



Cost and cost-effectiveness analysis of a bundled intervention to enhance outcomes after stroke in Nigeria: Rationale and design



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ABSTRACT

The economic and social costs of stroke to the society can be enormous. These costs can cause serious economic damage to both the individual and the nation. It is thus important to conduct a cost effectiveness analysis to indicate whether an intervention provides high value where its health benefits justify its costs. This study will provide evidence based on the costs of stroke with a view of improving intervention and treatments of stroke survivors in Nigeria.

This study utilizes two types of economic evaluation methods – cost-effectiveness analysis and cost–benefit analysis – to determine the economic impact of Tailored Hospital-based Risk Reduction to Impede Vascular Events after Stroke (THRIVES) intervention. The study is conducted in four Nigerian hospitals where 400 patients are recruited to participate in the study. The cost-effectiveness of THRIVES post-discharge intervention is compared with the control Intervention scenario, which is the usual and customary care delivered at each health facility in terms of cost per quality adjusted life years (QALYs). It is expected that successful implementation of the project would serve as a model of cost-effective quality stroke care for implementation.

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1. Introduction

Stroke is a disease with enormous health and economic implications. In 2005, the World Health Organization reported that 6 million persons died from stroke each year or 11 persons every minute [1]. In African countries where incomes are low, these enormous costs can cause serious economic damage to both the individual and the nation. These economic impacts of stroke with stroke-related costs can be as high as 3% to 4% of the annual health-care budget in some countries [2]. A review of the costs of stroke in low and middle-income countries was conducted and found that the highest mean direct medical cost of stroke was US\$ 8424 in Nigeria while the lowest mean cost of stroke was in Senegal (US\$ 416) [3]. These costs are mainly predicted by the length of stay and stroke severity.

The best intervention process of managing stroke survivors is still fraught with controversies especially as they concern the economic impacts of such interventions. This is because of its demand on scarce health resources of either the patient, family, or the health system in general. This therefore calls for defining the relative value of different stroke interventions with a view of identifying the most cost effective. Despite this, many of the past studies have failed to provide information about which treatments are the most efficient in reducing overall disease burden in the setting of economic constraints [4,5].

Incidentally, little is still known about the economic implications of stroke in many developing countries including Nigeria. Many stroke evaluation and treatment policies may result in benefits to health that is considered worth their cost [6]. Despite the studies on stroke in Nigeria, there are very few of the previous studies that have investigated the economic costs of stroke as well as compared the cost effectiveness of stroke intervention program in Nigeria. It is therefore important to contribute to this discourse by simultaneously assessing the health effects

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and costs of different health interventions; cost-effectiveness analysis provides a research methodology to make such comparisons.

Nigeria is currently experiencing a rapid epidemiological transition, where the predominant cause of mortality is shifting from the infectious diseases and perinatal conditions to chronic diseases and injuries. Stroke has recently become one of the main health conditions accounting for disability and mortality in the country. It has been shown that high and increasing rates of stroke affect people at much younger ages in SSA than in developed countries [7]. Post stroke survival rate is anticipated to increase in developing countries due to better treatment and management; hence it generates the necessity for arranging rehabilitation for stroke survivors in the most effective way so as to give them the best possible quality of life [8,9,10].

Earlier studies on stroke in Nigeria have focused on the issues of determinants of health-related quality of life (HRQoL) among stroke survivors [11,12] as well as the prevalence of strokes. Some studies have also investigated costs of stroke using different economic evaluation approaches [13,14] and Care environments for stroke rehabilitation as well as some others on the factors that predict those changes on their physical, mental, and social health during the recovery phase [15,16,17]. A key issue from most of the studies is the need to generate evidence to support development of effective health policy and strategy related to services for the stroke survivors. The issue of cost effectiveness of different options becomes more crucial given the resource constraints that many government health sectors face as well as the high poverty incidence and the lack of health insurance to mitigate the health shocks arising from the stroke condition [18].

However, in the past decade, there have been extraordinary medical advances in the treatments. While many may not survive stroke events, there is a growing proportion of persons surviving the event although they still require clinical management. Although many people survive stroke because of modern technology, most of them still live with impairment, disability, or handicap. Rehabilitation reduces disability and maximizes functional ability for stroke survivors with disabilities. Research has indicated that multidisciplinary, early, and intensive rehabilitation significantly reduces disability [19,20,21]. Rehabilitation can restore function and prevent permanent disability in patients with stroke [1]. It is important to conduct a cost effectiveness analysis to indicate whether an intervention provides high value depending on assessing whether its health benefits justify its costs [22]. Where interventions have little values for its cost it might not be worthwhile for full implementation. The ultimate goal of any stroke interventions is to improve the health-related quality of life (HRQoL) of survivors ensuring that they are enabled to fulfill their roles and purpose in life after the event [23]. Unfortunately, there has been scarcity of research to assess the cost-effectiveness of different interventions for post-stroke cases despite the increasing importance of this service to minimize post-stroke functional problems [5,24].

The Nigerian health system is faced with multiple constraints from both infectious and non-communicable diseases (NCDs), hence, there is a need for more evidence on the cost-effectiveness of the rehabilitative care model to recommend a better alternative course of treatment to stroke survivors. This has the possibility of benefiting not just the patients but also the Nigerian health system thereby ensuring that rehabilitation services offer good value for money, so that health care providers are encouraged to provide such services to facilitate access to care and quality of care. This study will provide evidence base on the costs of stroke with a view of improving intervention and treatments of stroke survivors alongside efforts to bring infectious diseases under control in Nigeria. This paper therefore presents the designs and methods of a study aimed at examining the economic impact of stroke in Nigeria.

2. The THRIVES project

The Tailored Hospital-based Risk Reduction to Impede Vascular Events after Stroke (THRIVES) project is designed to improve the

delivery of secondary stroke preventive services in Nigeria by designing and testing a chronic care model-based intervention. This study proposes to examine the impact of a tailored intervention on reducing blood pressure in a cohort of stroke survivors. It is expected that the successful implementation of the project would serve as a model of cost-effective quality stroke preventive care for implementation in other countries in Sub Saharan Africa [26].

The overall objective of the cost component of the THRIVES project is to fully capture the economic impact of care after stroke. The study shall focus on intervention and control groups. The control group shall follow standardized version of the usual and customary care delivered at each hospital selected for the study while for the intervention group, we shall utilize a process that follows 5 stages as follows:

1. *Pre-appointment phone text*: The day prior to each visit, the patients will receive a pre-appointment reminder telephone text sent by the clinic staff asking patients to arrive an hour early for their appointment.
2. *In-clinic educational video*: While in the waiting room the patients will be asked to watch a stroke awareness educational video. The video had been developed by the Nigerian Stroke Society in conjunction with the study Task Force containing dramatized stroke scenarios, educational messages, and questions on the material taught with delayed responses. The video will run for repeatedly every 30–45 min throughout the clinic.
3. *Patient report card*: When the patient meets with the physician, the material of the video will be briefly discussed. The physician will show the patient the customized report card and go over the patient's current vs. optimal control of key stroke risk factors.
4. *Post-clinic phone text*: At the end of given THRIVES clinic, the physician who saw the patient will send a brief structured telephone text to the patient's mobile (cell) phone emphasizing the areas requiring better risk factor control. Caregivers or family members are encouraged to participate in all aspects of the care intervention because they may be most responsible for medication adherence and improving lifestyle habits. The intervention will last one year after stroke onset.
5. *Outpatient stroke registry*: Each patient will be tracked in an electronic registry. The registry will contain data written on the report cards. It also will contain contact information on how the subject can be notified for care coordination telephone texts.

As part of efforts to ensure quality of intervention, the report card and phone texts will only be issued to, and discussed with intervention patients. As part of efforts to make the process culturally relevant, the interventions are also designed in Yoruba language in a bid to cater for the less English literate patients. The messages are carefully designed and validated by telecommunication experts who are part of the study's multidisciplinary task force committee to target adherence to risk factor. This messages are delivered to intervention patients at the various time points of the study. Follow-up phone calls are put through to patients to ensure that they are recipient of such messages. The control (usual care) patients are not scheduled to come to the clinic on the same day as intervention patients, and control patients will be scheduled to see other non-investigator neurologists by the research coordinator.

In a bid to address intervention fidelity, the study developed defined manuals/protocols/algorithms that explicitly spell out the THRIVES study purpose, goals/objectives, and essential or critical elements and all the content that must be covered. In addition, THRIVES manuals contain detailed information about each proposed encounter, including how much time should be allotted to cover each bit of content, what behaviors are to be demonstrated or role-played, and what strategies are used to check participants' understanding during the encounter. Each of these elements is then monitored to insure fidelity. Furthermore, to minimize variance in intervention delivery and enhance a high degree of structure in the intervention design, all physicians are properly

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