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# Cost of Acute Stroke Care at a tertiary care hospital in Karachi, Pakistan

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## Abstract

**Objective:** To evaluate cost of acute stroke care and its determinants at a tertiary care hospital in Karachi and to find out predictors of high cost care. Acute stroke is a leading cause of morbidity and mortality. Cost of care is the single most important determinant in availability of acute stroke care at a tertiary care hospital in Pakistan. It is also an important factor in development of public health policies and medical insurance plans. Average annual income in Pakistan is 4881 rupees (US\$ 85).

**Methods:** Medical and billing records of 443 patients with acute stroke were retrospectively reviewed from 1998-2001 at The Aga Khan University Hospital (AKUH), Karachi. Acute stroke care at AKUH usually includes routine laboratory investigation including Lipid profile, Magnetic resonance imaging/angiography (MRI/MRA), Echocardiogram, Carotid Doppler's ultrasound and medical management in the Stroke care unit.

**Results:** 443 patients were included in study. Age range was 25-98 years (Mean 58 years). 269 (61%) were male. Length of hospital stay was 1 day; 67 patients, 2 days; 83 patients, 3 days; 70 patients, 4-5 days; 87 patients, 6-10 days; 75 patients, 11-30 days; 49 patients and more than 30 days; 12 patients. Average length of stay was five days and median length was three days. Average total cost was 70,714 rupees (US\$1179) which included average radiology cost; 12,507 rupees (US\$ 208), average laboratory cost; 8365 rupees (US\$139), average pharmacy cost; 13,320 rupees (US\$222) and average bed/room charges; 27, 552 rupees (US\$459). Length of hospital stay is the most important determinant of cost. Average total cost for patients who stayed for 1 day was 19,597 rupees (US\$ 326), 2-3 days; 25,568 rupees (US\$426), 4-7 days; 49,705 rupees (US\$828), 8-30 days; 153,586 rupees (US\$2559), more than 30 days; 588,239 rupees (US\$9804). Average cost for general ward was 60,574 rupees (US\$1010), private ward was 74,880 rupees (US\$1248) and intensive care unit was 155,010 rupees (US\$2583).

**Conclusion:** Cost of acute stroke care is extremely high as compared to average national income at our hospital. Most important determinant of cost is length of hospital stay. Cost cutting measures and increased funding from state are necessary to increase the availability of acute stroke care (JPMA 53:552;2003).

## Introduction

Stroke is the leading cause of disability and third leading cause of death in United States of America, accounting for one in every 15 deaths.<sup>1</sup> Stroke affects 500,000 people every year in the United States, out of which 150,000 die.<sup>2</sup> It is the leading cause of disability; of 350,000 survivors 31% require assistance in activities of daily living, 20% require assistance in walking and 16% require institutional care.<sup>2</sup> Stroke is the leading cause of death in People's Republic of China.<sup>3</sup> Projected incidence of stroke is about 20000 per year in Karachi, Pakistan's largest city

with a population of about 12 million. Stroke not only increases mortality and morbidity, but also puts a great economic burden on the society. Economic burden of stroke in the US is 40.9 billion dollars per year.<sup>4</sup> The information about incidence, prevalence and cost of stroke care is not well known in Pakistan. Annual budget of Pakistan is 742 billion rupees and proportion of health budget is 135 million rupees (1.8% of budget). Average annual income of an individual is 4881 rupees (USD 85) in Pakistan.<sup>5</sup>

State of the art acute stroke care is a specialized care which not only requires a well equipped facility but trained

neurologists and a coordinated effort with other departments like radiology and cardiology. Due to severe budget constraints public health facilities are not capable of providing this specialized care. There are only a few private hospitals in Karachi, which are equipped to provide acute stroke care. Cost of care is the single most important determinant in patients' ability to access acute stroke care at a private, tertiary care hospital in Pakistan. Cost analysis is an important factor in development of public health policies and medical insurance plans. Our objective was to determine cost of acute stroke care and its determinants at tertiary care center in our country. This information may help the governmental policy makers and non-governmental organizations to develop health care plans and budget modifications to prevent loss of manpower and minimize economic burden on the society.

### Patients and Methods

Patients with diagnosis of acute stroke over a period of four years (1998-2001) were identified through ICD-9 coding system of the hospital medical records. Their medical and billing records were reviewed retrospectively. The data regarding demographics, length of hospital stay and cost of various investigations (laboratory and radiological), drugs and bed/room were recorded and analyzed. Acute stroke care at our hospital usually include routine laboratory investigations such as complete blood count (CBC), biochemistry (serum sodium, potassium, liver enzymes and lipid profile), coagulation profile (PT and aPTT), electrocardiogram (EKG), echocardiogram, carotid Doppler ultrasound, neuroimaging of brain (CT scan, MRI scan or both) and medical management in stroke care unit. The data was analyzed by using statistical package for social sciences version 10 (SPSS 10.0). The data is presented in frequencies, percentages and means with standard deviation. In addition chi square test was used to see association between various variables and cost of the care.

### Results

Four hundred forty three patients were identified. Age range was 25-98 years (mean 58 years). Two hundred sixty nine (61%) were men and 174 (39%) were women. Average length of stay was five days and median length of stay was three days (range 1- 68 days). Length of stay for 307 patients (70%) was less than 6 days while 220 patients (71%), stayed in hospital for just 3 days. Only 12 patients (3%) stayed in hospital for more than one month (Table 1).

Average total cost of the care was 70,714 Pak rupees (US\$ 1179) which included average radiology cost; 12,507 rupees (US\$ 208), average laboratory cost; 8365 rupees (US\$139), average pharmacy cost; 13,320 rupees (US\$222) and average bed/room charges; 27,552 rupees (US\$459). Bulk of the cost i.e., 39% was incurred by hospital bed/room charges and pharmacy, radiological investigations and laboratory investigations accounted for 19%, 18% and 12% respectively.

The average total cost was directly related to length of hospital stay (Table 2). Average laboratory and pharmacy

**Table 1. Length of hospital stay.**

S. No.	Length of hospital stay (days)	Number of patients*
1	1	67 (15)
2	2	83 (19)
3	3	70 (16)
4	4-5	87 (20)
5	6-10	75 (17)
6	11-30	49 (11)
7	>30	12 (3)

\* Percentages in parenthesis

**Table 2. Total cost\* (mean) of care in relation to length of hospital stay^.**

S. No	LOS (days)	ALC	APC	ARC	TAC
1	1	3272 (55)	1743 (29)	9148 (152)	19,597 (326)
2	2-3	3446 (57)	2134 (36)	10968 (182)	25,568 (426)
3	4-7	6504 (108)	11732 (196)	12151 (203)	49,705 (828)
4	8-30	17,404 (290)	32258 (538)	15074 (251)	153,586 (2559)
5	>30	59,298 (988)	160291 (2672)	35510 (592)	588,239 (9804)

\* cost in Pak Rupees (US\$ in parenthesis)

^USD= US Dollars, LOS= Length of hospital stay in days, TAC= Total average cost of care, ALC= Average laboratory cost, Average pharmacy cost, ARC= Average radiology cost

cost was also significantly higher in patients who stayed longer (Table 2). Though the average radiology cost was higher in the patients who stayed longer, however the difference was not as significant as that of the laboratory and pharmacy cost (Table 2). The cost was also higher in patients, who were admitted to intensive care unit (Table 3). The cost of the care for patients who were admitted to private ward was also higher as compared to those who were admitted to general ward (Table 3).

**Table 3. Total average cost of the care in relation to hospital locality.**

S. No.	Locality	Total average cost of care (Rupees)*
1	Intensive care unit	155010 (3583.5)
2	Private ward	74881 (1248)
3	General ward	60574 (1010)

\* In parenthesis: Cost in US\$

## Discussion

Cost of care for any medical problem is an extremely important issue for developing countries. The issue is more important for our country for two reasons i.e. our resources are limited and our health system is mainly based on self-financing. In the absence of a functional state health system and without widespread third-party payers, patients bear medical costs out of pocket. The impact of knowing cost of care for a problem like stroke (in acute settings) and its determinants would be profound, as this would not only help governmental as well as nongovernmental organizations including insurance agencies to design health policies and also help explore options for cutting the cost of acute care. This would also help in developing strategies for primary and secondary prevention from this deadly disease.

Stroke care has a high economic burden. This economic burden is directly related to long-term disability associated with stroke. It is well known that improved acute stroke care is not only associated with decreased long-term disability but it has a beneficial impact on economic burden related to stroke.<sup>6-9</sup> The reported cost of acute stroke care is variable and is related to the length of hospital stay.<sup>10-12</sup> Our study also found that the cost of care was higher in patients who stayed longer i.e., cost was increased by 30 times in patients who stayed for more than a month as compared to those who stayed for one day (Table 2). However, the long hospital stay could probably relate to severity of the stroke.

In North America the average cost of acute stroke care per discharge/patient is variably reported as US\$10,740 - 13,149.<sup>13,14</sup> A study from Singapore<sup>12</sup> reported relatively

lower cost for the care i.e., US\$ 7542 as compared to North America, however this is substantially high as compared to total average expenditure for the care at our center i.e., 70,714 rupees (US\$ 1179). The reasons for relatively lower cost at our center are probably lower cost for the neuroimaging and bed/room charges, and relatively shorter hospital stay. Relatively shorter hospital stay at our hospital is probably due to great emphasis on outpatient or home based rehabilitation as compared to inpatient rehabilitation in Singapore or North America.

Though we did not compute the costs for different types of stroke but it has been reported that the cost of acute stroke care is higher for hemorrhage as compared to ischemic strokes<sup>11,12,15</sup> and within the category of ischemic strokes the cost was high for nonlacunar infarctions as compared to lacunar infarction.<sup>12</sup>

At our center bulk of the cost i.e. 39% was incurred by hospital bed/room charges including physician's fee. Venketasubramanian et al<sup>12</sup> reported 48.5% of the total cost was shared by these charges. Cost of radiological investigations and medications was 19% and 12% respectively at our center as compared to 15 % and 8 % in Singapore.<sup>12</sup> The hospital bed charges were reported to be as high as 95% of the total charges for acute care of transient ischemic attacks in Canada.<sup>16</sup>

We do not know the exact cost of acute stroke care at other tertiary care centers in our country but it would be variable from center to center depending on the extent of evaluation and interventions. However, it would be lower at the centers in public sector at least by about 50%, as the hospital bed charges and physician's fee is nominal. The cost at other centers in private sector might be more or less similar provided that extent of evaluation and intervention is similar.

At our center average cost of acute stroke care per patient is high as compared to per capita income in Pakistan. Most important determinant of the cost is length of hospital stay so decreasing the stay by expediting the evaluation and rehabilitation would reduce the cost to some extent, however, increased funding from the state is necessary to increase the availability of the care.

Considering our limited resources, need of preventive strategies should be emphasized. Secondary prevention of stroke is mainly based on antiplatelet therapy and at best these drugs reduce recurrence by 16-37%.<sup>17,18</sup> Hypertension is the single most important modifiable risk factor for hemorrhagic as well as ischemic stroke<sup>19</sup> and it has been shown that every decrease in diastolic blood pressure of 7.5 mm Hg is associated with 46% reduction in stroke.<sup>20</sup> Diabetes mellitus and high cholesterol are other important modifiable risk factors for ischemic stroke. These

increase the risk of stroke by 1.5 to 3<sup>1</sup> and 1-2 folds respectively.<sup>22</sup> Every third person above age of 45 years in Pakistan has hypertension and every fourth person in the age group has diabetes mellitus.<sup>23</sup> Prevalence of hypercholestermia is 12.6% in persons above age of 15 years (and the frequency is as high as 33% in women of age above 65 years).<sup>23</sup> These facts underscore the need of utilization of the resources in identifying and aggressive control of the risk factors and education of the masses in this regard.

We believe that social and economic burden of stroke can be greatly reduced by providing state of the art care to acute stroke patients. Increased availability of this care is largely dependent on subsidized cost of this care. Measures are to be taken by Governmental health agencies and policy makers to subsidize cost of acute care, in order to increase availability of acute stroke care.

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