerebrovascular Diseases*. 2014;23(2):241-248.
30. Scheitz JF, Mochmann HC, Erdur H, Tütüncü S, Haeusler KG, Grittner U, et al. Prognostic relevance of cardiac troponin T levels and their dynamic changes measured with a high-sensitivity assay in acute ischaemic stroke: analyses from the TRELAS cohort. *International Journal of Cardiology*. 2014;177(3):886-893.