

Outcomes of an integrated clinical management strategy and associated factors for stroke patients in public hospitals in the lake region counties of Kenya

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ABSTRACT

Stroke is a major cause of mortality, morbidity, and diminished quality of life, making effective management essential for improving patient outcomes. An integrated clinical management strategy offers a standardized, evidence-based framework that combines comprehensive assessment, targeted interventions, and coordinated multidisciplinary care to enhance recovery among stroke patients. This study aimed to evaluate the outcomes of such a strategy and its associated factors among stroke patients in public hospitals in the Lake Region counties of Kenya. The target population comprised all patients admitted to the designated hospitals with a diagnosis of stroke. A quasi-experimental research design was used, enrolling 173 stroke patients from four county referral hospitals. Of these, 87 patients were assigned to the intervention group (in two hospitals), while 86 were in the control group (in two hospitals). The intervention group received care guided by an integrated clinical management strategy in addition to routine care. This strategy involved incorporating a structured tool into patient files and initiating care based on its guidelines. It was implemented by a nurse-led multidisciplinary team and emphasized coordinated, evidence-based care during hospitalization and after discharge through outpatient follow-up. The control group received standard stroke care. Data were collected using questionnaires, facility checklists, and patient records after obtaining institutional approvals. Healthcare providers and research assistants were trained on the integrated strategy. Patient outcomes, including mortality, hospital stay, morbidity, and complications, were recorded. The intervention was monitored through monthly reviews for up to six months, and discharged patients were followed up in outpatient clinics to assess progress. Data analysis was done using inferential and descriptive statistics. Findings showed that 43.3% (n=75) of patients had hospital stays of 1–7 days, while only 1.7% (n=3) stayed longer than 60 days. Mortality was significantly lower in the intervention group at 4.6% (n=4) compared to 16.3% (n=14) in the control group. Overall mortality was 10.4% (n=18), with most deaths (33.3%, n=6) occurring within 8–14 days of admission. Functional recovery was notably higher in the intervention group at 81.9% (n=68) compared to 55.6% (n=40) in the control group. Complications affected 72.3% (n=125) of patients. The most common were urinary incontinence (50.4%, n=63), pressure ulcers (38.4%, n=48), and aspiration pneumonia (33.6%, n=42), while depression was least reported (18.4%, n=18). The intervention significantly improved outcomes: patients in the intervention group were 70% more likely to have shorter hospital stays (RR = 1.7, 95% CI: 1.2–2.4, p = 0.002) and had a 72% lower risk of death (RR = 0.28, 95% CI: 0.10–0.78, p = 0.01). They were also 1.9 times more likely to return to pre-stroke functional status (RR = 1.9, 95% CI: 1.4–2.6, p < 0.0001) and 1.4 times more likely to achieve overall good outcomes. In conclusion, the integrated clinical management strategy significantly improved stroke outcomes, including survival, functional recovery, and reduced hospital stay. The study also found that stroke type and severity are associated, with hemorrhagic strokes presenting more severely. It recommends early diagnosis, timely intervention, and strengthened prevention strategies. Additionally, integrating patient, provider, and facility factors into stroke care is essential for improving recovery outcomes and adherence to secondary prevention.

Keywords: Factors, Integrated Clinical Management Strategy, Lake Region, Stroke Outcomes, Kenya

I. INTRODUCTION

Worldwide, there is an increase in morbidity and mortality among patients experiencing cardiovascular diseases especially stroke (Virani, 2020). Global estimate reports suggest that the number of individuals experiencing strokes has increased in the range of 7.1% to 9.6% mortalities (Edwardson, 2023). Statistics show that 15 million people suffer a stroke annually, 5 million deaths do occur and 5 million people develop disabilities (World Health Organization [WHO], 2021). Cardiovascular diseases (CVDs) are conditions that affect the heart and blood vessels, such as stroke and coronary artery disease. An estimated 19.8 million people died from CVDs in 2021, representing approximately 32% of all global deaths, of these deaths, 85% were due to heart attack and stroke and over three quarters of CVD deaths take place in low- and middle-income countries (WHO, 2021). Stroke management is complex and extends beyond prevention to include treatment of complications and long-term care (WHO, 2021).

In Africa, review reports that published data within the past decades show an annual stroke rate of 316 per 1000, and a prevalence of up to 1460 per 100,000, and a 3-year mortality rate greater than 80 % (Akinyemi et al., 2021). In Kenya, the incidence and prevalence of stroke largely remain unknown due to substantial gaps in the national data (Waweru & Gatimu, 2021). A scoping review done by Waweru and Gatimu (2021) revealed a stroke prevalence of 0.6% in a referral hospital in western Kenya. There are different clinical management strategies of care that have been employed in the care, management, and follow-up of stroke patients. These approaches encompass emergent stroke care, dedicated stroke unit care, stroke care in the community, use of a stroke register for patient follow up, monitoring plan of care documented on the clinical pathway, communication using current technologies, use of clinical protocols, clinical pathways, standard operating procedures and clinical guidelines, evidenced based care practices, patient centered care approach, coordinated care approach, integrated care and champion care for patients who suffer a stroke (Langhorne et al., 2020; Roushdy et al., 2022). Further, use of an integrated clinical management strategy to provide quality care for non-communicable diseases is of great need to improve patient experiences and outcomes.

Studies on stroke in the Lake Region Counties are limited and most studies have majorly focused on prevalence and incidence of stroke under Non-Communicable Diseases (NCDs) (Ominde et al., 2019). Lake Region county referral hospitals serve a high number of patients with non-communicable diseases; however, there is paucity of studies done on the integrated clinical management strategy for patients admitted with stroke in public health facilities. Therefore, this study sought to establish the outcomes of an integrated clinical management strategy and associated factors for stroke patients in the public hospitals of the lake region counties.

1.1 Statement of the Problem

Recent literature on Sub-Saharan Africa emphasizes the importance of structured acute-stroke management strategies including; early recognition, rapid triage, stroke units, standardized treatment protocols, and coordinated multidisciplinary care in improving outcomes among stroke patients (Mead et al., 2023). A study that assessed stroke services across 17 African countries found limited improvements in acute care capacity, including the gradual expansion of stroke units, increased adoption of tele stroke for rapid specialist input, and better organization of acute management pathways; however, substantial gaps still remain in integrated clinical management strategy in timely imaging, availability of thrombolysis and standardized emergency protocols (Roushdy et al., 2025). Evidence from the Tanzania Stroke Project demonstrates that, implementing structured acute-stroke protocols including standardized vital-sign monitoring, early imaging pathways, and protocols for management of blood pressure and blood glucose is feasible in low-resource settings, challenges were still noted among these patients related to late patient presentation with majority reporting to the health facility more than 24 hours after stroke onset (Tanzania Stroke Project, 2025). In addition, reviews of acute stroke care frameworks highlight that organized stroke units, integrated stroke management approaches, and protocol-driven emergency management consistently reduce mortality and disability, yet such units remain scarce in Africa, including Kenya, where acute stroke patients are often managed in general medical wards without standardized pathways (Waweru & Gatimu, 2021).

These findings underscore that adopting structured acute-stroke management protocols which integrate rapid assessment, early imaging, standardized treatment algorithms, and coordinated multidisciplinary care is critical for improving stroke outcomes in resource-constrained health systems including in public health facilities in Western region, Kenya. Further the consulted literature had limited documentation studies on integrated clinical management strategies for stroke patients and their effectiveness a gap which this study sought to address.

1.2 Research Objectives

- i. To assess the outcomes of an Integrated Clinical Management Strategy for stroke patients in public hospitals in the Lake Region Counties of Kenya.
- ii. To examine factors associated with outcomes of an Integrated Clinical Management Strategy for stroke patients in public hospitals in the Lake Region Counties of Kenya

II. LITERATURE REVIEW

2.1 Literature Review

Stroke is a critical medical emergency requiring timely intervention to improve survival and recovery outcomes (WHO, 2021). Effective stroke care includes early assessment, prompt treatment, specialized stroke units, rehabilitation, and caregiver support (Chen et al., 2021). Despite advancements through integrated clinical management strategies, disparities in care persist, particularly in rural areas. Integrated clinical management enhances coordination, decision-making, and continuity of care (Abdul et al., 2020). However, the effectiveness of an integrated

clinical management strategy largely depends on healthcare provider knowledge and competence on the care of stroke patients (Deng et al., 2020; Deng et al., 2021).

Health care Providers must possess up-to-date knowledge, evidence-based skills, and the ability to manage patients across the continuum of care (WHO, 2021). Key competencies include clinical care, communication, patient-centered approaches, and self-management support such as dysphagia screening and rehabilitation (Woo et al., 2020). Stroke is also considered a long-term condition requiring interdisciplinary collaboration, quality improvement, and use of health informatics (Ganesh et al., 2022). Healthcare provider expertise is shaped by training, experience, and practice in specialized settings, with continuous professional development being essential (Chen et al., 2021). Additionally, caregiver involvement is crucial in supporting recovery and ensuring continuity of care and integrated stroke care interventions that are complex and require coordinated, multidisciplinary efforts to achieve optimal outcomes (Deng et al., 2020).

2.2 Empirical Review

A systematic review was conducted to evaluate integrated care management for patients following acute stroke. The review aimed to identify existing integrated care strategies for stroke patients, assess whether structured stroke management pathways influence patient outcomes, and determine which components of integrated stroke care are most effective. The study included both control and intervention groups. Primary outcomes assessed were mortality, recurrent stroke, and major bleeding, while secondary outcomes included quality of life, unplanned hospital readmissions, anxiety and depression, lifestyle and cardiovascular risk factors, and adherence to treatment. In total, 99 studies were included, with 63 subjected to meta-analysis. The findings indicated that patients receiving integrated stroke care experienced a significant reduction in recurrent stroke, improved quality of life, and a lower incidence of depression. However, no significant differences were observed in mortality or major bleeding. Overall, the results suggest that integrated post-stroke care is associated with improved quality of life and reduced rates of depression and recurrent stroke (Ian et al., 2025)

Recently, studies have been conducted to identify and assess factors that may influence functional recovery in post-stroke patients, aiding in the differentiation between those who achieve good outcomes and those who do not (Virani, 2020). The outcome of a stroke is commonly influenced by factors such as age, gender, initial stroke severity, functional status at hospital admission, urinary incontinence, cognitive function impairment, and unilateral neglect syndrome (Woo et al., 2022). Furthermore, several patient factors that affect the application of integrated clinical management strategy include viewing the patient as an individual rather than solely focusing on the disease, considering underlying health conditions, evaluating drug usage and management (Jones et al., 2021). Jones et al. (2021) emphasizes that the immune status of stroke patients is crucial for their care and management, therefore treatment processes must consider each patient as an individual, including their relatives (Haki & Demirci, 2022).

Empirical studies have increasingly focused on identifying and evaluating factors that influence functional recovery among post-stroke patients, with the aim of distinguishing individuals likely to experience favorable outcomes from those at risk of poor recovery. Evidence from the literature consistently highlights several key determinants, including age, gender, and the initial severity of the stroke. Additionally, patients' functional status at the time of hospital admission has been shown to be a strong predictor of recovery trajectories. Clinical conditions such as urinary incontinence, cognitive impairment, and unilateral neglect syndrome have also been frequently examined, with findings suggesting that their presence is associated with less optimal rehabilitation outcomes. Collectively, these variables provide a valuable framework for predicting recovery and guiding individualized post-stroke care interventions. Factors Influencing outcomes with strokes seeks to define acute stroke management for patients entering the hospital which aids in developing effective management strategies and enhancing patient care and outcomes in acute stroke management (Edwardson, 2023).

An observational study investigating factors influencing the effective management of acute stroke revealed that patients arriving by means other than Emergency Medical Services (EMS) and those who lacked knowledge about treatment options experienced notable delays in reaching the hospital (Rababah et al., 2021; Asadi et al., 2020). Consequently, specialized stroke care including pre-hospital, hyper acute and acute treatment, rehabilitation, and secondary prevention is significantly lacking, leading to increased morbidity and mortality (Abdul et al., 2020). Furthermore, stroke patients often go to private diagnostic centers for neuroimaging because of insufficient scanners in many health facilities, which adds to the financial strain associated with strokes and the distance to the hospital was a crucial factor leading to considerable out-of-hospital delays (Li et al., 2022; Potisopha et al., 2023). Gaining peer support management is essential and can be derived from various sources such as stroke clubs, colleagues, and shared interests (Sharma et al., 2020). In a study done on nursing and institutional responsibilities for stroke, environment shared experiences of stroke, along with cultural and political factors, influence patient outcomes (Snively et al., 2020).

III. METHODOLOGY

3.1 Research Design

This study employed a quasi-experimental(study/control group) design to evaluate the outcomes of an integrated clinical management strategy, and associated factors among patients treated in public hospitals in the Lake Region Counties of Kenya. An intervention group that utilized the integrated clinical management strategy and the control that received standard care for stroke patients without using the integrated clinical management strategy. Random allocation was not applied, the two groups were selected from comparable health facilities, and baseline assessments were conducted to ensure similarity prior to the intervention. The design enabled the measurement of both control and intervention group outcomes in a naturalistic setting while reducing contamination by assigning different health facilities to each group.

3.2 Study Area

The research took place in the Lake Economic Bloc region of Kenya-Kakamega, Kisumu, Kericho and Kisii counties. The counties were purposively selected due to their capacity to handle emergencies, they are situated along the major highways, admission of referrals and treatment of stroke patients, and they serve a large population of patients with a stroke prevalence of 6.1% from the western region of Kenya. The county referral hospitals provide neuroimaging services that include; Computed Tomography (CT-scan) and Magnetic Resonance Imaging (MRI) for stroke patients. In addition to this, the hospitals do offer other services like thrombolytic medications.

3.3 Target Population

The target population included all patients admitted to the selected hospitals with a diagnosis of stroke. It also included healthcare providers working in the study areas who were directly involved in the care of stroke patients and met the inclusion and exclusion criteria. Health Care providers comprised nurses, clinical officers, neurologists or physicians, and unit in-charges from departments providing stroke care, including Accident and Emergency, medical wards, critical care units, and outpatient departments.

3.4 Sampling Procedure and Sample Size

The required sample size was determined using the Cochrane's Formula for Sample Size calculation. A study conducted by Ominde et al. (2019) on patterns of stroke among patients admitted in rural health facilities in Western Kenya revealed that out of 3200 medical cases admissions, 227 (7.09%) had a confirmed diagnosis of stroke. Using Cochranes formula, the minimum number of stroke patients to include in study is 71. Further, to account for non-responses, loss to follow-up and incomplete data, researchers adopt an additional 10–20% of the minimum sample size (Naing et al., 2022). Due to the small population of stroke patients admitted in the rural facilities in western region, Kenya, the researcher, added 20% of the minimum calculated sample size, and the minimum sample included in the study was 86 patients for each group. A total of 173 patients were included in the study with 87 in the intervention group and 86 in the control group. Twenty (20) health care providers were also included in the study, that is, ten (10) from each of the two (2) participating county referral hospitals. The 10 included participants from each of the units that provide care to stroke patients: Accident and Emergency, medical ward, critical care unit, medical out-patient department. The health care providers included nurses, clinical officers, neurologists or physicians and unit in charges. The target population included all patients who presented to the hospitals with stroke upon admission, and health care providers working in the study areas and were providing direct care to stroke patients and met the inclusion and exclusion criteria.

3.5 Data Collection Instruments and Procedure

Three main instruments were used to collect data. A structured questionnaire that was used to collect data from the patients on socio demographic characteristics and history, a key informant interview guide that collected demographic and professional information from healthcare providers, and a structured set of questions aimed at assessing healthcare providers' background knowledge of stroke care, health facility checklist tool was used to collect data on the health facility related factors. The checklist was used to document availability and functionality of equipment required for the management of stroke patients and availability of laboratory and radiological tests. Construct validity was ensured through the involvement of expert opinion from practitioners in the field and my supervisors who have vast experience and are familiar with the measure and the phenomenon under study. Content validity was ensured by conducting a pre-test that assessed the representativeness and clarity of the research tools. Thus, validity and reliability was utilized for data collection procedure and administered in both groups. Cronbach test on the integrated clinical management strategy domains resulted in an alpha value of 0.77 indicating acceptable

internal consistency. Data collection was conducted from the hospitals using the research tools and involved prospective data collection till the target was arrived at for the study period.

3.6 Data Analysis

Data collected were analyzed using descriptive (percentages and frequencies) and inferential statistics (bivariate analysis and multiple logistic regressions), and presented using tables and figures to enhance clarity, facilitate interpretation, and support understanding of the findings and aided interpretation.

3.7 Ethical Considerations

This study was conducted in accordance with the ethical standards for research where human subjects were involved. Ethical approvals were obtained from relevant institutions to include; clearance for data collection by the Directorate of Postgraduate Studies, then ethical clearance and approval was obtained from the MMUST Institutional Ethical Review Committee and Research permit from National Commission for Science, Technology & Innovation. Permission was then sought and obtained from the hospital's administrators. Informed consent was obtained from all study participants with explanations of the study purpose, procedures, and potential risks and benefits. Study subjects were informed and assured of voluntary participation and that they were free to withdraw from the study at any given time without affecting the care they received. Confidentiality and privacy were maintained by assuring the study participants that their records were well kept, and only accessed by the researcher.

IV. FINDINGS & DISCUSSION

4.1 Findings

4.1.1 Socio- Demographic Characteristics of Study Participants

Findings in table show that majority 76.3% (n=132) of the participants were in the age category of 40-49 years with a mean age of the participants was 44.9 ± 4.9 years. Majority, 61.3% (n=106) were female, married 80.9% (n=140), attained education at the college level 33.5% (n=58) and were employed 59.5% (n=103). Among the participants, 78% (n=135) lived more than 10 km away from the health facility. Majority, 67.6% (n=117) had no health insurance, with only 20.2 (35) reporting to have active Social Health Insurance (SHA).

Table 1

Socio- Demographic Information

Variables	Categories	Intervention n (%)	Control n (%)	Total n (%)
Age in years	30-39	9 (10.3)	8 (9.3)	17 (9.8)
	40 – 49	71 (81.6)	61 (70.9)	132 (76.3)
	≥50	7 (8.1)	17 (17 (19.8)	24 (13.9)
Mean age (\pm SD)	44.9 \pm 4.9 years			
Gender	Male	35 (40.2)	32 (37.2)	67 (38.7)
	Female	52 (59.8)	54 (62.8)	106 (61.3)
Marital status	Single	14 (16.1)	0 (0.0)	14 (8.09)
	Married	65 (74.7)	75 (87.2)	140 (80.9)
	Divorced	0 (0.0)	1 (1.2)	1(0.6)
	Widowed	8 (9.2)	10 (11.6)	18(10.4)
Education	Primary	19 (21.8)	9 (10.5)	28 (16.2)
	Secondary	18 (20.7)	16 (18.6)	34 (19.7)
	College	25 (28.7)	33 (38.4)	58 (33.5)
	Degree/Masters	25 (28.7)	28 (32.6)	53 (30.6)
Occupation	Employed	44 (50.6)	59 (68.6)	103 (59.5)
	Self employed	26 (29.9)	18 (20.9)	44 (25.4)
	Unemployed	17 (19.5)	9 (10.5)	26 (15.0)
Distance to facility (km)	< 10	21 (24.1)	17 (19.8)	38 (22)
	>10	66 (33.3)	69 (38.4)	135 (78)
Health Insurance status	SHA	20 (23.0)	15 (17.4)	35 (20.2)
	Private Insurance	9 (10.3)	12 (14.0)	21 (12.1)
	No insurance	58 (66.7)	59 (68.6)	117 (67.6)



4.1.2 Patient Outcomes

Table 2 Provides findings on bivariate analysis to determine the differences in the outcomes between the intervention and control group. Findings on the length of hospital stay showed that patients in the intervention group were 1.7 times more likely to have a short length of stay (≤ 8 days) compared to the control group (Table 2). This shows that patients who were in the intervention group and were managed using the integrated clinical management strategy were significantly more likely to have a shorter hospital stay (≤ 8 days) compared to those in the control group who received standard care. The intervention increased the likelihood of shorter stays among the patients in the intervention group by 70%, that is, (RR = 1.7, 95% CI: 1.2–2.4, $p = 0.002$). Among the participants included in the study 10.4% ($n=18$) died. Bivariate analysis showed $RR < 1$ which indicates lower risk of death in the intervention group. Mortality was significantly lower in the intervention group (4.6%) compared with the control group (16.3%). Patients in the intervention group had a 72% lower risk of death than those in the control group (RR = 0.28, 95% CI: 0.10–0.78, $p = 0.01$) (Table 3).

Table 2 shows that among the study participants in the intervention group, 68 out of 86 patients (63%) returned to pre-stroke functioning state compared with 37% in the control group (40 out of 87). The $RR > 1$ indicates that the participants in the intervention group were more likely to return to pre-stroke function than those in the control group. The intervention group had a 1.9-fold higher likelihood of returning to pre-stroke function (RR = 1.9, 95% CI: 1.4–2.6, $p < 0.0001$), indicating that the integrated clinical management strategy significantly improved functional recovery. Findings showed that the proportion of patients who developed stroke complications was almost similar in the intervention (70.1%) and control (74.4%) groups. The intervention was associated with a slightly lower risk of complications (RR = 0.94), but this difference was not statistically significant (95% CI: 0.74–1.19, $p = 0.62$). The integrated clinical management strategy did not significantly reduce the risk of developing stroke complications.

Table 2

Findings on bivariate analysis on outcomes of management strategies on stroke patients

	n	Intervention n (%)	Control n (%)	RR	95% CI	P value
Length of stay						
Short (≤ 8)	75	48 (64.0)	27 (36.0)	1.7	1.2 – 2.4	0.002
Long (> 8)	98	39 (39.8)	59 (60.2)			
Mortality						
Died	18	4 (4.6)	14 (16.3)	0.28	0.10–0.78	0.01
Survived	155	83 (53.56)	72 (46.5)			
Return to pre-stroke functioning state						
Yes	108	68 (63.0)	40 (37.0)	1.9	1.4 – 2.6	< 0.0001
No	65	19 (29.2)	46 (70.8)			
Developed complications						
Yes	125	61 (70.1)	64 (74.4)	0.94	0.74–1.19	0.62
No	48	32 (38.1)	(61.9)			

Table 3 findings on multiple logistic regression analysis of factors associated with length of hospital stay showed that participants in the intervention group had about 16 times higher odds of shorter hospital stay compared to the control group, after adjusting for age, gender, marital status, education level, occupation and distance to the health facility (AOR = 15.85, 95% CI: 6.72–37.34, $p < 0.001$). This indicates a strong, statistically significant effect of the intervention (Integrated Clinical Management Strategy), independent of sociodemographic characteristics. The findings from the multiple logistic regression further showed that none of the sociodemographic variables (age, gender, marital status, education level, occupation, and distance to the health facility) were significantly associated with length of hospital stay (all p -values > 0.05). This indicates that, after controlling for other variables in the model, the patient’s sociodemographic characteristics did not independently influence the likelihood of having a shorter hospital stay (≤ 8 days).



Table 3
Multiple Logistic Regression Results Showing Adjusted Odds Ratios for the Length of Hospital Stay

Variable	Adjusted OR (AOR)	95% CI	p-value
Category of participants (Intervention vs Control Group)	15.85	6.72-37.34	< .001
Age of participants	1.24	0.48-3.22	0.663
Gender (Female vs Male)	1.67	0.72-3.83	0.230
Marital Status			0.849
- Single vs Married	1.45	0.37-5.75	0.597
- Divorced/Widowed vs Married	1.22	0.18-8.49	0.842
Education Level			0.796
- Primary vs Degree/Masters	0.57	0.11-2.92	0.500
- Secondary vs Degree/Masters	0.70	0.19-2.52	0.580
- College vs Degree/Masters	0.60	0.22-1.67	0.330
Occupation			0.851
- Employed vs Other	0.71	0.16-3.19	0.572
- Self-employed vs Other	0.69	0.19-2.49	0.659
Distance to Health Facility (Less than 10 KM vs More than 10KM)	0.65	0.23-1.80	0.403

Multiple logistic regression analysis was conducted to examine the effect of an integrated clinical management strategy and demographic factors on mortality among stroke patients (Table 4). The model included participant category (intervention vs. control), age, and gender, type of stroke, and severity of stroke, marital status, education level, occupation, and distance to the health facility. Results indicated that participant category was the only statistically significant predictor of mortality. Patients in the intervention group had significantly lower odds of mortality compared to the control group (OR = 0.17, 95% CI: 0.05–0.60, p = 0.006), suggesting that the integrated clinical management strategy substantially reduced the risk of death. Other factors, including age, gender, type and severity of stroke, marital status, education level, occupation, and distance to the health facility, were not independently associated with mortality in this study as the results showed p > 0.05. These findings highlight the effectiveness of the integrated clinical management strategy in improving survival outcomes for stroke patients, while demographic and clinical characteristics did not show any significant independent influence on mortality among the study participants.

Table 4
Multiple Logistic Regression Results Showing Adjusted Odds Ratios for Mortality

Variable	Coefficient (B)	Standard Error (S.E)	Adjusted OR (AOR)	95% CI	p-value
Category of participants (Intervention vs Control Group)	-1.781	.648	0.17	0.05-0.60	0.006
Age of participants	.134	.801	1.14	0.24-5.49	0.867
Gender (Female vs Male)	-.547	.626	0.58	0.17-1.97	0.382
Type of Stroke	.943	.728	2.57	0.62-10.69	0.195
Severity of Stroke	-.534	1.058	0.59	0.07-4.66	0.614
Marital Status: Married vs Others	-1.003	1.064	0.37	0.05-2.96	0.346
Education Level Secondary vs Others	.892	.909	2.44	0.41-14.49	0.326
College vs Degree/Masters	.691	.793	1.99	0.42-9.44	0.384
Occupation					0.297
- Employed vs Other	.690	1.302	1.99	0.16-25.60	0.596
- Self-employed vs Other	1.504	1.280	4.50	0.37-55.36	0.240
Distance to Health Facility (< 10 KM vs >10)	.178	.752	1.19	0.27-5.21	0.813

The results on multiple logistic regression analysis conducted to determine factors independently associated with return to pre-stroke functional status after adjusting for demographic and clinical variables, showed that participants in the intervention group were significantly more likely to return to their pre-stroke state compared to those in the control group (AOR = 4.17, 95% CI: 1.77–9.88, p = 0.001) (Table 5). Stroke severity was also a significant predictor, with patients in the less severe category demonstrating higher odds of functional recovery (AOR



= 5.03, 95% CI: 1.38–18.35, $p = 0.014$). Education level showed mixed findings; participants with secondary education had significantly lower odds of returning to their pre-stroke state compared to other levels of education (AOR = 0.17, 95% CI: 0.04–0.73, $p = 0.017$), while the association for college versus degree/masters’ level was not statistically significant. Age, gender, type of stroke, marital status, occupation, and distance to the health facility were not independently associated with functional recovery ($p > 0.05$). Overall, the findings suggest that the integrated clinical management strategy and stroke severity were the strongest determinants of return to pre-stroke functional status among the study participants.

Table 5
Multiple Logistic Regression Results Showing Adjusted Odds Ratios for return to Pre-Stroke functioning State

Variable	Coefficient (B)	Standard Error (S.E)	Adjusted OR (AOR)	95% CI	p-value
Category of participants: (Intervention vs Control Group)	1.430	.439	4.17	1.77-9.88	0.001
Age of participants	.054	.490	1.05	0.40-2.76	0.912
Gender (Female vs Male)	.489	.458	1.63	0.67-3.99	0.286
Type of Stroke	.637	.467	1.89	0.76-4.72	0.172
Severity of Stroke	1.616	.660	5.03	1.38-18.35	0.014
Marital Status: Married vs Others	-.336	.668	0.71	0.19-2.65	0.615
Education Level Secondary vs Others	-1.746	.731	0.17	0.04-0.73	0.017
College vs Degree/Masters	-1.130	.630	0.32	0.09-1.11	0.073
Occupation Employed vs Other	-.308	.800	0.74	0.12-1.92	0.700
- Self-employed vs Other	-.717	.699	0.49	0.15-3.52	0.305
Distance to Health Facility (< 10 km vs >10)	-.114	.534	0.89	0.31-2.54	0.831

Table 6 findings on bivariate logistic regression to assess patient factors influencing effectiveness of clinical pathways for patients with stroke revealed the following. Patients in the intervention group were 1.4 times more likely to have had good outcome compared to those in the control (RR: 1.4; 95%CI: 1.2 – 1.7; $p = 0.0002$). Likewise, patients who had ischemic type of stroke had better outcome (RR: 1.4; 95%CI: 1.2 – 1.6; $p = 0.0008$), similar to those with severe stroke (RR: 1.2; 95%CI: 1.0 – 1.4; $p = 0.066$) although the relationship was marginally statistically significant. On the contrary, a significantly smaller proportion of patients with cardiac disease (RR: 0.7; 95%CI: 0.6 – 0.9; $p = 0.004$), diabetes/cardiac disease (RR: 0.8; 95%CI: 0.7 – 0.9; $p = 0.013$), diabetes/hypertension/cardiac disease (RR: 0.8; 95%CI: 0.6 – 0.9; $p = 0.004$) were less likely to have had good outcome compared to their counterparts. Generally, this implies that the additional burden of other chronic conditions worsens the outcome of hospitalized stroke patients.

Table 6
Patient factors influencing the effectiveness of integrated clinical management strategy for patients with stroke in public hospitals

Variables	n	Intervention Group n (%)	Control Group (%)	RR	95%CI	Pvalue
Age in years						
< 50	149	45 (30.2)	104 (69.8)	1.2	1.0 – 1.5	0.072
≥ 50	24	3 (12.5)	21 (87.5)			
Gender						
Male	67	22 (32.8)	45 (67.2)	1.1	0.9 – 1.4	0.234
Female	106	26 (24.5)	80 (75.5)			
Education						
Primary	28	12 (42.9)	16 (57.1)	1.3	0.9 – 1.8	0.051
Beyond Primary	145	36 (24.8)	109 (75.2)			
Smoking						
Yes	96	27 (28.1)	69 (71.9)	1.0	0.8 – 1.2	0.901
No	77	21 (27.3)	56 (72.7)			
Alcohol						
Yes	98	31 (31.6)	67 (68.4)	1.1	0.9 – 1.4	0.192
No	75	17 (22.7)	58 (77.3)			



Family history of stroke						
Yes	131	40 (30.5)	91 (69.5)	1.2	1.0 – 1.4	0.148
No	42	8 (19.1)	34 (80.9)			
Type of Stroke						
Ischemic	108	54 (62.8)	54 (62.8)	1.4	1.2 – 1.6	0.0008
Hemorrhagic	65	32 (37.2)	33 (37.9)			
Severe stroke						
Yes	85	29 (34.1)	56 (65.9)	1.2	1.0– 1.43	0.066
No	88	19 (21.6)	69 (78.4)			
Comorbidity						
Yes	69	12 (17.4)	57 (82.6)	0.8	0.7 – 0.9	0.013
No	104	36 (34.6)	68 (65.4)			
Yes	88	16 (18.2)	72 (81.8)	0.8	0.6 – 0.9	0.004
No	85	32 (37.7)	53 (62.3)			
Distance to hospital						
< 10 km	38	11 (28.9)	27 (71.1)	1.0	0.8 – 1.3	0.8.51
> 10 km	135	37 (27.4)	98 (72.6)			

Qualitative findings from the key informant interviews revealed that patient factors including time of presentation to the health facility and level of severity contribute to the effectiveness of the integrated clinical management strategy and patient outcomes. These are shown in the excerpts below:

“Patient factors play a big role in how effective an intervention is. Patients who present with severe strokes or multiple comorbidities such as hypertension and diabetes often have poorer outcomes despite receiving integrated care. I can therefore say that, early presentation and lower stroke severity make the strategy much more effective (KII2).”24/3/25

The socio-demographics such as age and patient adherence to treatment were also cited to contribute to the effectiveness of the strategy.

“We have noticed that patients’ characteristics such as age, level of education, and health-seeking behavior influence how well they respond to the strategy. Older patients and those who arrive late or do not adhere to rehabilitation and medication tend to benefit less. On the other hand, patients with good family support usually recover better under the integrated approach (KII10).24/3/25

4.2 Discussion

This study evaluated the outcomes of an integrated clinical management strategy for stroke patients by examining key outcomes such as mortality, length of hospital stays, functional recovery, discharge status, and complications. Overall, the findings indicate that the strategy had a positive impact on improving survival, although several systemic and clinical factors influenced patient outcomes. Mortality was a primary outcome, with 10.4 % (n=18) of participants dying during the study period. This pattern suggests that although early stabilization is important, the post-admission phase is critical for patient survival. Importantly, patients in the intervention group who received the integrated clinical management strategy had significantly lower odds of deaths compared to the control group (OR = 0.17, p = 0.006). This demonstrates that the strategy substantially reduced the risk of death and highlights the value of coordinated, continuous care beyond initial treatment. These findings are in line with other studies done among stroke patients in other countries like Ethiopia on the magnitude of risk factors and in-hospital mortality outcomes for patients with stroke (Alene et al., 2020). The outcomes are closely linked to underlying risk factors and comorbidities.

Evidence from related studies shows that hypertension is the most prevalent risk factor among stroke patients, followed by atrial fibrillation and diabetes mellitus. These conditions contribute significantly to both stroke occurrence and poor outcomes, including mortality (Woo et al., 2022). The findings emphasize that effective management of these risk factors especially blood pressure control is essential to improving patient survival and reducing the overall burden of stroke. The study also aligns with international evidence supporting integrated care approaches. For example, structured care models such as the Atrial Fibrillation Better Care (ABC) pathway have been shown to reduce cardiovascular events and improve survival outcomes. Patients receiving optimal, guideline-based care experienced significantly fewer complications and better overall outcomes. This reinforces the idea that holistic, patient-centered management strategies can lead to both clinical and economic benefits (Camacho & Lip, 2024; Mosisa et al., 2023).

Regarding hospitalization, most patients (43.3%) had relatively short stays of 1–7 days, but a small proportion required prolonged hospitalization (over 60 days), likely due to complications or severe stroke. Variability in length of stay reflects differences in disease severity, complications, and hospital practices. While the integrated strategy may

contribute to more efficient care, external factors such as hospital resources and care coordination also play a role. Interestingly, socio-demographic factors (age, gender, education) were not significantly associated with length of stay in this study, suggesting that clinical factors and system level issues may be more influential determinants. Despite these positive outcomes, several limiting factors were identified. Delayed presentation to health facilities reduced the effectiveness of early interventions, while resource constraints and inconsistent access to therapy hindered optimal care delivery. These barriers likely contributed to complications, prolonged hospital stays, and reduced chances of full functional recovery (Fekadu et al., 2020; Woo et al., 2022). Overall, the integrated clinical management strategy improved survival outcomes among stroke patients, particularly by reducing mortality risk. However, patient outcomes were strongly influenced by timing of care, availability of resources, and management of underlying conditions. Strengthening early access to care, improving hospital resources, and ensuring consistent implementation of integrated care models are critical to maximizing the benefits of such strategies.

Effective integrated clinical management of stroke patients depends on both healthcare provider and facility related factors. Well-trained and adequately staffed health care providers are crucial for implementing protocols, ensuring close monitoring of stroke patients, and delivering timely interventions. Strong teamwork and multidisciplinary collaboration improve decision-making and continuity of care, though negative provider attitudes, such as resistance to change, can hinder progress. On the facility factors, the availability of essential equipment, proper infrastructure, specialized stroke units, and efficient referral systems significantly enhances care quality. Overall, institutional support, including strong leadership and policy backing, is vital for successfully implementing integrated stroke care strategies. Key informants noted that facilities with adequate resources and organizational support achieved better patient outcomes. Findings from the current study concur with other studies done in a systematic review and meta-analysis of protocols used in the management of patients with hypertension in Sub-Saharan Africa, results revealed that adherence to protocols varied such as comprehensive services, patient focus, and standardized care delivery that had strong implementation, while gaps were noted in geographic coverage, information systems, governance structures, and financial management (Camacho & Lip, 2024).

Comparative studies also reveal disparities between urban and rural settings. Urban hospitals tend to have more organized stroke care systems, including dedicated stroke units and specialized staff, whereas rural facilities often face challenges such as limited infrastructure and resource constraints. This highlights the need for equitable resource distribution to improve stroke care across different regions. These results are consistent with the current study findings. Further supporting evidence shows that patient-related factors, such as comorbidities like diabetes mellitus and hypertension, also influence outcomes, but these are closely linked to the quality of care provided. For example, lower immune status was associated with higher in-hospital mortality, emphasizing the importance of comprehensive and well-coordinated care (Youkee et al., 2021; Sarfo et al., 2021). Overall, the effectiveness of integrated clinical management strategy for stroke patients depends on a combination of well-trained healthcare providers, adequate staffing, strong teamwork, positive provider attitudes, sufficient resources, and supportive health care systems. Addressing gaps in infrastructure, staffing, and system organization is essential to improving patient outcomes and ensuring successful implementation of integrated care strategies.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

In this study most stroke patients were hospitalized for 1–7 days, with only a very small proportion (1.7%) (n=3) staying longer than 60 days. Mortality rates were notably lower in the intervention group (4.6%) (n=4) compared to the control group (16.3%) (n=14), suggesting that the intervention may improve survival outcomes. Overall, the findings support the effectiveness of an integrated clinical management strategy for stroke patients, particularly in addressing both pre- and post-stroke challenges. Improved adherence to such interventions may also enhance key healthcare processes, including reduced hospital stay, faster access to care, and better diagnostic efficiency. The study further highlights a relationship between stroke type and severity, with hemorrhagic strokes associated with more severe cases. It emphasizes the importance of early diagnosis, timely treatment, and strong prevention strategies to improve patient outcomes. Additionally, the presence of other chronic conditions was found to worsen outcomes among hospitalized stroke patients, facilities with adequate resources and organizational support achieved better patient outcomes, and adequate training was critical to achieving optimal patient outcomes

5.2 Recommendations

This study recommends that stroke outcomes be optimized through integrated, timely, and patient-centered care spanning the acute, rehabilitation, and post-discharge phases, with effectiveness measured using standardized outcome indicators. Rapid access to specialized stroke services and early severity assessment like the National Institute Health (NIH) Stroke Scale improves survival and reduces disability, while prompt reperfusion therapy in

eligible patients is associated with lower mortality and improved functional outcomes, commonly measured by the modified Rankin Scale and Barthel Index. Further the study, recommends that patient, health care providers and facility factors be embraced systematically in the care of stroke patients as these influence recovery trajectories, and adherence to secondary prevention.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported on this paper.

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