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Clinical utility of EMSE and STESS in predicting hospital mortality for status epilepticus

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ABSTRACT

Purpose: To explore the applicability of the epidemiology-based mortality score in status epilepticus (EMSE) and the status epilepticus severity score (STESS) in predicting hospital mortality in patients with status epilepticus (SE) in western China. Furthermore, we sought to compare the abilities of the two scales to predict mortality from convulsive status epilepticus (CSE) and non-convulsive status epilepticus (NCSE).

Method: Patients with epilepsy (n = 253) were recruited from the West China Hospital of Sichuan University from January 2012 to January 2016. The EMSE and STESS for all patients were calculated immediately after admission. The main outcome was in-hospital death. The predicted values were analysed using SPSS 22.0 receiver operating characteristic (ROC) curves.

Result: Of the 253 patients with SE who were included in the study, 39 (15.4%) died in the hospital. Using STESS ≥4 points to predict SE mortality, the area under the ROC curve (AUC) was 0.724 ($P < 0.05$). Using EMSE ≥79 points, the AUC was 0.776 ($P < 0.05$). To predict mortality in NCSE, STESS ≥2 points was used and resulted in an AUC of 0.632 ($P > 0.05$), while EMSE ≥90 points gave an AUC of 0.666 ($P > 0.05$).

Conclusions: The hospital mortality rate from SE in this study was 15.4%. Those with STESS ≥4 points or EMSE ≥79 points had higher rates of SE mortality. Both STESS and EMSE are less useful predicting in-hospital mortality in NCSE compared to CSE. Furthermore, the EMSE has some advantages over the STESS.

1. Background

Status epilepticus (SE) is one of the most common neurological emergencies. SE is a pathological condition characterized by persistent epileptic seizures that carries a high risk of morbidity and mortality. Rapid assessment of the patient's condition and risk of death is very important. This assessment should be objective and should be used to improve the quality of care and rational use of medical resources. The status epilepticus severity score (STESS) and the epidemiology-based mortality score in status epilepticus (EMSE) are two commonly used clinical evaluation tools to assess epilepsy status and prognosis. The scores can, to a certain extent, predict hospital morbidity and mortality. STESS [1,11] uses the four parameters of consciousness, age, "worst" seizure type, and history of previous seizures to assess the risk of death in patients with SE. According to previous studies, STESS ≥3 points predicts poor functional outcomes (including hospital death or disability). However, more recent evidence has suggested that STESS ≥4 points better predicts poor outcomes. EMSE [2] includes additional variables such as aetiology, electroencephalogram (EEG) findings, co-morbidities, and other parameters. Thus, ESME takes more individual patient factors into account. Previous studies have shown that EMSE-ADLEG (EMSE—Age, Duration, Level of Consciousness, EEG) ≥58 points or EMSE-ECLEG (EMSE—Aetiology, Co-morbidity, Level of Consciousness, EEG) ≥77 points can predict patient disability. EMSE-ADLEG ≥60 points or EMSE-ECLEG ≥81 points can predict hospital mortality. However, there are limitations for both scales in their ability to predict outcomes for convulsive status epilepticus (CSE) and non-convulsive status epilepticus (NCSE). The aim of this study was to determine the ability of these scales to predict hospital morbidity from SE in patients in western China.

2. Methods

This study included a total of 253 patients with SE who were admitted to the emergency department, neurological intensive care unit, neurology department, neurosurgery department, or another department at the West China Hospital of Sichuan University between January 2012 and January 2016. All patients were diagnosed according to the International League Against Epilepsy's (ILAE) most recent diagnostic criteria for status

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epilepticus [12]. The ILAE defines timepoint T1 SE as a seizure duration between 5 and 30 min, timepoint T2 SE as a seizure duration between 30 and 60 min, refractory SE as a seizure duration between 1 and 24 h, and a super-refractory SE as a seizure duration greater than 24 h [12]. Patients were required to have both clinical data and EEG data to be considered for inclusion. In accordance with the Declaration of Helsinki, participants in this study gave informed, voluntary consent to participate.

Inclusion criteria were: 1) age ≥18 years; 2) discharge diagnostic ICD-10 (International Classification of Diseases-10) with SE; 3) treated according to the American Epilepsy Society (AES) 2016 Status Epilepticus Guidelines [6]; 4) provided voluntary and informed consent regarding the prognosis of epilepsy in patients with persistent SE.

Exclusion criteria were: 1) no EEG data or EEG data obtained at a time other than seizure onset, and 2) patients who did not provide informed consent.

2.1. Methods

The two scales used to predict in-hospital mortality were the EMSE (Table 1) and the STESS (Table 2). EMSE and STESS were calculated for all patients immediately after admission. The state of each patient's consciousness was assessed prior to the use of benzodiazepines. All patients with SE were treated according to the American Epilepsy Society (AES) 2016 Status Epilepticus Guidelines [6]. Treatment was as follows: in the first stage (6–20 min), the patient was given two benzodiazepines, such as

Table 1
EMS (epidemiology-based mortality score in status epilepticus).

AETIOLOGY:score one stratum	points
CNS-anomalies	2
Drug reduction/withdrawal , poor compliance	2
Multiple sclerosis	5
Remote cerebrovascular disease，brain injury	7
Hydrocephalus	8
Alcohol abuse	10
Drug overdose	11
Head trauma	12
Cryptogenic	12
Brain tumor	16
Metabolic sodium balance	17
Metabolic disorder	22
Acute cerebrovascular diease	26
Cns-infection acute	33
Anoxia	65

+

COMORBIDITY:score each disease	points
Myocardial infarction, congestive heart failure, peripheral vascular disease,chronic pulmonary disease,connective tissue disease,ulcer disease,mild liver disease,diabetes	10
Hemiplegia,moderate or severe renal disease,diabetes with end organ damage,any tumor including leukemia/lymphoma	20
Moderate or severe liver diaease	30
Metastatic solid tumor,AIDS	60

+

EEG:score only worst stratum	points
Burst suppression(spontaneous)	60
ASIDs	40
Lpdss	40
Gpds	40
No LPDs, GPDs or ASIDs	0

+

AGE:score one stratum	points
21-30	1
31-40	2
41-50	3
51-60	5
61-70	7
71-80	8
>80	10

+

+

→ sum score