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ORIGINAL RESEARCH

Screening Performance of Stroke Scale for Mid-Level Personnel (SML) in Detecting Acute Stroke with Large Vessel Occlusion: A Cross-sectional Study

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Abstract: **Introduction:** The stroke scale for the mid-level personnel (SML) was designed for emergency medical services personnel to predict acute ischemic stroke due to large vessel occlusion (LVO) in both prehospital and in-hospital settings. This study aimed to validate and determine the appropriate cut point of the SML score in this regard. **Methods:** This single-centered, prospective validation study to assess a novel LVO triage tool was performed in a tertiary care hospital in Bangkok. Patients presenting within 24 hours of onset of acute stroke were included in the study. The scale is designed for mid-level providers and emergency medical services (EMS) personnel including paramedics, emergency medical technicians (EMTs) and emergency department (ED) nurses. LVO was confirmed by brain and neck computed tomography angiography (CTA). Area under the receiver operating characteristic (ROC) curve, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), likelihood ratios (LRs), and correctly classified instances (CCI) were calculated. Youden's index was used to determine an appropriate cut point of the SML score for LVO prediction. **Results:** 200 cases with the median age of 64.0 (56.5-73.0) years were included (53.5% female). 83 (41.5%) cases were affiliated to the LVO and 117 (58.5%) to the non-LVO group. The median SML scores for non-LVO and LVO stroke patients were 3 (2 - 3) and 6 (5 - 7), respectively ($p < 0.001$). The most common presentations in both groups were facial palsy, arm weakness and speech impairment or dysarthria. There was significantly higher prevalence of neglect (8 (6.8%) vs. 5 (4.3%); $p < 0.001$) and eye deviation (39 (47%) vs. 29 (35%); $p < 0.001$) in the LVO stroke group than in the non-LVO group. LVO patients scored higher in all categories when compared to non-LVO cases. SML scores of 4 and 5 had the highest Youden's index of 0.82 and 0.67, respectively. SML score of 4 yielded the highest correctly classified instances (CCI) of 90% with sensitivity and specificity of 96.4% (95% confidence interval (CI): 89.9-99.3%) and 85.3% (95% CI: 77.6-91.2), respectively. SML score of 4 also achieved the lowest negative LR of 0.04 and an odds ratio of 157 (95% CI: 46.7-521). The AUC of SML in cutoff point of 4 was 0.901 (95%CI: 0.853 - 0.949). **Conclusions:** SML score may be helpful for mid-level medical providers and also EMS personnel in detecting LVOs since prehospital phase. According to the results, we recommend a cut point SML score ≥ 4 for enhanced sensitivity and NPV.

Keywords: Stroke; Cerebral infarction; Ischemic stroke; Emergency medical services; Emergency medicine

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1. Introduction

Acute ischemic stroke, a common emergency condition in Thailand, accounts for a high morbidity and mortality rate. As the leading cause of death, ischemic stroke caused 96.7 deaths in every 100.000 Thai people in 2021 (1). Moreover, acute ischemic stroke also accounts for the highest disability-adjusted life year in Thailand (2). Hence, early treatment, which includes timely recanalization of the occluded arteries to save the surrounding penumbra area from permanent damage is crucial to reduce disease burden (3). First-line treatment is intravenous thrombolytic agent; however, patients with large vessel occlusion (LVO) tend to have better outcomes with endovascular reperfusion therapy (4). There are several definitions of LVOs, but for this paper we will be defining LVOs as occlusion of the internal carotid artery, M1 segment of middle cerebral artery, and basilar artery, which accounts for 25-40% of acute ischemic stroke cases (5, 6).

Since early reperfusion is crucial in improving treatment prognosis, timely diagnosis of stroke is imperative. Due to the limited number of hospitals in Bangkok that provide endovascular reperfusion therapy for LVO patients, prehospital screening of LVO can potentially enhance triage of patients to appropriate hospitals that are capable of providing computed tomography angiography (CTA) and endovas-

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cular treatment. Therefore, an effective pre-hospital LVO prediction tool may lead to timely management without delays and improved outcomes.

Screening questionnaires for LVO prediction that have been used in other countries include Rapid Arterial Occlusion Evaluation (RACE) and Field Assessment Stroke Triage for Emergency Destination (FAST-ED) (7, 8). In this study, we introduce a novel LVO prediction tool for use in the Department of Emergency Medicine in King Chulalongkorn Memorial Hospital (EMKCMH). The LVO triage tool, also known as the stroke scale for the mid-level personnel (SML), is a Thai questionnaire that evaluates 5 clinical predictors of LVO with similarities to the RACE and FAST-ED. The SML is concise and easy to use, making it suitable for medical personnel of all levels to identify LVO since prehospital setting, which will enhance rapid triage and appropriate transfer to designated hospitals. This study aimed to assess the accuracy of SML as a screening tool and to determine an appropriate cut-off point for LVO prediction in patients suspected of acute stroke.

2. Methods

2.1. Study design and setting

The design was a prospective cross-sectional study for validation of the SML score. The screening performance characteristics of SML score in detecting the LVO in adult patients suspected to acute stroke was evaluated, considering the results of brain and neck CTA scan as the gold standard. Data was collected from January 11th, 2020 until October 28th, 2021.

Informed consent was obtained after explaining about the risks and benefits of the study to the patient and relatives. After the patient and relatives unanimously agreed to participate in the study, EMKCMH personnel evaluated the patient's SML score without delaying diagnosis or treatment. The study received a grant from the Institutional Review Board of Chulalongkorn University under Application No. 801/62.

2.2. Participants

Patients aged 18 years and older with clinical symptoms suggestive of acute stroke within 24 hours, including facial palsy, hemiplegia, hemiparesis, dysarthria, and aphasia were included. Patients who presented with stroke after more than 24 hours, seizures, vertigo or ataxia, blood glucose level less than 60 mg/dl, had incomplete medical record or no brain and neck CTA scans were excluded from the study. Patients were recruited into this study by paramedics who were informed of the inclusion criteria, without having to wait for physicians to evaluate.

2.3. Data gathering

The patient's SML score was quickly assessed by first responders such as paramedics, emergency department (ED) nurses, emergency medical technicians (EMTs), and emergency physicians (EPs) who have been trained to use the SML scale by the researchers. The questionnaire was filled out by both prehospital and in-hospital medical personnel on patients in the EMKCMH, including those who walked in by themselves and also patients who were transported by emergency medical service (EMS). The gold standard for LVO diagnosis was the official report of the brain and neck CTA scan, which was assessed by a radiologist who was blinded to the SML score.

As shown in table 1, the SML scale evaluates 5 items including facial palsy, arm weakness, speech disturbances such as dysarthria and aphasia, eye deviation, and hemineglect. Each category is scored from 0 to 2 based on the presence and severity with a total score of 10. Gaze deviation and neglect will only be evaluated in cases with left hemiparesis or hemiplegia. Cases in which gaze deviation and neglect were not evaluated were given scores of 0 in those 2 categories. SML differs from RACE in that SML only assesses the patient's arm weakness, which is more practical in real-life scenarios and also reduces evaluation time as the ambulance is a confined space making it more challenging to assess leg motor function (7). Moreover, a previous study has shown that evaluating only arm motor power instead of both upper and lower extremities is still effective for LVO prediction (9).

SML is different from FAST-ED as SML only requires evaluation of eye deviation and hemineglect in patients with non-dominant side weakness (8). Patients with weakness of their dominant side will only be scored on 3 items: facial palsy, arm weakness, and speech abnormalities, which are believed to be adequate for LVO prediction. Dhanadol Rojanasarntikul and Sivapan Pechudom were responsible for data collection.

2.4. Statistical analysis

The sample size of at least 205 participants was calculated based on sensitivity value of 0.8, marginal error of 0.1, prevalence of LVO as approximately 30%, and a p-value < 0.05. Statistical tests were done using SPSS for windows version 25.0. The raw data was analyzed using descriptive statistics. Participants were separated into two groups, non-LVO and LVO, after definite diagnosis with brain CT scan and brain and neck CTA scan. The LVO group consisted only of confirmed LVO ischemic stroke patients, whereas the non-LVO group included hemorrhagic and ischemic stroke along with stroke mimic patients. The screening performance characteristics of SML (sensitivity, specificity, positive and negative likelihood ratio (LR), area under the receiver operating characteristic (ROC) curve) for each SML score was calculated and reported with 95% confidence interval (CI). The appropriate cut-off of SML score for LVO prediction was calculated using Youden's index.

3. Results

3.1. Baseline characteristics of studied patients

200 cases with the median age of 64 (56.5-73.0) years were included (53.5% female). 169 (84.5%) cases had ischemic stroke, 23 (11.5%) were stroke mimics, and only 8 cases (4%) had hemorrhagic stroke, which were all confirmed by brain CT scan and brain and neck CTA scan. The most common underlying disease was hypertension reported in approximately half of the participants (56.9%). The majority of stroke cases (53.5%) were assessed by ED nurses followed by paramedics (44.5%) and doctors (2.0%). 83 (41.5%) cases were affiliated to the LVO and 117 (58.5%) to the non-LVO group.

The non-LVO group comprised of 86 (73.5%) ischemic stroke cases, 23 (19.7%) stroke mimic cases, and 8 (6.8%) hemorrhagic stroke cases. Tables 2 and 3 compare the baseline characteristics as well as outcomes between cases with and without LVO. There were no significant differences between groups regarding sex ($p = 0.09$), age ($p = 0.19$), and underlying disease ($P > 0.05$). Out of the 15 people with atrial fibrillation (AF), 10 of them had LVO ($p = 0.04$). A total of 37 cases received thrombectomy, in which 8 and 29 patients were diagnosed as non-LVO and LVO stroke, respectively. Meanwhile, 81 patients received recombinant tissue plasminogen activator (rtPA), which comprised of 42 non-LVO and 39 LVO patients. Of the 143 admissions, 89 and 54 admitted patients were in the non-LVO and LVO group, respectively.

All 4 patients discharged from the ED were diagnosed as non-LVO, which also included stroke mimic conditions. Prior to admission or intervention, there were 11 patients with moderate to severe National Institutes of Health Stroke Scale (NIHSS) score and 4 patients with severe NIHSS group, both of which decreased to 0 after admission or intervention. After admission or intervention, the number of patients with NIHSS score of 0 increases from 163 to 188. Likewise, the majority of patients had a modified Rankin Scale (mRS) of 0 after admission or intervention.

3.2. Screening performance of SML score

As shown in table 4, the median SML scores for non-LVO and LVO stroke patients were 3 (2 - 3) and 6 (5 - 7), respectively ($p < 0.001$). The most common presentations in both groups were facial palsy, arm weakness and speech impairment or dysarthria. There was significantly higher prevalence of neglect (8 (6.8%) vs. 5 (4.3%); $p < 0.001$) and eye deviation (39 (47%) vs. 29 (35%); $p < 0.001$) in the LVO stroke group than in the non-LVO group. LVO patients scored higher in all categories when compared to non-LVO cases.

Table 5 shows the screening performance characteristics of SML score in different cut-off points. SML scores of 4 and 5 had the highest Youden's index of 0.82 and 0.67, respectively. Moreover, an SML score of 4 yielded the highest correctly classified instances (CCI) of 90% (95% CI: 85.0-93.8%) with sensitivity and specificity of 96.4% (95% CI: 89.9-99.3%) and 85.3% (95% CI: 77.6-91.2%), respectively. SML score of 4 also achieved the lowest negative LR of 0.04 (95% CI: 0.01-0.13) and an odds ratio of 157. In comparison, SML score 5 has higher specificity but lower sensitivity, CCI, and positive LR of 87.1% (95% CI: 79.6-92.6%), 79.8% (95% CI: 69.6-87.7%), 84% (95% CI: 78.2-88.8%), and 6.17 (95% CI: 3.8-10), respectively. An SML score of 8 produced the highest positive LR of 8.29 (95% CI: 2.52-27.2) but a high negative LR of 0.81 (95% CI: 0.72-0.90).

With an SML score cut-off of 4, the numbers of true positive (TP), false positives (FP), false negatives (FN), and true negative (TN) were 81, 17, 3, and 99 cases, respectively. The AUC of SML in cut-off point of 4 was 0.901 (95% CI: 0.853-0.949; figure 1). Table 5 compares the screening performance characteristics of SML score, FAST-ED, and RACE in predicting the LVO following acute stroke.

4. Discussion

The study determined an SML score cut-off of 4 as the most appropriate cut-off point as it had the highest Youden's index along with the highest CCI of 90.0% and lowest negative LR of 0.04. Moreover, SML score ≥ 4 had high TP and TN with low FN explaining the high sensitivity of 96.4%, which is important for a screening tool. Meanwhile, the number of FP was higher than FN explaining a lower value for the test's specificity at 85.3%. However, since the SML score is a screening tool rather than a diagnostic tool, the lower specificity is acceptable. Similarly, the cut-off point of 4 had high PPV and NPV, which is crucial for an acceptable screening test.

In this study, there were more non-LVO than LVO cases and the most common underlying disease in all groups was hypertension followed by diabetes mellitus. All 83 patients in the LVO group had confirmed diagnosis by brain and neck CTA, whereas the non-LVO group comprised of ischemic, hemorrhagic, and also stroke mimic cases. The most common diagnosis was ischemic stroke in both groups. Most of the SML scores were evaluated by paramedics and nurses with satisfactory performance indicating that the SML score can be used by pre-hospital and mid-level personnel with accuracy. Most of the patients showed clinical improvement after admission or intervention as evidenced by the decrease in NIHSS score. The improvement of NIHSS scores indicates appropriate and timely management of stroke in both groups.

When compared to other LVO prediction tests for prehospital screening such as FAST-ED, and RACE, the SML score had the highest sensitivity, PPV, NPV, and AUC. The optimal cut-off point for FAST-ED was 4, which yielded sensitivity, specificity, PPV, NPV, and AUC of 0.60, 0.89, 0.72, 0.82, and 0.81, respectively (8). As for the RACE study, the ideal cut-off score was 5, which produced sensitivity, specificity, PPV, NPV, and AUC of 0.85, 0.68, 0.42, 0.94, and 0.82, respectively (7).

The SML had the highest Youden's index of 0.82, whereas FAST-ED produced the highest score of 0.49. SML had a higher sensitivity than FAST-ED and RACE, which may be at-

tributed to the different scoring method. The SML tool assigned neglect to a score of either 0 or 2 making it simple to evaluate, unlike FAST-ED that has 0, 1, and 2 points for neglect. However, neglect may also be caused by encephalopathy, visual field loss, sensory defects, and language barriers and is also time-consuming to assess with poor interrater reliability (10). Hence, evaluation of neglect may be not be ideal for pre-hospital LVO prediction tests.

The SML score outperformed FAST-ED and RACE in most areas, but the other two studies recruited more participants than our study. In this study, 84 LVOs were detected from 200 patients, while in the FAST-ED study, 240 LVOs were diagnosed from 727 qualifying patients and in the RACE study, 76 LVOs were detected from 357 patients (7, 8). Unlike this study, the RACE scale was studied in a population where a majority of patients were diagnosed using transcranial Doppler, which is a less sensitive and specific investigation for diagnosis of LVOs compared to the CTA (11). Since the SML score was validated in a study population where almost half of the patients received LVO diagnosis confirmed by CTA brain and neck, the scale may be more applicable for detecting LVO cases among stroke patients.

Similar to FAST-ED, the SML score included 5 clinical predictors of LVO: facial palsy, gaze deviation, arm weakness, neglect, and speech changes (10). The RACE scale evaluated 6 items with an additional category of leg weakness making it slightly longer than the other two tests. Both FAST-ED and RACE only included 1 item with binary scoring. Meanwhile, the SML scale contained 2 items with binary scoring: gaze deviation and neglect with a score of 0 for absent and 2 for present. Binary scoring may reduce assessment time and enhance interrater reliability leading to rapid triage and accurate score. Moreover, a shorter scale may also reduce interference with other necessary prehospital evaluations and management (10).

The highest predictive findings of LVO are gaze deviation and arm weakness, in that order (10). Gaze deviation suggests cortical or brainstem dysfunction with even higher suspicion for LVO when combined with hemiparesis (8, 10). In the SML scale, gaze deviation was evaluated only in cases with left hemiparesis, but recognition of gaze deviation instantly warrants 2 points, which increases sensitivity for LVO detection. Similarly, FAST-ED also assigned up to 2 points for gaze deviation, whereas RACE scale only appointed 1 point. Moreover, aphasia is also a strong discriminator of LVO; therefore, 2 points were given for expressive aphasia or severe dysarthria and 1 point for any other speech disturbances (8). FAST-ED provided a more detailed scoring for the speech category with points for both fluency and comprehension, whereas RACE only assesses for receptive aphasia. Furthermore, RACE only evaluated aphasia in cases with right hemiparesis and agnosia in cases with left hemiparesis, which does not take into account that some patients may have right hemisphere dominance (8). The RACE score stresses importance on motor function as a maximum of 6 out of 9 points are given to arm and leg weakness and facial palsy with a cut-off score of 5 for prediction of LVO. However, motor function can also be caused by subcortical and lacunar infarction, so it may not be a strong discriminator of LVO (8).

In this study, we validated a novel LVO screening tool for pre-hospital and in-hospital triage with high sensitivity and specificity that can also be used by mid-level health personnel. The SML score is concise and simple enough for a pre-hospital provider or mid-level personnel to interpret, which are features of an ideal LVO prediction tool. Moreover, we also determined that the cut-off of 4 was the most appropriate for SML score in LVO detection with high discrimination capabilities. With high sensitivity, specificity, and predictive values, the SML score outperformed other scales such as RACE and FAST-ED. Thus, the SML scale can be a helpful tool in assisting rapid triage of LVO patients to stroke centers that can offer proper investigation and endovascular treatment without unnecessary delays. Future work includes evaluation of interrater reliability and assessment time. Furthermore, large, multi-centered studies should be performed to obtain results with more clinical and statistical significance.

5. Limitations

To the best of our knowledge, this study is one of the first LVO prediction tools created in Thailand, so there is limited data on the Thai population and the Thai EMS system to compare our findings with. However, our relatively small sample size may affect the reliability of our results. Another limitation was selection bias as some patients were referred from other hospitals for CTA due to clinical suspicion of LVO, while some patients were already diagnosed with LVO by CTA and then referred to KCMH for endovascular thrombectomy. Since KCMH is a teaching university hospital that provides tertiary care, cases presented or referred to KCMH typically have more critical clinical manifestations than those presenting to a general hospital, which may increase the prevalence of LVO strokes in this study.

Another limitation was that SML scale only evaluated gaze deviation and neglect in patients with left hemiparesis based on the assumption that all patients have right hemisphere dominance, which is not always the case. Since gaze deviation is highly predictive of LVO, only assessing gaze deviation in patients with left hemiparesis may lead to under-triage of LVOs. Moreover, SML did not assess receptive aphasia, which may lead to faulty prediction of LVOs as it is also a sign of LVO. Furthermore, SML scoring involved subjective evaluation of the severity of the patient's disability. Another limitation was the use of this scale on patients who present with ataxia or vertigo as patients with these symptoms were excluded from the study.

6. Conclusions

It seems that, SML score may be helpful for mid-level medical providers and also EMS personnel in detecting LVOs since

prehospital phase. According to the results, we recommend an SML score cut-point ≥ 4 for enhanced sensitivity and NPV.

7. Declarations

7.1. Acknowledgments

None.

7.2. Author contributions

Conceptualization, D.R., A.C.; methodology, D.R., A.C., and S.P.; formal analysis, D.R., N.L.; writing—original draft preparation, N.L.; writing—review and editing, D.R., A.C., N.L., and S.P. All authors have read, approved the final version, and agreed to the published version of the manuscript.

7.3. Funding

The authors did not receive external funding for this research.

7.4. Conflict of Interest

None of the authors declare any potential or actual relationship, activity, or interest related to the content of this article.

7.5. Using Artificial Intelligence Chatbots

The authors declare no use of artificial intelligence chatbots in any part of this study..

7.6. Data availability

Data are available from the corresponding author upon reasonable request.

References

1. World Health Organization. Thailand [Health data overview for the Kingdom of Thailand] 2025 [Available from: https://data.who.int/countries/764.
2. Suwanwela NC. Stroke epidemiology in Thailand. J Stroke. 2014;16(1):1-7.
3. Powers WJ, Rabinstein AA, Ackerson T, Adeoye OM, Bambakidis NC, Becker K, et al. Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. Stroke. 2019;50(12):e344-e418.
4. Smith WS, Lev MH, English JD, Camargo EC, Chou M, Johnston SC, et al. Significance of large vessel intracranial occlusion causing acute ischemic stroke and TIA. Stroke. 2009;40(12):3834-40.
5. Rai AT, Seldon AE, Boo S, Link PS, Domico JR, Tarabishy AR, et al. A population-based incidence of acute large vessel occlusions and thrombectomy eligible patients indicates significant potential for growth of endovascular stroke therapy in the USA. J Neurointerv Surg. 2017;9(8):722-6.
6. Lakomkin N, Dhamoon M, Carroll K, Singh IP, Tuhrim S, Lee J, et al. Prevalence of large vessel occlusion in patients presenting with acute ischemic stroke: a 10-year systematic review of the literature. J Neurointerv Surg. 2019;11(3):241-5.
7. Pérez de la Ossa N, Carrera D, Gorchs M, Querol M, Millán M, Gomis M, et al. Design and validation of a prehospital stroke scale to predict large arterial occlusion: the rapid arterial occlusion evaluation scale. Stroke. 2014;45(1):87-91.
8. Lima FO, Silva GS, Furie KL, Frankel MR, Lev MH, Camargo ÉC, et al. Field Assessment Stroke Triage for Emergency Destination: A Simple and Accurate Prehospital Scale to Detect Large Vessel Occlusion Strokes. Stroke. 2016;47(8):1997-2002.
9. Keenan KJ, Smith WS. The Speech Arm Vision Eyes (SAVE) scale predicts large vessel occlusion stroke as well as more complicated scales. J Neurointerv Surg. 2019;11(7):659-63.
10. Keenan KJ, Kircher C, McMullan JT. Prehospital Prediction of Large Vessel Occlusion in Suspected Stroke Patients. Curr Atheroscler Rep. 2018;20(7):34.
11. Suwanwela NC, Phanthumchinda K, Suwanwela N. Transcranial doppler sonography and CT angiography in patients with atherothrombotic middle cerebral artery stroke. Am J Neuroradiol. 2002;23(8):1352-5.

Table 1: The Stroke scale for the mid-level personnel (SML) for large vessel occlusion (LVO) prediction in pre-hospital and in-hospital triage

Items	Score		
	1	2	3
1. Facial palsy	None	Mild	Moderate to Severe
2. Arm weakness	No weakness	Drift or some movement against gravity	Cannot move against gravity
3. Speech disturbance1	None	Mild to moderate dysarthria	Aphasia or unable to understand spoken words
4. Gaze deviation	None or not evaluated	Partial	Forced deviation
5. Neglect2	None or not evaluated	-	Present

Items 4 and 5 will only be evaluated in patients with left hemiparesis. 1: Speech disturbance includes both dysarthria and aphasia;
2: Neglect is considered present when patient does not recognize own arm.

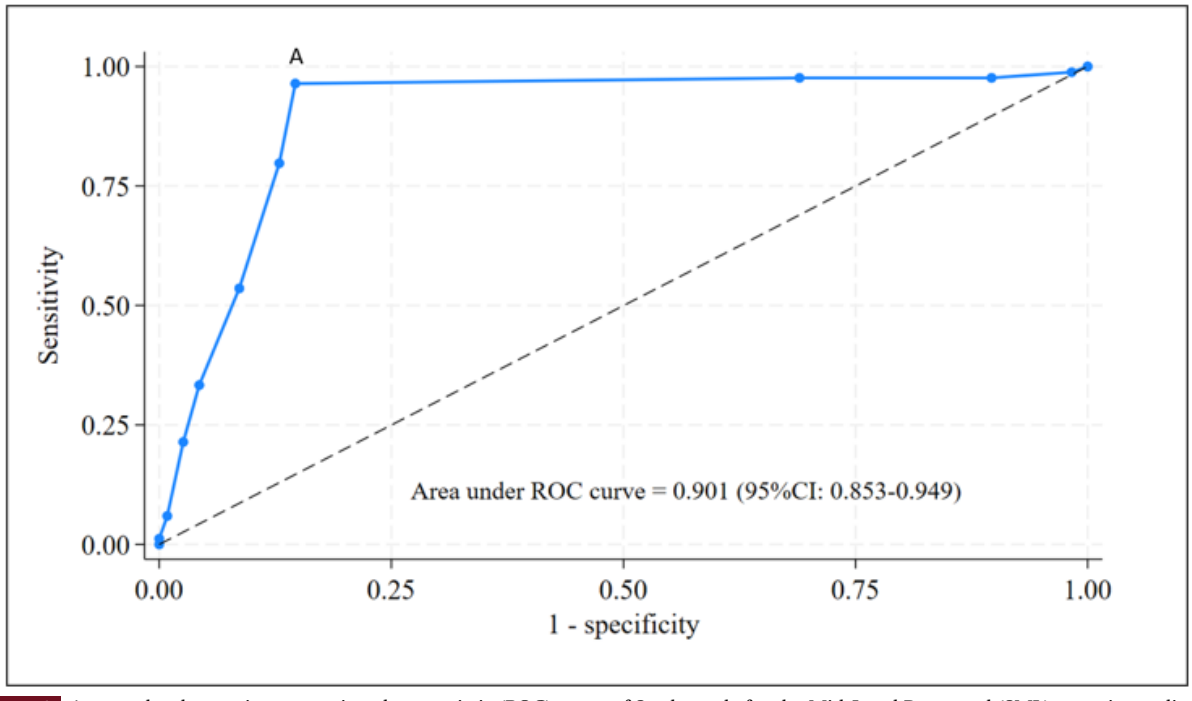

Figure 1: Area under the receiver operating characteristic (ROC) curve of Stroke scale for the Mid-Level Personnel (SML) score in predicting large vessel occlusion (LVO). CI: confidence interval.

Table 2: Comparing the baseline characteristics of studied patients between cases with and without large vessel occlusion (N=200)

Characteristics	Total	Large vessel occlusion		P-value
		No (N=117)	Yes (N=83)	
Sex				
Female	107 (53.5)	69 (59.0)	38 (45.8)	0.09
Male	93 (46.5)	48 (41.0)	45 (54.2)	
Age (years)				
Median (IQR)	64 (56.5-73.0)	62 (55-73)	66.5 (58-72.5)	0.19
POCT glucose (mg/dl)				
Median (IQR)	126 (104.5-149.5)	121.5 (101.5-142.5)	132.5 (110.5-167)	0.01
Type of stroke				
Ischemic	169 (84.5)	86 (73.5)	83 (100.0)	<0.001
Hemorrhagic	8 (4.0)	8 (6.8)	0 (0)	
Stroke Mimic	23 (11.5)	23 (19.7)	0 (0)	
Underlying disease				
Hypertension	111 (56.9)	60 (51.3)	51 (61.4)	0.35
Diabetes mellitus	47 (23.5)	27 (23.1)	20 (24.1)	0.93
Dyslipidemia	35 (17.5)	17 (14.5)	18 (21.7)	0.21
Atrial fibrillation	15 (7.5)	5 (4.3)	10 (12.0)	0.04
History of stroke	25 (12.5)	14 (12.0)	11 (13.2)	0.83
Parkinson's disease	1 (0.5)	1 (0.9)	0 (0)	0.39
IHD	14 (7)	6 (5.1)	8 (9.6)	0.23
Malignancy	5 (2.5)	4 (3.4)	1 (1.2)	0.40
Evaluator				
Paramedic	89 (44.5)	39 (33.3)	50 (60.2)	<0.001
Nurse	107 (53.5)	76 (65.0)	31 (37.3)	
Doctor	4 (2)	2 (1.7)	2 (2.4)	
NIHSS prior to admission or intervention				
No stroke symptoms (0)	163 (81.5)	109 (93.2)	54 (65.1)	<0.001
Minor (1-4)	1 (0.5)	0 (0)	1 (1.2)	
Moderate (5-15)	21 (10.5)	6 (5.1)	15 (18.1)	
Moderate to severe (16-20)	11 (5.5)	1 (0.9)	10 (12.0)	
Severe (21-42)	4 (2)	1 (0.9)	3 (3.6)	

Data are presented as number (%) or median (IQR: Interquartile range); IHD: Ischemic heart disease; POCT: Point-of-Care Testing; NIHSS: National Institutes of Health Stroke Scale.

Table 3: Comparing the outcomes of studied patients between cases with and without large vessel occlusion (N=200)

Outcomes	Total	Large vessel occlusion		P-value
		No (N=117)	Yes (N=83)	
Intervention				
Thrombectomy	37 (18.5)	8 (6.8)	29 (35.0)	<0.001
rtPA	81 (40.5)	42 (35.9)	39 (47.0)	0.15
ED disposition				
Admit	143 (71.5)	89 (74.8)	54 (65.0)	0.075
Refer	53 (26.5)	24 (20.5)	29 (34.9)	0.01
Discharge	4 (2)	4 (3.4)	0 (0)	0.14
NIHSS after admission or intervention				
No stroke symptoms (0)	188 (94)	116 (99.1)	72 (86.7)	0.001
Minor (1-4)	7 (3.5)	1 (0.9)	6 (7.2)	
Moderate (5-15)	5 (2.5)	0 (0)	5 (6.0)	
Moderate to severe (16-20)	0 (0)	0 (0)	0 (0)	
Severe (21-42)	0 (0)	0 (0)	0 (0)	
mRS after admission or intervention				
0	183 (91.5)	113 (96.5)	70 (84.3)	0.002
1	5 (2.5)	1 (0.9)	4 (4.8)	
2	4 (2)	1 (0.9)	3 (3.6)	
3	2 (1)	1 (0.9)	1 (1.2)	
4	2 (1)	0 (0)	2 (2.4)	
5	4 (2)	1 (0.9)	3 (3.6)	

Data are presented as number (%). rtPA: Recombinant Tissue Plasminogen Activator; ED: Emergency Department; NIHSS: National Institutes of Health Stroke Scale; mRS: modified Rankin Scale.

Table 4: Comparing the stroke scale for the mid-level personnel (SML) score of studied patients between cases with and without large vessel occlusion (N=200)

Item	Total	Large vessel occlusion		P-value
		No (N=117)	Yes (N=83)	
Facial palsy				
0	50 (25)	37 (31.6)	13 (15.7)	<0.001
1	123 (61.5)	75 (64.1)	48 (57.8)	
2	27 (13.5)	5 (4.3)	22 (26.5)	
Arm weakness				
0	15 (7.5)	14 (12.0)	1 (1.2)	<0.001
1	108 (54.0)	80 (68.4)	28 (33.7)	
2	77 (38.5)	23 (19.6)	54 (65.1)	
Speech impairment				
0	21 (10.5)	20 (17.1)	1 (1.2)	<0.001
1	109 (54.5)	77 (65.8)	32 (38.6)	
2	70 (35)	20 (17.1)	50 (60.2)	
Eye deviation				
0	166 (83)	112 (95.7)	54 (65.0)	<0.001
1	1 (0.5)	0 (0)	1 (1.2)	
2	33 (16.5)	5 (4.3)	28 (33.8)	
Neglect				
0	153 (76.5)	109 (93.2)	44 (53.0)	<0.001
2	47 (23.5)	8 (6.8)	39 (47.0)	
Total score				
Median (IQR)	3 (3-6)	3 (2-3)	6 (5-7)	<0.001

Data are presented as number (%) or median (IQR: Interquartile range).

Table 5: Screening performance characteristics of Stroke scale for the Mid-Level Personnel (SML) scores in prediction of Large Vessel Occlusion (LVO)

SML score	Cases (n)	LVO (n)	Sensitivity (%)	Specificity (%)	CCI (%)	PLR	NLR
0	3	1	100.0	0	42.0(42.9-57.1)	1.00	-
1	11	1	98.8 (93.5-100)	1.7 (0.2-6.1)	42.5(35.1-49.2)	1.01(0.97-1.04)	0.69(0.06-7.49)
2	24	0	97.6 (91.7-99.7)	10.3 (5.5-17.4)	47.0(40-54.2)	1.09 (1.01-1.17)	0.23 (0.05-1)
3	64	1	97.6 (91.7-99.7)	31.0 (22.8-40.3)	59.0(51.98-65.9)	1.42 (1.25-1.61)	0.08(0.02-1)
4*	16	14	96.4 (89.9-99.3)	85.3 (77.6-91.2)	90.0(85.0-93.8)	6.58(4.23-10.2)	0.04(0.01-0.13)
5	27	21	79.8 (69.6-87.7)	87.1 (79.6-92.6)	84.0(78.2-88.8)	6.17 (3.8-10)	0.23 (0.15-0.36)
6	22	17	53.6 (42.4-64.5)	91.4 (84.7-95.8)	75.5(68.9-81.3)	6.21 (3.33-11.6)	0.51(0.40-0.64)
7	12	10	33.3 (23.4-44.5)	95.7 (90.2-98.6)	69.5(62.6-75.8)	7.73 (3.12-19.2)	0.70 (0.60-0.81)
8	15	13	21.4 (13.2-31.7)	97.4 (92.6-99.5)	65.5(58.5-72.1)	8.29(2.52-27.2)	0.81 (0.72-0.90)
9	5	4	5.9 (1.96-13.3)	99.1 (95.3-100)	60.0(52.8-66.8)	6.90(0.82-58)	0.95 (0.90-1)
10	1	1	1.2 (0.03-6.5)	100.0 (96.9-100)	58.5(51.3-65)	-	0.99 (2.5-100)

All measures are reported with 95% confidence interval (CI). CCI: Correctly Classified Instances (%);
PLR: Positive Likelihood Ratio; NLR: Negative Likelihood Ratio.

Table 6: Comparison of screening performance characteristics of different scores in predicting the large vessel occlusion in patients with acute stroke

Performance	SML ≥ 4	FAST-ED ≥ 4	RACE ≥ 5
Sensitivity	0.96 (0.90-0.99)	0.60	0.85
Specificity	0.85 (0.78-0.91)	0.89	0.68
PPV	0.82 (0.75-0.90)	0.72	0.42
NPV	0.97 (0.94-0.10)	0.82	0.94
AUC	0.90 (0.85- 0.95)	0.81	0.82 (0.77- 0.87)

All measures are reported with 95% confidence interval (CI). SML: Stroke scale for the Mid-Level Personnel; FAST-ED: Field Assessment Stroke Triage for Emergency Destination; RACE: Rapid Arterial Occlusion Evaluation; PPV: Positive Predictive value; NPV: Negative Predictive Value; AUC: area under the receiver operating characteristic curve.