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

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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.

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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 center.

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

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.

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Appendix:

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