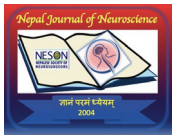
Comparison of Scoring Tools EMSE and STESS for the Prediction of In-Hospital Mortality in Convulsive Status Epilepticus in Adults and the Elderly



Archana Verma[1], Alok Kumar[2], Manoj Kumar Verma[3]

[1]Department of Neurology, All India Institute of Medical Sciences, Munshiganj, Dalmau Road, Raebareli (U.P.) 229405, India.

[2]Department of Forensic Medicine & Toxicology, UP university of Medical Sciences, Saifai, Etawah. -206130 (U.P.) India.

[3]Department of community medicine, UP university of Medical Sciences, Saifai, Etawah. -206130 (U.P.) India.

Date of submission: 31st December 2021 Date of acceptance: 23rd January 2022 Date of publication: 15th March 2022

Abstract

Aim: The aim of this study was to compare the predictive accuracy of the Status Epilepticus Severity Score (STESS) and the Epidemiology-based Mortality Score in Status Epilepticus—etiology, age, and levels of consciousness (EMSE-EAL) score for in-hospital mortality in adults and the elderly with CSE.

Methods: We conducted a hospital-based cross-sectional study. A total of 193 participants with a diagnosis of CSE were enrolled in the study. The means area under the receiver operating characteristic curve (AUC) was compared to distinguish between the score performances.

Results: The average age of the respondents was 46.15 ± 20.25 years; 138 (69.8%) of them were adults, and 55 (30.2%) were elderly. In our study, in-hospital mortality was 30 (15.5%). In adults, on comparison STESS with the cutoff value of ≥3 has an AUC of 0.712 (95 percent CI =0.60–0.83), whereas ESME-EAL with the cutoff value of ≥40 has an AUC of 0.912 (95 percent CI =0.86–0.97), and in the elderly, STESS has an AUC of 0.613 (95 percent CI =0.43–0.80), and ESME-EAL has AUC of 0.848 (95% CI =0.74–0.80).

Conclusions: The EMSE-EAL-40 score is superior to the STESS-3 for predicting in-hospital mortality in both adults and the elderly with CSE. EMSE-EAL can be easily applied in resource-poor sectors with constrained diagnostic facilities.

Key words: Convulsive Status epilepticus; EMSE; in-hospital mortality; STESS

Introduction

Status epilepticus (SE) is a potentially fatal neurological condition, especially if treatment is delayed.[1] The prognosis of SE depends on the etiology and is age-dependent.[2] In adults, common etiologies of SE include central nervous system (CNS) infections, acute stroke, nonadherence to antiepileptic medications (AEDs), hypoxic encephalopathy, and metabolic reasons ,[3-6] while in the elderly; stroke is the most common cause.[7]

It is critical to have clinical techniques to predict mortality risk at SE onset. The Status Epilepticus Severity Score (STESS) was the first score developed for predicting in-hospital mortality in convulsive status epilepticus (CSE), and its applications are simple and may be useful in acute settings; it accurately predicts favorable outcomes but has a lower predictive value for mortality. [8] The EMSE (Epidemiology-based Mortality Score in Status Epilepticus) is a reliable predictor of both good and bad outcomes. [9] It takes into account age, EEG, etiology, and co morbidity. Pacha et al suggested a modified form of EMSE that included age, etiology, and level of consciousness (EMSE-EAL).[10]

Early understanding of the prognosis of a SE episode is critical for developing effective treatment methods. As a result, there is a need for the creation of a reliable instrument for predicting the prognosis of SE in adults and the elderly in order to provide prompt treatment intervention. Hence, the goal of this study was to examine

Access this article online

Website: https://www.nepjol.info/index.php/NJN

DOI: https://doi.org/10.3126/njn.v19i1.41968

HOW TO CITE

Verma A, Kumar A, Verma MK. Comparison of scoring tools EMSE and STESS for the prediction of in-hospital mortality in convulsive status epilepticus in adults and the elderly. NJNS. 2022;19(1):11-5.

Address for correspondence:

Dr. Archana Verma

Professor and Head Department of Neurology, All India Institute of Medical Sciences, Munshiganj, Dalmau Road, Raibareli (U.P.) 229405, India.

Email: archanashiva2010@rediffmail.com

ISSN: 1813-1948 (Print), 1813-1956 (Online)

the predictive accuracy of STESS-3 and EMSE-EAL-40 scores for in-hospital mortality in adults and the elderly with CSE.

Methods

We carried out a prospective, cross-sectional study by consecutively enrolling adult patients with the diagnosis of CSE admitted to the neurology department from December 2016 to February 2019. The study was approved by the Institutional Ethical Review Board.

Convulsive status epilepticus was defined as unremitting or recurrent seizure activity lasting ≥30 minutes without regaining of the preexisting stage of consciousness.[11] Patients with psychogenic CSE, hypoxia-related CSE, and nonconvulsive SE were excluded.

During the study period, a total of 515 patients were admitted for evaluation and management of epilepsy and epileptic seizures, of which 55 elderly and 138 adult patients fulfilled the inclusion criteria and were enrolled for the study. Patients aged 18years to 60 years and more than > 60 years were grouped as adults and elderly, respectively.

Demographic data recorded included the following: age, gender, level of consciousness assessed by the Glasgow Coma Scale (GCS) at the time of admission, seizure type, and history of epilepsy; duration and aetiology of CSE, co-morbidity, complications and duration of hospital stay.

STESS and EMSE scores were calculated at baseline in all the enrolled patients. The STESS includes four parameters: level of consciousness, "worst" seizure type, age, and history of previous seizures. The score ranges from 0 to 6; a score of 3 or more indicates the risk of mortality. As continuous video-EEG monitoring is not available at our center, the modified version of EMSE, including 3 variables, EMSE-EAL, was used. The optimal cutoff points were 3 for STESS and 40 for EMSE-EAL scores for the prediction of in-hospital mortality. In-hospital mortality was the primary outcome parameter of STESS-3 and EMSE-40.

Statistical analysis

IBM SPSS-23, was used for statistical analysis. Continuous data was expressed as mean, standard deviation, median, interquartile range (IQR), and percentage for things like epilepsy duration and hospital stay. With a 95% confidence interval, the odds ratio (OR) was estimated using univariate logistic regression (CI). To analyze the cutoff values, respective sensitivity and specificity of scales, as well as positive and negative predictive values, receiver operating characteristic (ROC) curves were created for both scales against the result. All tests were two-tailed, with p-values of >.05 considered significant.

Results

The present study comprised one hundred and ninety-three patients with CSE, of whom 138 (69.8%) were adults and 55 (30.2%) were elderly. 136 (80%) were males, and the mean age was 46.15 ± 20.25 years (range: 18–90 years). One hundred and one (45.9%) patients had preexisting epilepsy. The median duration of CSE in adults was 5.5 h (IQR: 3–11 h), approximately the same as compared with the elderly, i.e., 5 h (IQR: 2–9 h). CSE was well controlled following the first line drugs in 112/138 (81.1 % of adults) and 47/55 (85.4% of the elderly). Table 1. The demographic and clinical characteristic of patients with CSE.

In-hospital mortality was 30 (15.5%) in our series. The average STESS-3 in survivors was 2.66 ±1.09, in contrast to 3.30± 1.02 in the dead. The average score of ESME-EAL-40 in survivors was 32.02 ±10.6 and 49.37± 8.24 in the dead. The sensitivity and specificity of STESS with a cutoff value of ≥3 were 68.4% and 69.7%, respectively, with an area under the receiver operating characteristic curve (AUC) of 0.712 (95% CI = 0.60–0.83) for adults. However, ESME-EAL with a cutoff value of ≥40 showed sensitivity of 94.7% and specificity of 77.3% with an AUC of 0.912 (95% CI = 0.86–0.97).

In the elderly, the sensitivity and specificity of STESS with the cutoff value of≥ 3 were 54.5% and 65.9%, with an AUC of 0.613 (95% CI = 0.43–0.80). ESME-EAL with a cutoff value of ≥40 showed sensitivity of 100% and specificity of 68.2% with an AUC of 0.848 (95% CI = 0.74–0.80). The ROC curves for the prediction of in-hospital mortality for EMSE-40 are depicted in Fig. 1,2.

Demographic		Adults (18–60 years) N=138	Elderly (>60 years) N=55	Unadjusted OR (95% CI)	p value
Gender	Male	96 (70.6)	40 (29.4)	0.85 (0.43-1.72)	0.729
	Female	42 (73.7)	15 (26.3)		
Religion	Hindu	130 (70.7)	54 (29.3)	0.30(0.04-2.47)	0 .45
	Muslim	8 (88.9)	1 (11.1)		

Etiology	Established epilepsy	27 (90.0)	3 (10.0)		0.002
	Acute symptomatic	52 (73.2)	19 (26.8)		
	Remote symptomatic	53 (67.9)	25 (32.1)		
	Cryptogenic	6 (42.9)	8 (57.1)		
CSE type	Generalized convulsive SE	56 (75.7)	18 (24.3)	1.4(0.73-2.71)	0.33
	Focal onset evolving into bilateral convulsive SE	82 (68.9)	37 (31.1)		
History of epilepsy	Yes	77 (76.2)	24 (23.8)	1.63 (.87 — 3.06)	0.151
	No	61 (66.3)	31 (33.7)		
Duration of CSE in hours	<12	111 (70.7)	46 (29.3)	0.80 (0.35 1.84)	0.686
	>12	27 (75.0)	9 (25.0)		
Response to 1st line of treatment	Non responder	26 (76.5)	8 (23.5)	0.73 (0.30 1.73)	0.537
	Responder	112 (70.4)	47 (29.6)		
GCS	<8	69 (66.3)	35 (33.7)	0.57 (0.30 1.08)	0.11
	>8	69 (77.5)	20 (22.5)		
STESS	<3	138 (90.8)	14 (9.2)	0.092 (0.06 — 0.15)	<0.001
	≥ 3	0 (0.0)	41 (100.0)		
EMSE	<40	93 (70.5)	39 (29.5)	0.85 (0.42 — 1.67)	0.384
	≥ 40	45 (73.8)	16 (26.2)		

Table 1: The demographic and clinical characteristic of patients with CSE

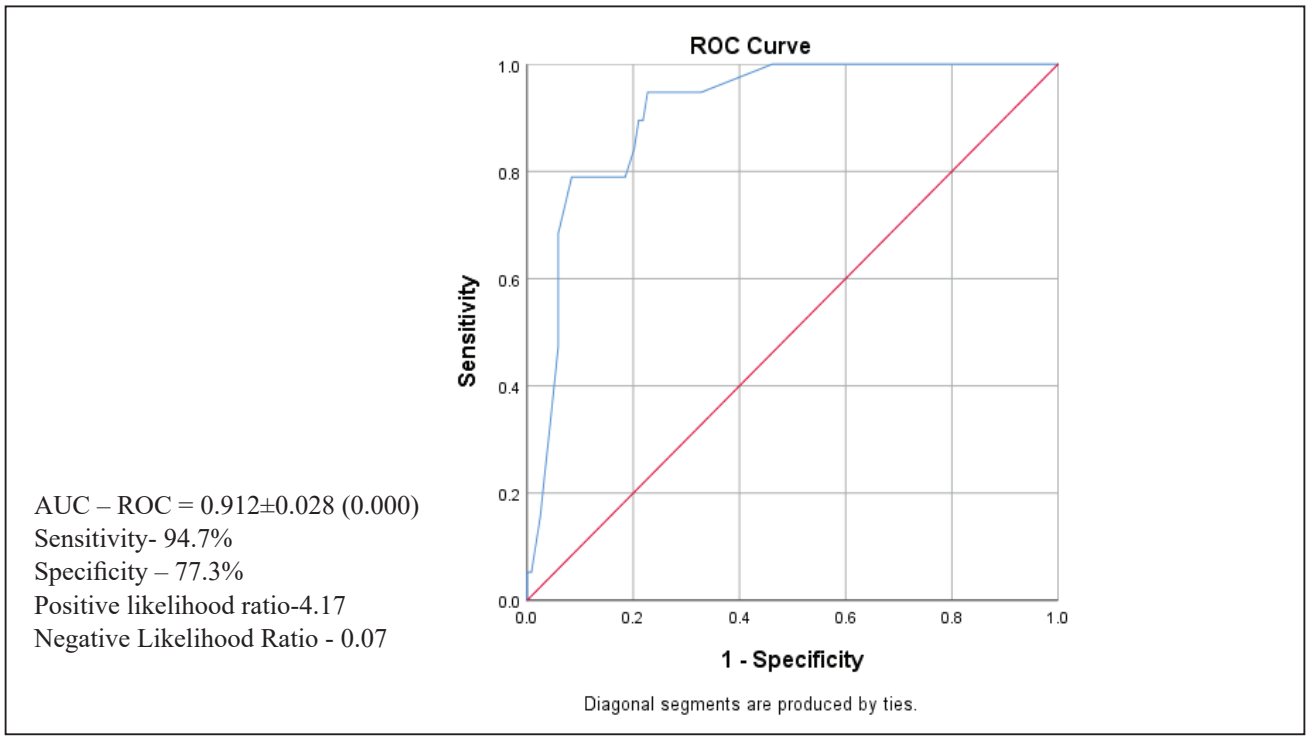


Figure 1: The ROC curves for the prediction of in-hospital mortality for EMSE-40 in adults

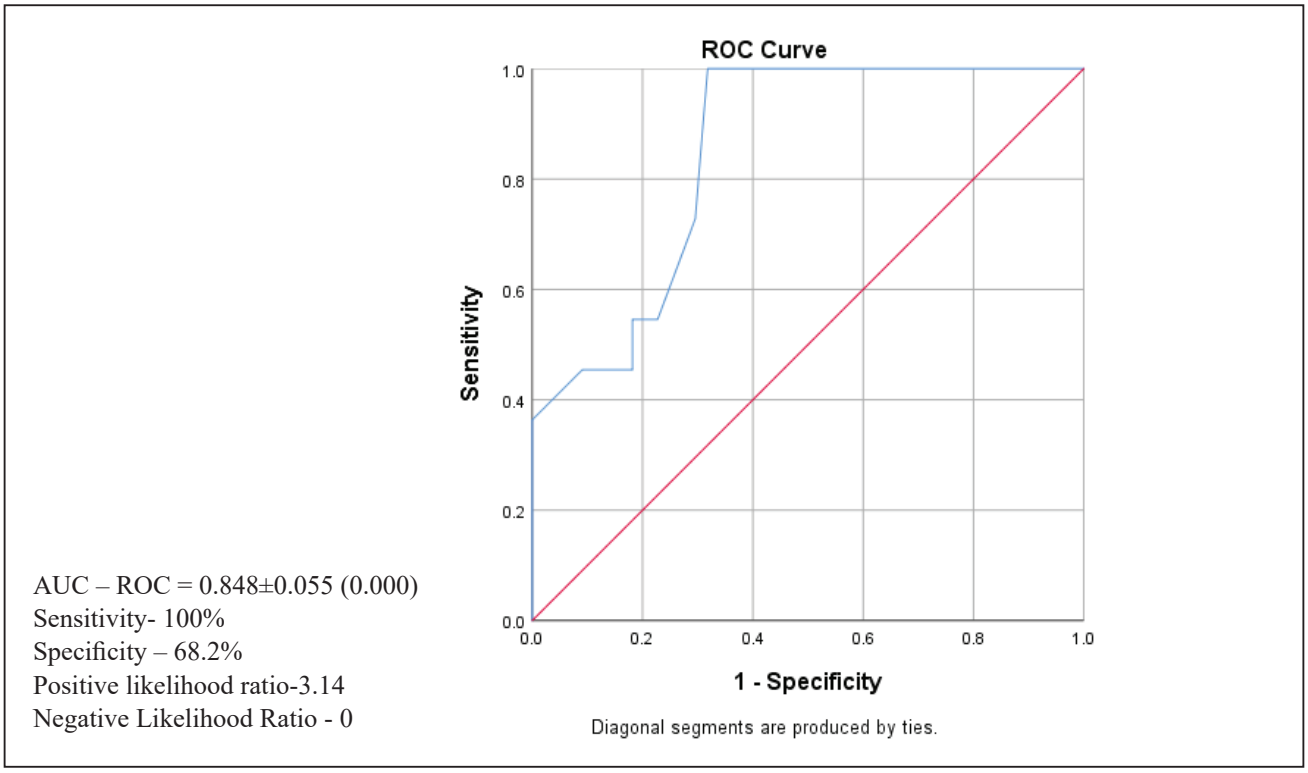


Figure 2: The ROC curves for the prediction of in-hospital mortality for EMSE-40 in elderly age more than 60 years

Discussion

Status epilepticus is a life-threatening neurologic condition that has a high rate of morbidity and fatality. Short-term mortality ranged from 7 to 39 %; we found 15.5% in-hospital mortality, which is consistent with prior data.[12., 13]

The STESS is good at predicting unfavorable outcomes, but it has a top limit impact, especially in individuals over 65 years old who have never had a seizure before.[14] Pacha et al.[10] found that the best combination of EMSE score variables was given without comorbidity as a variable, and that there was no statistical differences in the Charlson Comorbidity Index score in the survival and nonsurvival groups.

In our study, the STESS-3 score had a lower specificity than the EMSE-EAL-40 score in adults (69.7 vs. 77.3). In compared to EMSE-EAL-40, which has an AUC of 0.912 (95 percent CI = 0.83–0.97), STESS-3 has an AUC of 0.712 (95 percent CI =0.60–0.83) for adults and was linked with lower rates of right outcome prediction. EMSE-EAL-40 also had a better predictive outcome in the elderly group, with an AUC of 0.848 (95 percent CI =0.74–0.80) compared to STESS-3, which had an AUC of 0.613 (95 percent CI =0.43–0.80). EMSE-EAL, according to Reindl et al., is equally simple to calculate as STESS and has a higher diagnostic accuracy.[15]

EMSE-64 in SE superior to STESS-3 and 4 in predicting good or bad outcomes. It could be useful for risk stratification in interventional research and is suggested for individual outcome prediction. In the 30-day prediction of mortality and morbidity, EMSE-64 appears to be superior to STESS-3 and STESS-4.[16]

We used a modified form of EMSE- EAL-40, which has lower positive predictive values than EMSE-EACE (etiology-age-comorbidity-EEG),[9] is a limitation of this study. Only the motor CSE was included, and due to a lack of accessibility of continuous video-EEG monitoring at our centre.

Conclusion

In compared to STESS 3, our data imply that EMSE-EAL-40 produced a higher rate of correctly identified episodes in both adults and the elderly with CSE. EMSE-EAL-40 which can be easily applied in resource-poor sectors with limited diagnostic facilities especially where continuous video-electroencephalogram (EEG) monitoring is unavailable.

References

1. Al-Mufti, F, Claassen, J. Neurocritical Care: Status Epilepticus Review. Critical Care Clinics. 2014 Oct; 30 (4): 751-764. https://doi.org/10.1016/j.ccc.2014.06.006
2. Rosenow F, Hamer HM, Knake S. The epidemiology of convulsive and nonconvulsive status epilepticus. Epilepsia. 2007;48:82-84. https://doi.org/10.1111/j.1528-1167.2007.01359.x
3. Brophy GM, Bell R, Claassen J. Guidelines for the evaluation and management of status epilepticus. Neurocrit Care. 2012; 17:3-23. https://doi.org/10.1007/s12028-012-9695-z
4. Chin RFM, Neville BGR, Scott RC. A systematic review of the epidemiology of status epilepticus. Eur J Neurol. 2004;11:800-810. https://doi.org/10.1111/j.1468-1331.2004.00943.x
5. Murthy JMK, Jayalaxmi SS, Kanikannan MA. Convulsive status epilepticus: clinical profile in a developing country. Epilepsia. 2007;48:2217-2223. https://doi.org/10.1111/j.1528-1167.2007.01214.x
6. De Lorenzo RJ, Pellock JM, Towne AR, Boggs J G. Epidemiology of status epilepticus. J Clin Neurophysiol. 1995 Jul;12(4):316-25. https://doi.org/10.1097/00004691-199512040-00003
7. De Toledo JC. Changing presentation of seizures with aging: clinical and etiological factors. Gerontology. 1999;45:329-335. https://doi.org/10.1159/000022114
8. Rossetti AO, Logroscino G, Bromfield EB. A clinical score for prognosis of status epilepticus in adults. Neurology. 2006;66:1736-8. https://doi.org/10.1212/01.wnl.0000223352.71621.97
9. Leitinger M, Holler Y, Kalss G, Rohracher A, Novak HF, Höfler J, et al. Epidemiology based mortality score in status epilepticus (EMSE). Neurocrit Care. 2015;22:273-82. https://doi.org/10.1007/s12028-014-0080-y
10. Pacha MS, Orellana L, Silva E, Ernst G, Pantiu F, Quiroga Narvaez J, et al. Role of EMSE and STESS scores in the outcome evaluation of status epilepticus. Epilepsy & Behav. 2016;64:140-2. https://doi.org/10.1016/j.yebeh.2016.09.036
11. Gastaut H. Classification of status epilepticus. In: Delgado-Escueta AV, Wasterlain CG, Treiman DM, Porter RJ, editors. Status epilepticus: mechanisms of brain damage and treatment. New York: Raven Press: Adv Neurol. 1983;34:15-35.
12. Logroscino G, Hesdorffer DC, Cascino G, Annegers JF, Hauser WA. Short-term mortality after a first episode of status epilepticus. Epilepsia .1997;38(12): 1344-9. https://doi.org/10.1111/j.1528-1157.1997.tb00073.x
13. Coeytaux A, Jallon P, Galobardes B, Morabia A. Incidence of status epilepticus in French-speaking Switzerland: (EPISTAR). Neurology. 2000;55(5):693-7. https://doi.org/10.1212/WNL.55.5.693
14. Leitinger M, Kalss G, Rohracher A, Pilz G, Novak H, Höfler J, et al. Predicting outcome of status epilepticus. Epilepsy & Behav 2015;49:126-30. https://doi.org/10.1016/j.yebeh.2015.04.066
15. Reindl C, Knappe RU, Sprügel MI, Sembill JA, Mueller TM, Hamer HM, et al. Comparison of scoring tools for the prediction of in-hospital mortality in status epilepticus. Seizure. 2018;56:92-7. https://doi.org/10.1016/j.seizure.2018.01.024
16. Giovanninia G, Montia G, Tondellia M, Marudic A, Valzaniab F, Leitingerd M, et al.Mortality, morbidity and refractoriness prediction in status epilepticus: Comparison of STESS and EMSE scores. Seizure. 2017; 46: 31-37. https://doi.org/10.1016/j.seizure.2017.01.004