Cost of Out-Patient Stroke Management in Selected Physiotherapy Departments in Kano Metropolis and its Influence on Appointment Adherence

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Abstract

Affordable cost of stroke care may lead to significant savings and an increase in the effective use of health care resources including adherence to treatment appointments. This study investigated the cost of out-patient stroke management in two selected physiotherapy departments in Kano metropolis and its influence on Appointment Adherence (AAD). The method employed in the study consisted of: Cross sectional survey design which was used in the study where 100 participants with stroke were recruited. The ability to perform basic activities of daily living function was assessed with Barthel index, the cost of stroke care and AAD were assessed with a researcher designed questionnaire. The data obtained were summarised with descriptive statistics and analysed with Pearson's correlation and Chi-square at significance alpha level of 0.05. The Results obtained were: The study participants consist of 47(47%) males and 53 (53%) females with mean age of 57.19±14.0 years. Forty one (41%) were self-employed and 10 (10%) were civil servants. The average monthly direct and indirect cost of outpatient stroke management (direct and indirect cost combined) per patient was ₦4726 ($30.34) and the average direct monthly cost of physiotherapy per patient was ₦1240, ($7.96). Barthel scores are significantly associated with AAD (X^2= 40.2; P=0.000). In conclusion, the cost of outpatient stroke care in Kano metropolis is low and affordable. This has promoted accessibility and adherence to physiotherapy appointments among stroke survivors.

Keywords: *Stroke, Cost, Out-Patient, Physiotherapy.*

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Introduction

Stroke is a costly disease and a leading cause of disability (Di Carlo 2009). Societies usually incur costs that are related to both stroke treatment and loss of productivity (Saka et al, 2009). According to Wier and Andrews (2011), stroke ranked among 20 most expensive conditions treated in the United States. This implies that stroke imposed enormous economic burden on individuals and societies even among developed countries like the United States which incurred annual total cost of $65.5 billion in 2008 (ibid). In 2011, the cost of 36 weeks of in-patient stroke care per patient in Nigerian public and private hospitals was ₦95,100 and ₦76, 7900 respectively (Birabi et al, 2012).

Although out-patient program can be less costly than in-patient care (Birabi et al, 2012) it can be very expensive in some places. In Sweden, the mean annual cost of caring for an elderly stroke patient was $25373; out of which 30% ($7611.9) was the cost of out-patient and informal care (Claesson et al, 2000). According to Godwin et a l, (2011) the average direct cost of yearly outpatient rehabilitation was $11,689 which was about $974 monthly. Furthermore, the mean cost of out-patient physiotherapy in Malaysia was $9.5 per month ($28.5 for 3 months) (Hejazi et al, 2015). Additionally, Roderick et al, (2001) found in a study that the average cost per visit to a hospital per day was between £48 and £38 for domiciliary physiotherapy. More so, a research estimated that the typical out-patient stroke rehabilitation program of 8-12 weeks cost approximately $2000 per patient (Teasel et al, 2011) which is $166.67 per week. Moreover, Young & Forster (1993) found that the median cost out-patient care for 8 weeks was 620 pounds ($911.76) and 385 pounds ($566.17) pounds were for the home physiotherapy group. In Nigeria, the cost of out-patient stroke-care per patient especially that of physiotherapy services is yet to be reported. Evaluation of the cost incurred for managing a disease or disorder is an essential part of health care policy (Birabi et al, 2012). Regular cost evaluation and cost adjustments can help promote adequate utilisation of available health care services and facilities.

Adherence is the extent to which an individual closely follows a prescribed component of an intervention for a desirable outcome (Ogwumike et al, 2015). In physiotherapy, it could relate to attendance of appointments, following instructions during clinic-based exercises, performing the prescribed home-based exercises (Kolt et al, 2007; Jack et al, 2010). High levels of adherence have been linked to improved outcomes of rehabilitation (Brewer et al, 2000; Jack et al, 2010; Al-Eisa 2010) and improvement in functional outcomes could promote patient satisfaction and significant reduction in costly long-term expenditures on stroke care (Duncan et al,

2005). A recent study by Levine et al, (2013) found that non-adherence related to prohibitive cost of medication increased significantly from 43.1% to 57.1% especially among uninsured stroke survivors. Similarly, non-adherence with medication in Ghana was attributed to unaffordable cost of drugs (Buabeng et al, 2004). In Nigeria, only the study conducted by Birabi et al, in 2012 examined the cost of inpatient stroke management, but how this cost influenced stroke survivors' adherence to treatment was not examined. It is therefore important to investigate the relationship between the cost of out-patient stroke management and its influence on appointment adherence and therefore the study was carried out in selected physiotherapy departments in Kano metropolis (Nigeria).

Method

The research was an 8 weeks prospective cross sectional survey design that recruited participants using purposive sampling technique. The study participants comprised all stroke survivors attending out-patient physiotherapy clinics of Aminu Kano Teaching Hospital (AKTH) and Murtala Muhammad Specialist Hospital (MMSH) with the exception of those treated on humanitarian grounds (not paying for treatment). A proforma designed by the researcher was used to collect data on socio-demographic characteristics of the participants that included age, gender, level of education, monthly income and occupation. The cost of physiotherapy treatment per session, cost of transportation and cost of topical analgesics, and that of prosthetic/orthotic devices were also captured including the side affected and duration of stroke. Furthermore, attendance table was used to record the attendance of patients at physiotherapy out-patient clinic for the calculation of level of adherence to appointment keeping.

Data collection procedure

Ethical approval for the study was sought and obtained from the ethical committees of AKTH and Kano State Health Management Board. The participants for this study were stroke survivors attending out-patient physiotherapy clinics of Aminu Kano Teaching Hospital (AKTH) and Murtal Muhammad Specialist Hospital (MMSH). They were approached individually and the purpose and procedure of the study was explained to each of them. Thereafter, those that met the inclusion criteria were recruited after they have given their written informed consent. The consent included voluntarism and confidentiality which were duly respected. Anonymity was guaranteed as no name was required or used in connection with any of the information obtained from the study participants. All patients that were placed on hospital admission were not included.

Sample Size Calculation

The prevalence of stroke in Kano state is yet to be reported, however, studies from some parts of Nigeria have shown that the crude prevalence of stroke ranges between 58/100, 000 (0.58 per 1000) (Osuntokun et al, 1987), 1.31 per 1000 (Sanya et al, 2015) and 1.14 per 1000 (Danesi et al, 2007; Wahab 2008). The prevalence of 1.14 per 1000 (0.114 per 100) was used to calculate sample size for the study because the exact value for Kano is unknown. The sample size calculation for prevalence studies was used.

$$n = \frac{Z^2P(1-P)}{e^2} \text{ (Daniel, 1999)}$$

P= proportion = (0.114)
Z= is a constant = 1.96 at 95% confidence interval
E= precision or acceptable error margin = 5% = 0.05.

$$\text{Sample size } n = \frac{1.96^2 \times 0.114\ (1 - 0.114)}{(0.05)^2} = 155.2$$

The calculated sample size for the study was 155 participants. This study was able to recruit 100 participants.

Evaluation of Activities of Daily Living (ADL)

The Barthel index was used to assess ADL. The instrument has 10 items that were used to rate the patient ability to perform basic self-care activities. The scores obtained by the individual items where added up to give a total score between 0 (completely dependent) and 100 (independent). For the purpose of data analysis Barthel index scores were categorised such that the score of 80–100 was rated as independent, 60–79 require slight help with ADL, 40–59 moderately dependent, 20–39 very dependent and scores <20 were rated as completely dependent (Shinar 1987).

Assessment of Cost of Stroke Management

Annual cost of stroke management was obtained from the equation.
Cost per month = cost of treatment per session x number of prescribed treatment sessions per month
Cost per annum = cost of treatment per session x number of prescribed treatment sessions per month x 12

Assessment of Adherence

Patients Adherence was calculated from the formula

$$\text{Adherence} = \frac{\text{Number of attendance}}{\text{Total sessions prescribed}} \times 100$$

Patients with ≥ 70% attendance were considered adherent and those with <70 attendance rates were regarded non-adherent for the reasons stated else were (Ogwumike et al, 2014).

Data Analysis Procedure

Data obtained was summarised using descriptive statistics of frequency, mean and standard deviation. Inferential statistics of Spearman's correlation and Chi-square were used to determine the relationship between cost of out-patient stroke management and treatment adherence among stroke patients. Cost data was not normally distributed because it has Kolmogorov-Smirnov test value of P=0.00 suggesting significant violation of the assumption of normality and the Adherence rate was in percentage, hence Spearman's rank order correlation was used for the analysis. To enable Chi-square analysis, the adherence score was dichotomised and while socio-demographic and income related variables were in categories. All analyses were conducted using the Microsoft Excel and Statistical Packages for Social Sciences (SPSS) for Windows version 16.0 at a probability level of 0.05.

Results

A total of 100 stroke survivors participated in this study. There are forty seven (47%) males and fifty three (53%) females. Their mean age was 57.19±14.0years, age range 17-80years. The mean ages of males and females were 57.53±12.9 and 56.88±15.1 years respectively. Forty nine (49%) were unemployed, forty one (41%) were self-employed, while ten (10%) were civil servants. Ninety five percent of the participants are married, two (2%) are single and three (3%) are widows while sixty one (61%) were diagnosed with left hemispheric affectation. These results were presented in table 1.

Cost of Out-Patient Physiotherapy for Stroke

The direct cost of outpatient physiotherapy ranged between ₦200 - ₦400 per session in 2014. Depending on the total number of treatments received by the patient during the month, the mean direct cost of physiotherapy treatment was ₦1240 ($7.96) per patient. Furthermore, the mean indirect monthly cost incurred by stroke patients was ₦3486 ($22.38) which was the sum of transport cost ₦2390 ($15.35) and cost of topical analgesics ₦1096 ($7.04). In addition, the annual cost of out-patient stroke physiotherapy management per patient was ₦56712 ($364.12) which was the sum of annual direct cost ₦14,880 ($95.54) and that of annual indirect cost ₦41, 832 ($268.58).

Additionally, the mean annual income per person was ₦224280 ($1440). The direct cost/income ratio was 6.63%, indirect cost/income ratio 18.65% and total cost/income ratio was 25.25%. Putting into consideration that one[2] U.S. Dollar was equivalent to ₦155.75 between 12th March and 12th May, 2014.

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[2] *http://www.cbn.gov.ng/rates/ExchangeArchives.asp.*

Table 1: *Characteristics of study participants*

Variables	**Frequency**
Age range(years)	
Males	25-80
Females	17-80
Gender	**n (%)**
Males	47 (47%)
Females	53 (53%)
Occupation	
Civil servants	10 (10%)
Self employed	41 (41%)
Unemployed	49 (49%)
Income level	
<₦18, 000 (Below minimum wage)*	65 (65%)
₦18, 000 - ₦49, 000 (Low income)	19 (19%)
₦50, 000 - ₦99, 000 (Moderate)	13 (13%)
₦100, 000 and above (high income)	3 (3%)
Education level	
Non formal	70 (70%)
Primary	9 (9%)
Secondary	13 (13%)
Tertiary	8 (8%)
Duration of stroke(weeks)	
Less than 1 year	45 (45%)
1-3 years	34 (34%)
4-6 years	15 (15%)
Greater than 6 years	6 (6%)
Brain hemisphere affected	
Right	39 (39%)
Left	61 (61%)

Key n=frequency; %=percent; SD=standard deviation; *Minimum wage in Nigeria is ₦18,000.

Level of Adherence

A number of appointments sessions prescribed to the patients during the two months study period ranged from 8 to 16 depending on level of functional recovery of the patient. Sixty nine (69%) participants were adherent to appointment keeping, while 31(31%) were non-adherent (*see* table 2). It was further found out that significant association existed between the levels of adherence to appointment keeping and the Barthel scores of the participants (X^2=40.2; P=0.000) (*see* Table 2). However, there was a negative insignificant correlation between the level of adherence to appointment keeping and each of the monthly cost of transportation (rho=-0.174; P>0.05) and monthly cost of treatment (rho=0.137; P>0.05) (*see* table 2).

Table 2: *Adherence rate to appointment keeping and its association with functional ability, income, duration of stoke level of education and cost of care (N=100).*

Participants' variables	**Adherence variables**		**X^2**	**P-value**
	Adherence and Gender of participants			
	ADH	NAD		
Male	30	17	1.108	0.29
Female	39	14		
Adherence and level of education of participants				
	ADH	NAD		
Non formal	46	24	3.97	0.27
Primary	6	3		
Secondary	9	4		
Tertiary	8	0		
Adherence and				
	ADH	NAD		
Below minimum	43	22	1.98	0.58
Low income	13	6		
Moderate	10	3		
High income	3	0		
Adherence and functional abilities of participants				
	ADH	NAD		
Independent	35	2	40.2	0.000*
Slightly dependent	19	2		
Moderately dependent	10	12		
Very dependent	2	9		
Completely dependent	3	6		

Correlations		
Variables	Rho-value	P-value
Functional ability	0.53	0.000*
Monthly cost of Rx	-0.137	0.174
Monthly cost of analgesic	-0.016	0.873

Key-NAD=non-adherent; ADH=adherent; *significant **31 participants had less than 70% attendance were rated non-adherent while those with 70% and above attendance were rated adherent.

Discussion

The cost of providing care and that of loss of productivity post stroke can pose a major economic challenge to the individual and society. This study evaluated the cost of managing stroke and its relationship with appointment adherence in some selected out-patient physiotherapy departments in Kano metropolis.

It is observed, in this study that the direct cost of out-patient physiotherapy in Kano city was affordable because it consumed only 6.63% of the patients' income. Although the average monthly income per patient in this study was very low (₦18, 690), the average monthly cost of out-patient physiotherapy (₦1, 240) was very reasonable when compared with ₦2,777 per 4-weeks of inpatient stroke care in the report of Birabi et al, (2012). It is very possible that the cheapness of physiotherapy services in Kano city was the facilitator of patients' ability to conveniently pay for outpatient care for longer periods of continuous therapy post stroke. In addition, the monthly direct cost out-patient care in this study (₦1240, [$7.96]) was similar to that of Hejazi et al, (2015) who reported that the mean cost of out-patient physiotherapy in Malaysia was $9.5 per month ($28.5 for 3 months) (Hejazi et al, 2015). The cost in this study was less than £48 (₦ 12,000) that was reported as cost for visit to hospital per day (outpatient care) and £38 (₦9,500) for domiciliary physiotherapy (Roderick et al, 2001). The possible reason for the similarity between the finding in this study and that of Hejazi et al, (2015) could be because both studies were conducted in developing countries. It is worth mentioning that one US Dollar was equivalent to N155.75 and 3.29-3.23 Malaysian ringgit which implies that stroke patients in Malaysia may find it [3]much easier to pay for physiotherapy services due to the value of their currency relative to USD. This further implies that it would be much easier for average Malaysian to spend one USD per day since there is no much disparity between ringgit and USD which is a possible sign of higher standard of living among Malaysians when compared to average Nigerian.

Furthermore, the average monthly cost of out-patient stroke management (combined direct and indirect costs) in this study (₦4,726 {$30.34}) was less than what was reported in some studies, though the costs were not easily comparable, studies from developed nations usually reported cost of out-patient therapy to include total costs of physiotherapy, occupational and speech therapies combined. For example, in Teasel et al, (2011) out-patient stroke rehabilitation cost about $2000 per patient for 8-12 weeks of therapy which was $166.67 per week. Similarly, Young & Forster (1993) reported that the median cost out-patient care for 8weeks was 620 pounds ($911.76)

[3] Bank Negara Malaysia at the time of this study *12th March - 12th May, 2014*

which gives $113 per week. This gives approximate weekly cost of outpatient physiotherapy alone as $55.56 and $37.67 for Teasel et al, (2011) and Young & Forster (1993) respectively assuming the cost of the three therapies are the same. Hence these costs were on the high side compared to what was obtained in this study.

It can be argued at this juncture that there may not be strong basis for the huge sums of money usually spent on medical tourism by some Nigerians who utilise public funds to treat themselves abroad. The funds are mostly spent on illnesses that may be adequately managed by healthcare experts in the country including physiotherapist. It can be suggested that even those with critical medical conditions that required expertise treatment outside Nigeria may not have any cogent reason to discontinue their regular physiotherapy on the basis of cost of therapy alone upon return to Nigeria from their medical tourism.

Additionally, the total annual cost of out-patient stroke management of per stroke patient in this study (₦56712 / $364.12) was less than the annual cost of inpatient care reported in Birabi et al, (2012). In Birabi et al 2012's study it was found that the cost of in-patient stroke care in Nigeria per patient in a government hospital for 36weeks of post stroke treatment was ₦95100 ($600) in 2011. This was about ₦126,666.67 per annum though cost of physiotherapy care only accounted for 46% (₦58, 266.67) ibid. It can be argued that there is no much disparity in the cost of out-patient and inpatient physiotherapy provided in government hospitals in Nigeria. The annual cost of outpatient stroke care could be very prohibitive in some developed countries. For example, in Sweden, 30% ($7611) of the mean annual cost of therapy per patient was for out-patient and informal care (Claesson et al, 2000). According to Godwin et al, (2011) the annual direct cost of yearly outpatient rehabilitation was $11,689 which was about $974 monthly (Godwin et al, 2011).

It was further observed in this study that adherence is strongly associated with functional ability of the participants. Increased functional abilities may lead to greater adherence to appointment among stroke survivors and vice versa. The negligible relationship between costs of outpatient stroke management and adherence to appointment may have been influenced by the affordability of out-patient stroke care in Kano metropolis (based on the cost/income ratio). The outcome of this study is however different from those of Buabeng et al, (2004) and Levine et al, (2013) where high cost of drugs leads to non-adherence to treatment among patients with hypertension and stroke respectively. It is very possible that the cost/income ratio is high in the latter two studies, and also possible that rehabilitation services post

stroke may be more appreciated by stroke patients compared to drug treatment.

Furthermore, more than two-thirds of the study participants were adherent to appointment. The high levels of adherence recorded in this study could be attributable to the cheapness (cost of therapy being very low) and affordability of the physiotherapy services offered in the selected hospitals based on the cost/income ratio analysis. There is therefore the need for the expansion of physiotherapy services so that it can be provided in all general hospitals in urban and semi-urban areas of the Kano state so as to adequately cater for the pressing rehabilitation needs of the people**.**

Limitations of the Study

There are some limitations that have been observed in the study. The sources of the funds for payment of physiotherapy services in this study were actually not fully explained. The study only assumed that the cost of care was borne by the patients themselves which may not always be the case. Other sources of funds for patients' treatment could come from their immediate family members, health insurance scheme, or third party payers such as insurance companies. Another limitation of the study is that it covers only two of the major hospitals in Kano and a small sample size, the outcome of the study may not be a true reflection of actual cost of out-patient physiotherapy for the whole of Kano state. This may therefore limit the generalization of research finding to only the hospitals under study.

Conclusion

The average monthly direct cost of outpatient stroke management in Kano metropolis per patient is ₦4,726 ($30.34). Affordable cost of outpatient stroke care in Kano metropolis has promoted accessibility and adherence to physiotherapy services.

References

Al-Eisa, E. (2010). Indicators of adherence to physiotherapy attendance among Saudi female patients with mechanical low back pain: A clinical audit. *BMC, Musculoskeletal Disorders*, 11, 124.

Birabi, B. N. Oke, K. Dienye, P. O. & Okafor, U. C. (2012). Cost burden of post stroke condition in Nigeria: A pilot study. *Glob J Health Science*, 15; 4(6), pp. 17-22.

Brewer, B. W. Van Raalte, J. L. Cornelius, A. E. Petitpas, A. J. Sklar, J. H. Pohlman, M. H. Krushell, R. J. & Ditmar T. D. (2000). Psychological factors, rehabilitation adherence and rehabilitation outcome after anterior cruciate ligament reconstruction rehabilitation. *Psychology,* vol. 45. pp. 20-37

Buabeng, K. O. Matowe, L. & Plange-Rhule, J. (2004). Unaffordable drug prices: The major cause of non-compliance with hypertension medication in Ghana. *Journal Pharmacy Pharmaceutical Science* (www.ualberta.ca/~csps), vol. 7. no.3 pp. 350-352

Claesson, L. Gosman-Hedstrom, G. Johannesson, M. Fagerberg, B. & Blomstrand, C. (2000). Resource utilization and cost of stroke unit care integrated in a care continuum: A 1 year controlled prospective randomized study in elderly patients, *Stroke.* Vol. 31 pp. 2569-2577

Danesi, M. Okubadejo. N. Ojini, F.(2007) Prevalence of stroke in an urban, mixed-income community in lagos. *Neuroepidemiology*. Vol. 28 no. 4. pp. 216-223.

Daniel, W. W. (1999). *Biostatistics*: A Foundation for Analysis in the Health Sciences. 7th ed. New York: John Wiley & Sons.

Di Carlo, A., (2009) Human and economic burden of stroke. *Age ageing,* vol. 38 no.1 pp. 4-5.

Duncan, P. W. Zorowitz, R. Bates, B. Choi, J. Y. Glasberg, J. J. Graham, G. D. Katz, R. C. Lamberty, K. & Reker, D. (2005) Management of adult stroke rehabilitation care: a clinical practice guideline. *Stroke*, vol. 36.

Godwin, K. M. Wasserman, J. & Ostwald, S. K. (2011). Cost associated with stroke: Outpatient rehabilitative services and medication. Topics in Stroke Rehabilitation, *Suppl* 1.

Hejazi, S. M. A. Mazlan, M. Abdullah, S. J. F. & Engkasan, J. P. (2015). Cost of post-stroke outpatient care in Malaysia. *Singapore Medical Journal.* vol. 56 no. 2. pp. 116–119.

Jack, K. McLean, S. M. Moffett, J. K. et al.(2010). Barriers to treatment adherence in physiotherapy outpatient clinics: A systematic review. *Manual Therapy* 2010. vol.15. pp. 220–228.

Kolt, G. S. Brewer, B. W. Pizzari, T. et al. (2007). The sport injury rehabilitation adherence scale: a reliable scale for use in clinical physiotherapy. *Physiotherapy,* vol. 93. pp. 17–22.

Levine, D. A. Morgenstern, L. B. Langa, K. M. Piette, J. D. Rogers, M. A. M. & Karve, S. J. (2013). Recent trends in cost-related medication non-adherence among us stroke survivors, *Annals of Neurology*, vol. 73. no. 2. pp. 180–188.

Ogwumike, O. O. Badaru, U. M. & Adeniyi, A. F. (2015). Barriers to treatment adherence among stroke survivors attending outpatient

physiotherapy clinics in North-western Nigeria. *Clinical Health Promotion,* vol. 5. pp. 4-10.

Ogwumike, O. O. Badaru, U. M. & Adeniyi, A. F. (2014). Factors influencing adherence to home-based exercise by stroke survivors in North Western Nigeria**.** *International Journal of Therapies and Rehabilitation Research,* 3:1.

Osuntokun, B. O. Adeuja, A. O. Schoenberg, B. S. Bademosi, O Nottidge V. A. Olumide, A. O. Ige, O. Yaria, F. Bolis, C. L.(1987). Neurological disorders in Nigerian Africans: A community-based study. *Acta Neurol Scand.* vol. 75. no. 1. pp. 13-21.

Roderick, P. Low, J. Day, R. Peasgood, T. Mullee, M. A. Turnbull, J. C. Villar, T. & Raftery, J. (2001). Stroke rehabilitation after hospital discharge: A randomized trial comparing domiciliary and day-hospital care. *Age and ageing*, vol. 30. pp. 303-310

Sanya, E. O. Desalu, O. O. Adepoju, F. Aderibigbe, S. A. Shittu, A. Olaosebikan, O. (2015). Prevalence of stroke in three semi-urban communities in middle-belt region of Nigeria: A door to door survey. *Pan African Medical Journal*.

Saka, O. Mcguire, A. & Wolfe, C. (2009). Cost of stroke in the United Kingdom. *Age and Ageing*, vol. 38 pp. 27–32.

Teasell, R. W. Foley, N. C. Bhogal, S. K. & Speechley, M. R. (2003). Early supported discharge in stroke rehabilitation. *TropStroke Rehabilitiation*, vol. 10. pp. 19 –33.

Wahab. (2008). The burden of stroke in Nigeria. *Int J Stroke.* vol. 3 no. 4 pp. 290-292.

Wier, L. M. & Andrews, R. M. (2011). The most expensive condition by payer, 2008. *Health Care Cost and Utilization Project*, Accessed at http://www.hcupus.ahrq.gov/reports/statbriefs/sb107.pdf

Young, J. Forster, A. (1993). Day hospital and home physiotherapy for stroke patients: A comparative cost effectiveness study. *Journal of Royal College Physicians London.* vol. 27no. 3. pp. 252-258.