AUDIT

A clinical audit on recognition and management of stroke in a tertiary care hospital of Sri Lanka

Jayasekera MMPT[1], Edirisinghe EMDT[2], Ekanayake EJC[3], Fernando P[4], Kariyawasam VT[5]

[1,3,4,5] Department of Medicine, General Sir John Kotelawala Defence University (KDU), Sri Lanka

[2] University Hospital, Kotelawala Defence University, Sri Lanka

Article Information

Corresponding Author
Prof. MMPT Jayasekera
Email: priyamja@kdu.ac.lk

https://orcid.org/0000-0002-6699-7937

https://doi.org/10.4038/sljms1.v2i1.49

Received 13 May 2025
Accepted 26 July 2025

Conflicts of Interest: None

Funding: The audit was self-funded by the principal investigator.

Abstract

Background: Stroke is a major cause of mortality and morbidity worldwide, with a significant burden in low- and middle-income countries. This audit evaluated the impact of introducing validated tools, the FAST test and ROSIER score, to improve stroke recognition and treatment initiation by outpatient doctors at a tertiary care hospital in Sri Lanka.

Methods: A two-cycle audit was conducted. The first cycle involved retrospective data collection over 12 months, followed by two weeks of training and three months of implementation for outpatient doctors and the medical team on the use of the FAST and ROSIER tools. The second cycle involved prospective data collection over three months with the use of the same implemented tools.

Results: Twenty-eight patients [median age 67(IQR 9) years; male: 20, female: 8] and eleven patients [median age 77.5(IQR 14) years; male: 5, female: 6] were included in the first and second cycles of the audit, respectively. Stroke onset was documented in 64% of patients during the first cycle and in 100% of patients during the second. Disability was specified in 82% of patients in the first cycle and 100% of patients in the second. CT scans were performed within a median of 75 minutes (IQR 123) and 52 minutes (IQR 58) after arrival in the first and second cycles, respectively. Three patients received aspirin and four received antihypertensives before CT in the first cycle, compared to none in the second.

Conclusion: There has been a substantial and meaningful improvement in the recording of disability and early recognition of stroke, timely diagnosis, and initiation of management following the intervention comprising, implementation of the FAST test, ROSIER score and National Stroke Guidelines.

Keywords: Stroke recognition, FAST test, ROSIER score, clinical audit, Sri Lanka

Cite this article as: Jayasekera MMPT, *et al.* A clinical audit on recognition and management of stroke in a tertiary care hospital of Sri Lanka. SLJMS 2025; 2(1): 26-32

This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License, which permits unrestricted use, distribution and reproduction in any medium provided the original author and source are credited.

Introduction

Stroke is defined as a rapidly developing clinical syndrome of focal or global disturbance of cerebral function, lasting more than 24 hours or leading to death, no apparent cause other than vascular origin.[1] Stroke is the third most common cause of disability and the second most common cause of death globally. It is also a major contributor to depression and dementia. Developing countries account for 87% of stroke-related fatalities and disability-adjusted life years worldwide, and 70% of strokes. People who are at the height of their productive lives are primarily affected by strokes. This expanding dilemma has received very little attention to date, despite having a significant impact on the socioeconomic development of nations.[2]

Although most patients and doctors recognise stroke, there is often a lack of urgency in seeking or providing treatment. Timely CT imaging and administration of intravenous thrombolytics within 4.5 hours of the onset of stroke symptoms are crucial,[3] emphasising the importance of early recognition, prompt hospital presentation, and rapid intervention for better outcomes. The validated FAST (Face, Arms, Speech, and Time) Test and ROSIER score (Recognition of Stroke in Emergency Room) are the most important, simple, and quick diagnostic tools that should be implemented in the outpatient or emergency department. The FAST test assesses facial and arm weakness, as well as speech abnormalities, whereas the Rosier score additionally assesses leg weakness, visual field defects, and events such as loss of consciousness and seizures. It is a quick and widely used screening method that helps identify anterior circulation strokes early.[4] The FAST test is known to have limitations, particularly in detecting posterior circulation strokes, which can manifest with less common symptoms such as dizziness, vision abnormalities, or imbalance.[5] The ROSIER score overcomes these restrictions and increases the detection range in emergencies. Other neurological symptoms, like loss of consciousness and visual field problems, are included in the ROSIER tool.[6] Subsequent systematic reviews and meta-analyses have confirmed its diagnostic accuracy and validated its usefulness in various clinical settings.[7]

The standards were based on FAST and ROSIER scores, which are used worldwide, although national stroke guidelines were not implemented at the time of the study.[3] At the University Hospital Kotelawala Defence University (UHKDU), patients are presented to the outpatient department (OPD) for admission and treatment. Given the enormous volume of patients presenting, a tool to rapidly diagnose stroke and take necessary action is required.

During the study, there was no emergency department in the hospital, and outpatient medical officers were advised to recognise stroke patients with the assistance of the FAST test and ROSIER score and then inform the on-call casualty medical officer. The recommended practice on arrival of the patient was to attend the emergency and, once stabilised, to perform a CT scan of the brain and to initiate management in coordination with the on-call medical team.

This audit aimed to assess improvements in the identification of stroke following the introduction of the FAST test and ROSIER score, with the overarching goal of enhancing early stroke recognition by outpatient doctors and improving the care of stroke patients. Additionally, it sought to evaluate stroke-associated morbidity and analyse the duration from home to hospital arrival to optimise timely interventions.

In this context, conducting an audit is crucial to evaluate the effectiveness of stroke recognition, documentation, and implementation of current protocols, enabling identification of gaps in early detection, diagnosis, and timely interventions, with the intention to enhance patient outcomes and reduce long-term disabilities.

Methods

This clinical audit was conducted on patients presenting with stroke to the OPD and medical wards at UHKDU. The audit followed a standard two-cycle approach. The first cycle of this audit involved gathering retrospective data on every other stroke patient who was diagnosed and discharged from UHKDU's medical wards during the preceding 12 months (May 2019-April 2020) to assess the existing practice.

Following this, a targeted educational intervention was implemented over two weeks by the principal investigator, a physician, for first-contact doctors at the OPD and the medical team. They were trained using two validated tools, the FAST test and the ROSIER score. Using either instrument, doctors were instructed to recognise patients presenting with stroke symptoms and notify the on-call physician or medical officer promptly.

As soon as a stroke was suspected, the conventional approach called for immediate non-contrast CT imaging of the brain as well as baseline tests such as International Normalised Ratio (INR), prothrombin time (PT), and Full Blood Count (FBC). It was advised that antiplatelet therapy should not be initiated before obtaining a CT scan of the brain to determine the nature of the stroke. Additionally,

instructed to avoid any rapid reduction of blood pressure until the type of stroke-whether ischaemic or haemorrhagic-is diagnosed. Thrombolytic treatment was administered to patients who satisfied eligibility requirements in compliance with the National Institutes of Health Stroke Scale Score (NIHSS).

Following the intervention, FAST and ROSIER scores were practised under the direct supervision of the principal investigator for three months, and the second cycle of the audit was commenced. Prospective data collection was conducted over three months (August 2020 – October 2020) following the patient's discharge from the medical ward. Every other patient presenting with suspected stroke was included in the study, who were assessed with FAST and ROSIER tools, as they were introduced as mandatory tools at admission. Recordings based on the above scores and the timely request of investigations by outpatient doctors were audited in addition to the implementation of national stroke guidelines-based treatment.

A structured paper-based data sheet explicitly created for the audit was used to collect data. The same data collection form was utilised in both cycles to ensure consistency in data gathering. Later, the data was entered into an Excel sheet and analysed using IBM SPSS Statistics 26.0. Data on the second cycle were collected only after gaining informed written consent from the patients. Demographic information, including age, sex, etc., comorbidities, presenting symptoms, signs, time to arrival at the OPD, time to CT scan, and patient outcomes, was among the data gathered. Patient confidentiality was strictly maintained. Data were collected by two pre-intern doctors (co-investigators), who were trained and supervised by the principal investigator, a physician in internal medicine. Approval was obtained from the institutional administration and the Ethics Review Committee, General Sir John Kotelawala Defence University (RP/2020/5). Descriptive statistics were used to analyse and present the continuous and categorical data. Due to the skewed distribution of the data, the median was reported as a more appropriate measure of central tendency than the mean.

Results

A total of 39 patients were included in the audit, with 28 patients in the pre-intervention group (first cycle) and 11 in the post-intervention group (second cycle). The majority were males in the first cycle, comprising 71.4% (n=20) and 45.5% (n=5) in the second cycle. The mean age was 67 (IQR 9) and 77.5 (IQR 14) years in the first and second cycles, respectively.

The majority of patients in both cycles had diabetes mellitus and hypertension; hypertension was present in 60.7% and 72.7% of patients in the first and second cycles, respectively. Whereas, 64.3% and 45.5% of patients in the first and second cycles had diabetes mellitus.

There was a significant improvement in key time intervals following the intervention. The time taken for CT brain imaging on arrival (door-to-CT time) showed considerable improvement, decreasing from a median of 75 minutes (IQR 123) in the first cycle to 52.5 minutes (IQR 58) in the second cycle. The median time from stroke onset to hospital presentation (stroke onset-to-door time) reduced from 24 hours (IQR 18) to 7 hours (IQR 48) in the first and second cycles, respectively, indicating early identification of stroke among patients (Figure 1).

Following the intervention, the diagnosis and documentation of stroke by first-contact OPD doctors showed an improvement. In the first cycle, only 21(75%) patient records contained a formal diagnosis of stroke, whereas

Table. Distribution of comorbidities among stroke patients in the two audit cycles

Comorbidity	*Number and % of patients*	
	First cycle (n=28)	*Second cycle (n=11)*
Hypertension	17 (60.7%)	8 (72.7%)
Diabetes mellitus	18 (64.3%)	5 (45.4%)
Ischaemic heart disease	3 (10.7%)	2 (18.1%)
Dyslipidaemia	3 (10.7%)	3 (27.2%)

this rose to 100% in the second cycle. Stroke onset time was recorded in 100% of patients in the second cycle, compared to 18 (64%) patients in the first cycle. In the first cycle, the disability was identified in all 28 patients, but specified only in 23 (82.1%) of them. In the second cycle, disability was identified and specified in all patients according to the FAST and ROSIER score tools. Notification of the on-call medical officer of the stroke patient also improved. In the first cycle, only 21(75%) cases had documented that the on-call doctor was informed, but following the training, the number rose to 100%, ensuring escalation of care. Documentation of stroke treatment initiation showed notable improvement following intervention. In the first cycle, 20 (71.4%) patients had documented evidence that treatment was initiated, whereas all patients (100%) had documented evidence in the second cycle. Three (10.7%) patients and four (14.2%) patients were given aspirin and antihypertensives, respectively, at the OPD before undergoing a CT scan in the first cycle. Following the intervention, none received these medications in the second cycle before performing the CT (Figure 2).

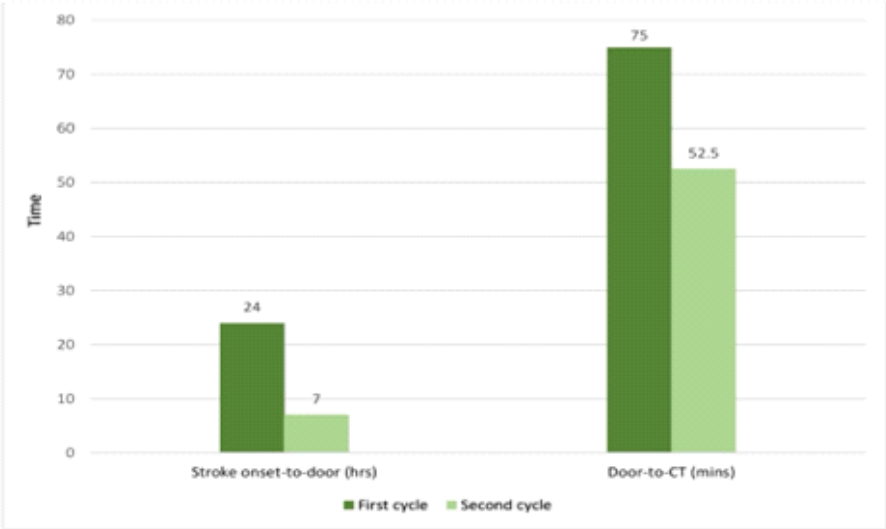

Figure 1. Comparison of stroke onset-to-door time and door-to-CT time in the first and second cycles.

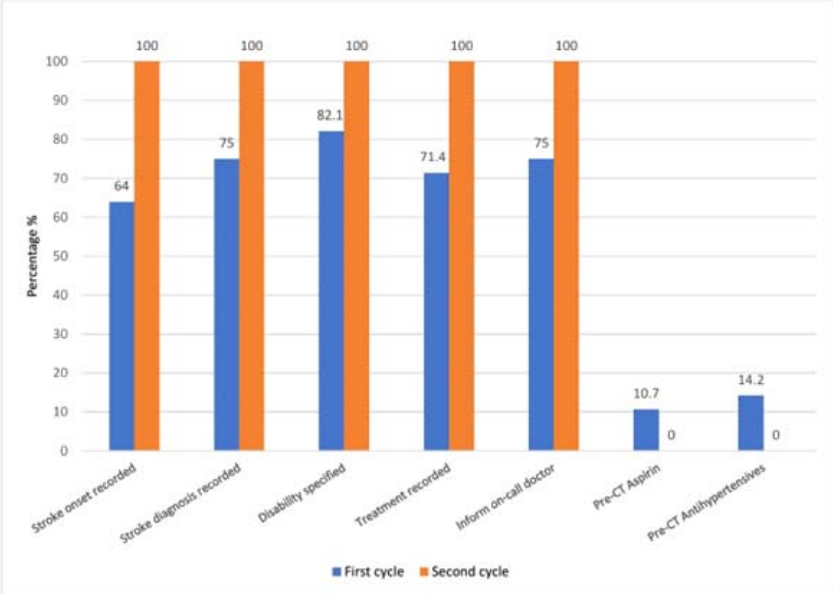

Figure 2. Comparison of key stroke audit indicators in the two cycles, pre- and post-intervention.

Discussion

Enhancing recognition of stroke patients and documentation of stroke symptoms were some of the primary objectives of this audit. Due to the ease of use and adequate sensitivity, the FAST test, which assesses speech disturbance, arm weakness, and face droop, is often recommended.[4] FAST alone, however, might not be able to identify strokes with unusual presentations, particularly those involving the posterior circulation.[5] Therefore, the ROSIER score was added as an additional tool. It has been verified with good sensitivity and specificity in emergency situations and incorporates extra symptoms such as loss of consciousness and visual field impairments.[6,7]

Our audit results demonstrated an improved use of these validated tools, the FAST test and the ROSIER score by first-contact doctors at the OPD, as evidenced by increased documentation of comprehensive symptoms (e.g., face, arm, leg, speech, and visual), identification of specific disabilities (100% compared to 82.1%) and the diagnosis of stroke (100% compared to 75%), after the intervention.

In addition, the second cycle had more consistent documentation, such as the onset time of stroke (100% compared to 64%), and on-call doctor notification (100% compared to 75%). Specifically, the documentation of treatment increased from 71.4% to 100%. These findings are consistent with other studies demonstrating that audit-based interventions can effectively improve clinical documentation and adherence to guidelines.[8]

The results demonstrated significant overall improvements in stroke care following the structured intervention. Specifically, we observed significant improvements in several key performance indicators, such as documentation of stroke onset and specified disability, and shorter time taken for diagnosis, clinical decision-making, and therapeutic interventions. This implied that the doctors became more meticulous in their care for stroke patients following the intervention.

It was observed that the time taken for ordering CT imaging dropped significantly from 75 to 52.5 minutes, and all patients were kept informed of the on-call medical team. The time for initiating treatment and the documentation also showed a noteworthy improvement.

Post-intervention data demonstrated a significant positive impact of ongoing stroke care, compared to the results of pre-intervention outcomes. However, due to the small sample sizes in the two audit cycles, these differences did not reach statistical significance but may still be considered substantial and meaningful to interpret the improved standards of quality care.

To lower mortality and disability from acute ischaemic stroke, prior research has repeatedly emphasised the importance of early detection and prompt treatment.[9,10] Further, it's also shown that any delays in CT imaging affect outcomes and decrease eligibility for thrombolysis.[11] The shorter time taken for CT imaging following the intervention is another indication of improved workflow effectiveness.

The decrease in the outpatient department's pre-imaging administration of drugs, such as aspirin and antihypertensives, was another significant improvement noted. This change has therapeutic significance since it can be detrimental to administer antiplatelets or blood pressure-lowering medications too soon before imaging confirms the type of stroke, particularly in patients who have haemorrahgic strokes, for which such treatment is contraindicated.[12,13] Improved compliance with national and international stroke management guidelines, which recommend neuroimaging as the initial evaluation step before initiating pharmacological therapy, is reflected in the post-intervention group's total cessation of use of pre-imaging aspirin and antihypertensives.[13,14] This improvement is most likely a result of the OPD doctors' increased awareness of stroke care guidelines following the training intervention.

These improvements in stroke care align with international best practices and findings from high- and low-income nations that have implemented audit-based improvements or stroke coding procedures.[15]

Patients in both groups had significant rates of concomitant conditions like diabetes, hypertension, and ischemic heart disease, which is in line with South Asian stroke risk profiles.[16] This highlights even more the importance of integrating stroke care pathways with the management of non-communicable diseases (NCDs).

The long stroke onset-to-door times recorded in both cycles underscore a persistent deficiency in public awareness and lack of emergency medical transport services, a problem identified in South Asian stroke treatment systems.[17] This audit identified systemic deficiencies in pre-hospital care, despite improvements in hospital-based procedures following the intervention. Thus, public awareness campaigns, expedited referrals, and pre-hospital protocols are recommended and integrated into future quality improvement initiatives.

Conclusion

This audit demonstrated that the implementation of validated stroke recognition tools-FAST and ROSIER-combined with targeted stroke-care training initiatives, led to significant improvements in the timelines of stroke detection, CT imaging, stroke diagnosis, medical team referrals, and therapeutic interventions. These findings underscore the value of structured quality improvement strategies guided by standardised clinical protocols, particularly in resource-constrained healthcare environments such as Sri Lanka. However, given the specific context and relatively short duration of the audit, the generalisability of these results may be limited.

Limitations

To minimise selection bias, every other patient was included rather than all eligible patients. The study's key limitation was its small sample size resulting from the sampling method, particularly during the second cycle of data collection, which was limited to a period of three months. This abbreviated period constrained the number of participants enrolled, thereby diminishing the statistical power of the study. As a result, it is possible that meaningful trends or associations failed to reach statistical significance, not due to a true absence of effect, but rather due to insufficient data volume. However, it is important to note that this evaluation constitutes an audit rather than a large-scale research study. Within the context and intent of an audit, these observations are still valuable and should be interpreted accordingly.

The lack of an electronic medical record system hindered data management, as manual recordkeeping was time-consuming and prone to errors, potentially leading to incomplete documentation and misclassification of stroke diagnoses. These challenges underscore the need for an enhanced health information infrastructure to improve the accuracy and reliability of clinical research in similar settings.

Recommendations

Further research involving larger and more diverse patient populations, extended over longer time frames, is recommended to validate and expand upon these outcomes. Further, it's recommended to conduct ongoing audits to ensure adherence to guidelines and drive quality improvement.

Public education programmes that urge people to seek care immediately at the first signs of a stroke should be reinforced to address the issue of recurring delays in hospital presentation.

Authors' Contributions

MMPTJ: corresponding author and principal investigator, developed the audit concept and was involved in supervising data collection, verifying data accuracy, funding, and preparing the final manuscript.

EJCE and PF: involved in data collection

EMDTE: statistical analysis.

VTK: contributed to manuscript writing.

All authors read and approved the final manuscript.

REFERENCES

1. Ministry of Health Sri Lanka. Clinical practice guidelines: Management of stroke. Colombo: Ministry of Health, Sri Lanka; 2018.
2. A stroke global response is needed. *Bulletin of the World Health Organization* 16; **94**: 634-634A. doi: http://dx.doi.org/10.2471/BLT.16.181636
3. Ministry of Health Sri Lanka. National Guidelines for Management of Stroke. Colombo: Ministry of Health; 2024. Available from: https://www.health.gov.lk
4. Harbison J, Hossain O, Jenkinson D, et al. Diagnostic accuracy of stroke referrals from primary care, emergency room physicians, and ambulance staff using the Face Arm Speech Test. *Stroke*. 2003; **34**(1): 71-6.
5. Aroor S, Singh R, Goldstein LB. BE-FAST (Balance, Eyes, Face, Arm, Speech, Time): A modified version of FAST to identify stroke in the prehospital setting. *Ann Neurosci.* 2017; **24**(3): 160-63.
6. Nor AM, Davis J, Sen B, et al. The Recognition of Stroke in the Emergency Room (ROSIER) scale: development and validation of a stroke recognition instrument. *Lancet Neurol.* 2005; **4**(11): 727-734.
7. Sadeghi-Hokmabadi E, Amini A, Javanmard A, et al. Diagnostic accuracy of the ROSIER scale in the identification of stroke: A systematic review and meta-analysis. *BMC Neurol.* 2020; **20**(1): 374.
8. Ivers N, Jamtvedt G, Flottorp S, et al. Audit and feedback: Effects on professional practice and healthcare outcomes. *Cochrane Database Syst Rev.* 2012; (6): CD000259.
9. Powers WJ, Rabinstein AA, Ackerson T, et al. Guidelines for the early management of patients with acute ischemic stroke. *Stroke.* 2019; **50**(12): e344-e418.
10. Campbell BCV, De Silva DA, Macleod MR, et al. Ischaemic stroke. *Nat Rev Dis Primers.* 2019; **5**(1): 70.
11. Saver JL. Time is brain – quantified. *Stroke.* 2006; **37**(1): 263-66.
12. Sandercock PAG, Counsell C, Gubitz GJ. Antiplatelet therapy for acute ischaemic stroke. *Cochrane Database Syst Rev.* 2014; (3):CD000029.

13. Qureshi AI, Ezzeddine MA, Nasar A, et al. Prehospital aspirin use and hemorrhagic transformation after ischemic stroke: Effect on clinical outcomes. *J Neurosurg.* 2006; **105**(5): 736-40.

14. Bath PM, Woodhouse L, Scutt P, et al. Blood pressure reduction in acute stroke: Controversies, evidence, and ongoing trials. *Lancet Neurol.* 2015; **14**(7): 701-14.

15. Meretoja A, Weir L, Ugalde M, et al. Reducing in-hospital delay to 20 minutes in stroke thrombolysis. *Neurology.* 2012; **79**(4): 306-13.

16. De Silva HA, Gunatilake SB, Wimalaratna H. Stroke services in Sri Lanka: The need for a national policy. *Ceylon Med J.* 2009; **54**(3): 84-6.

17. Pandian JD, Sudhan P. Stroke epidemiology and stroke care services in India. *J Stroke.* 2013; **15**(3): 128-34.