Status Epilepticus Management: An Update

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Topics

- Status Epilepticus Management: An Update

  - Timeline and development of definition and criteria for SE

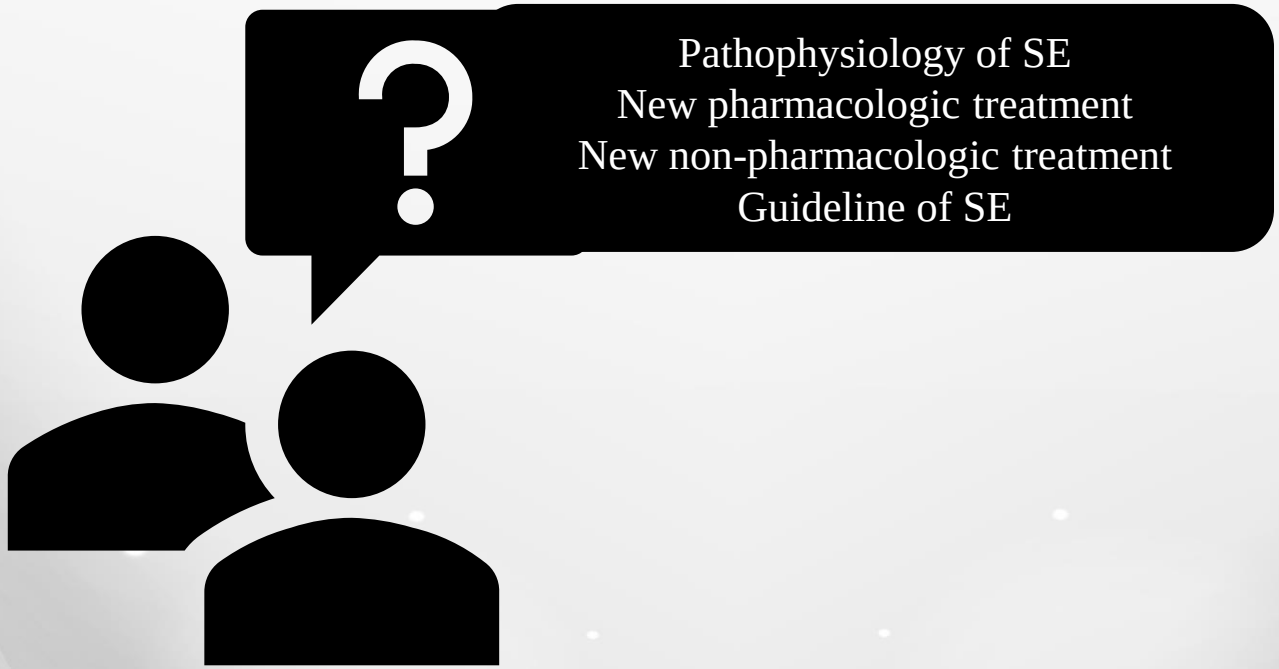
  - Evidence-based management of SE

    - important researches in SE

- Outcome predictors of status epilepticus

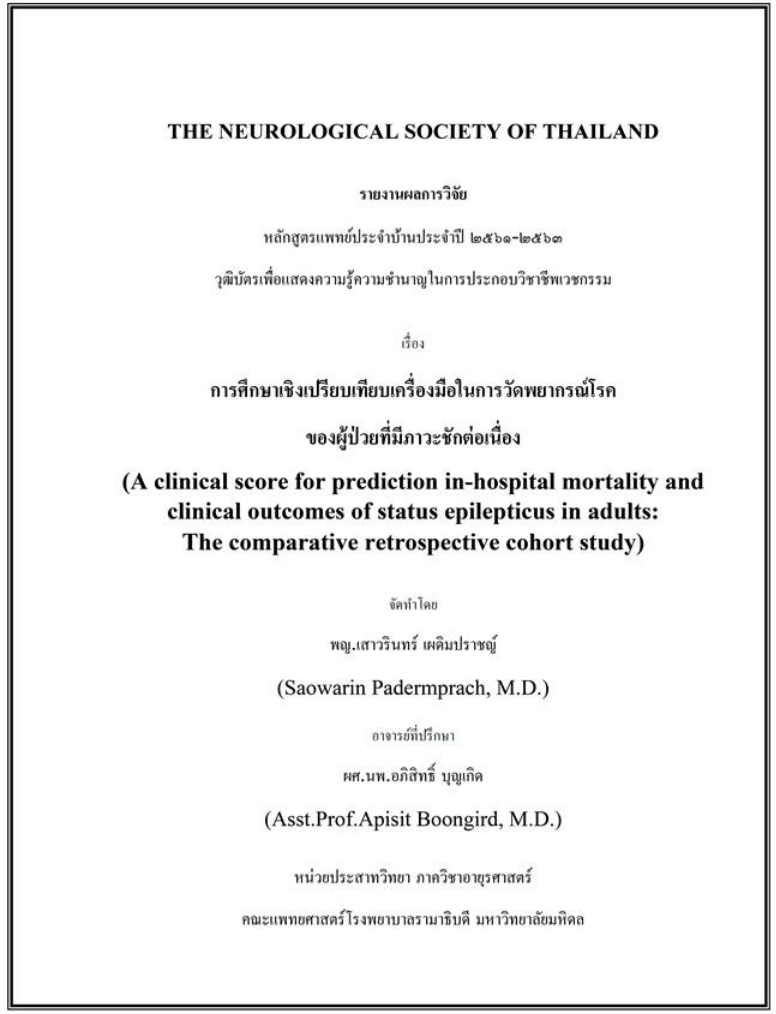
Status epilepticus (SE)

- The mortality of SE has not been changed for many years.



Seizure. 2017 Jan;44:65-73.

SE cases at Ramathibodi Hospital (January 2014 – December 2019)



THE NEUROLOGICAL SOCIETY OF THAILAND

รายงานผลการวิจัย

หลักสูตรแพทย์ประจำบ้านประจำปี ๒๕๖๑-๒๕๖๓

วุฒิบัตรเพื่อแสดงความรู้ความชำนาญในการประกอบวิชาชีพเวชกรรม

เรื่อง

การศึกษาเชิงเปรียบเทียบเครื่องมือในการวัดพยากรณ์โรค

ของผู้ป่วยที่มีภาวะชักต่อเนื่อง

(A clinical score for prediction in-hospital mortality and clinical outcomes of status epilepticus in adults: The comparative retrospective cohort study)

จัดทำโดย

พญ.เสาวรินทร์ เผดิมปราชญ์

(Saowarin Padermprach, M.D.)

อาจารย์ที่ปรึกษา

ผศ.นพ.อภิสิทธิ์ บุญเกิด

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หน่วยประสาทวิทยา ภาควิชาอายุรศาสตร์

คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล

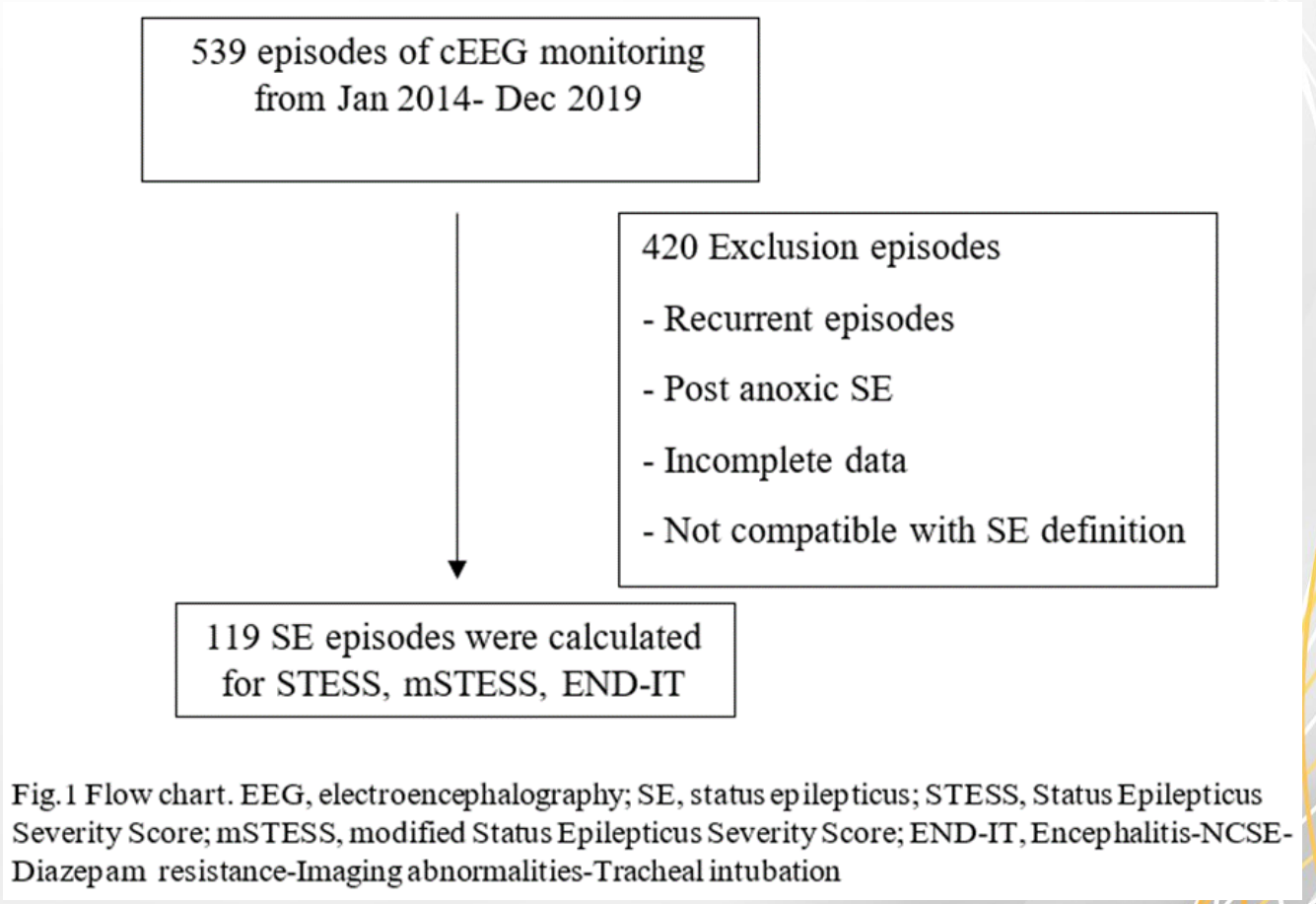

Fig.1 Flow chart. EEG, electroencephalography; SE, status epilepticus; STESS, Status Epilepticus Severity Score; mSTESS, modified Status Epilepticus Severity Score; END-IT, Encephalitis-NCSE-Diazepam resistance-Imaging abnormalities-Tracheal intubation

SE cases at Ramathibodi Hospital (January 2014 – December 2019)

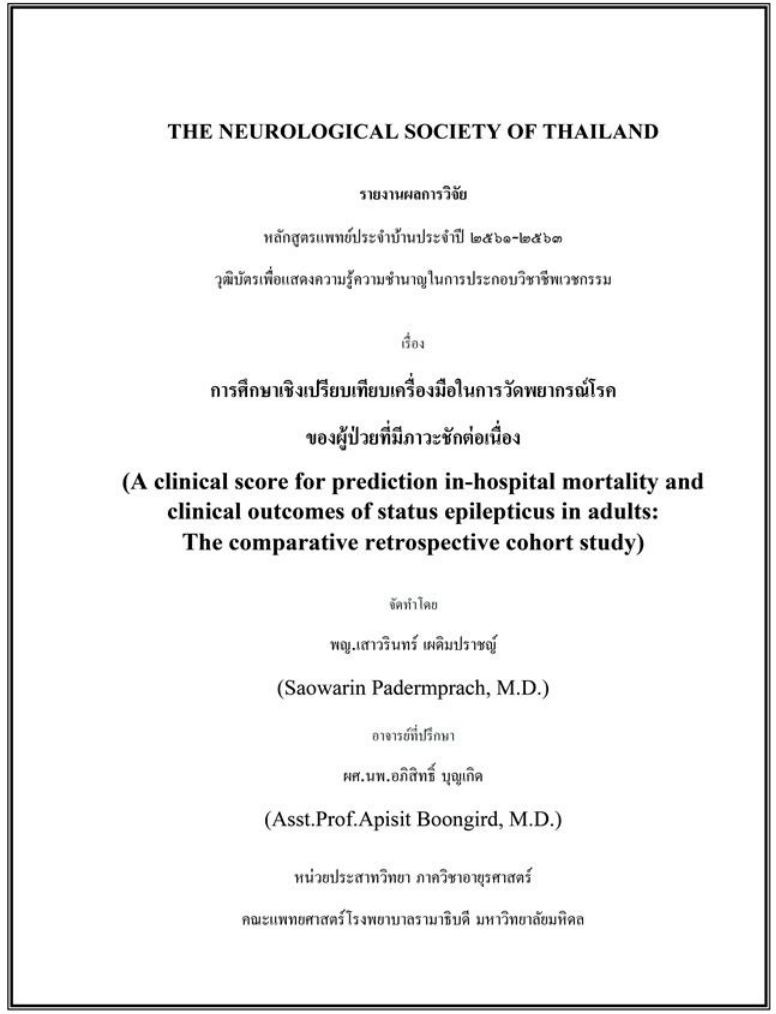

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Table 1. Demographic Data

	Total cohort (n = 119)
Male gender	58 (48.7%)
Age in years (mean)	59.76
Type of worst status epilepticus	
▪ Simple partial or complex partial	7(5.8%)
▪ Generalized convulsive	47(39.4%)
▪ NCSE in coma	65(54.6%)
History of seizure	
▪ Yes	34(28.5%)
▪ No	85(71.4%)
Anesthetic used	
▪ Yes	70(58.8%)
▪ No	49(41.1%)
No. of AED	
▪ 1-2	52(43.7%)
▪ >3	67(56.3%)
Etiology of seizure	
▪ Acute symptomatic	98(82.3%)
▪ Remote symptomatic	20(16.8%)
▪ Idiopathic	1(0.8%)
Cause of Death (n = 41)	
▪ End organ failure	11(26.8%)
▪ Septic shock	20(48.7%)
▪ Cancer	2(4.8%)
▪ Arrhythmia	3(7.3%)
▪ Encephalitis	3(7.3%)
▪ Stroke	2(4.8%)

NCSE, Nonconvulsive Status Epilepticus in Coma; AED, Antiepileptic Drugs

Death 1/3

Saowarin Padermprach, M.D.; Apisit Boongird, M.D.

	Year	References
Definition of Refractory Status Epilepticus (RSE)	2011	Lancet Neurol . 2011 Oct;10(10):922-30.
A definition and classification of status epilepticus--Report of the ILAE Task Force on Classification of Status Epilepticus	2015	Epilepsia, 56(10):1515–1523, 2015
Definition of Super-Refractory Status Epilepticus (SRSE)	2015 2016	Epilepsy Behav . 2015 Aug;49:131-4. J Clin Med. 2016 May 19;5(5):54.
Salzburg EEG consensus criteria for non-convulsive status epilepticus	2015	Epilepsy Behav: E&B 2015;49(August)158–63
Proposed consensus definitions for new-onset refractory status epilepticus (NORSE), febrile infection-related epilepsy syndrome (FIRES), and related conditions	2018	Epilepsia. 2018 Apr;59(4):739-744.

A definition and classification of status epilepticus--Report of the ILAE Task Force on Classification of Status Epilepticus

Type of SE	Operational dimension 1 Time (t1), when a seizure is likely to be prolonged leading to continuous seizure activity	Operational dimension 2 Time (t2), when a seizure may cause long term consequences (including neuronal injury, neuronal death, alteration of neuronal networks and functional deficits)
Tonic- clonic SE	5 min	30 min
Focal SE with impaired consciousness	10 min	> 60 min
Absence status epilepticus	10-15 min[a]	unknown

a= Evidence for the time frame is currently limited and future data may lead to modifications

Epilepsia, 56(10):1515–1523, 2015

Early phase
Premonitory SE, impending SE

Time (t1), when a seizure is likely to be prolonged leading to continuous seizure activity

Established SE

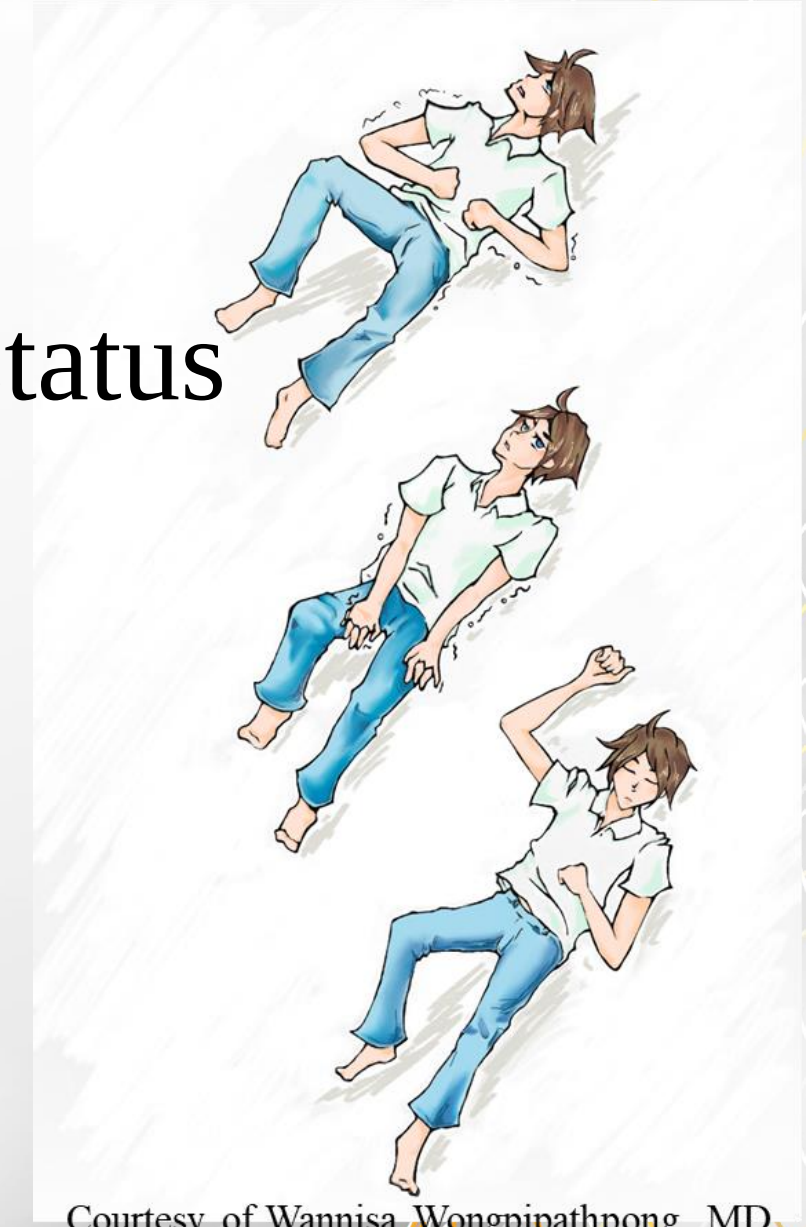
Time (t2), when a seizure may cause long term consequences (including neuronal injury, neuronal death, alteration of neuronal networks and functional deficits)

Refractory SE

Super-refractory SE

Seizure. 2017 Jan;44:65-73.

Generalized convulsive status epilepticus (GCSE)

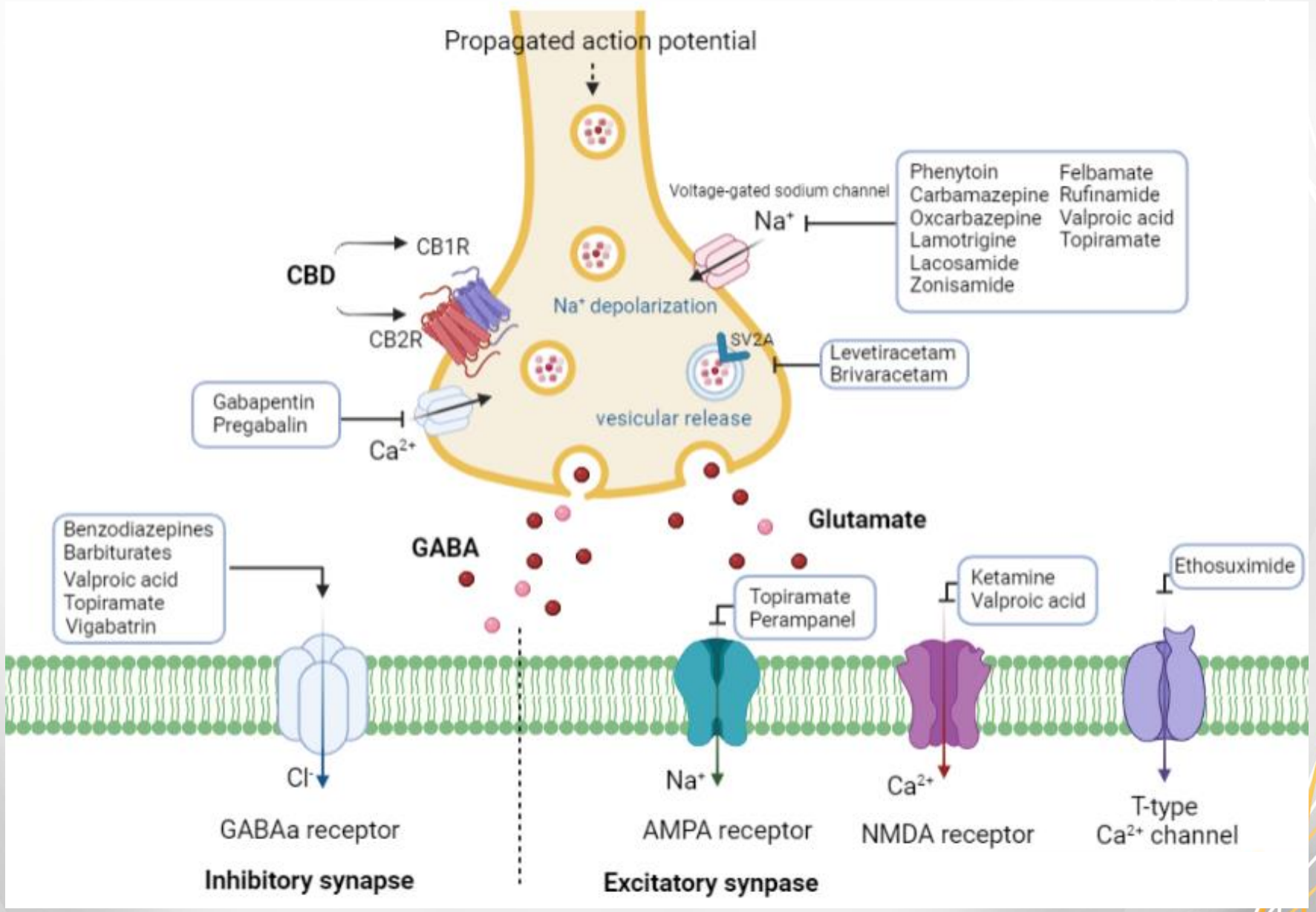


Courtesy of Wannisa Wongpipathpong, MD.

Veterans **A**ffairs Status Epilepticus Cooperative Study in 1998 (VA study)

- A comparison of four treatments for generalized convulsive status epilepticus. **V**eterans **A**ffairs Status Epilepticus Cooperative Study Group established the primacy of lorazepam over phenytoin alone as first-line treatment of early CSE in hospital.

N Engl J Med. 1998 Sep 17;339(12):792-8.



Courtesy of Wannisa Wongpipathpong, MD.

Brivaracetam (BRV)

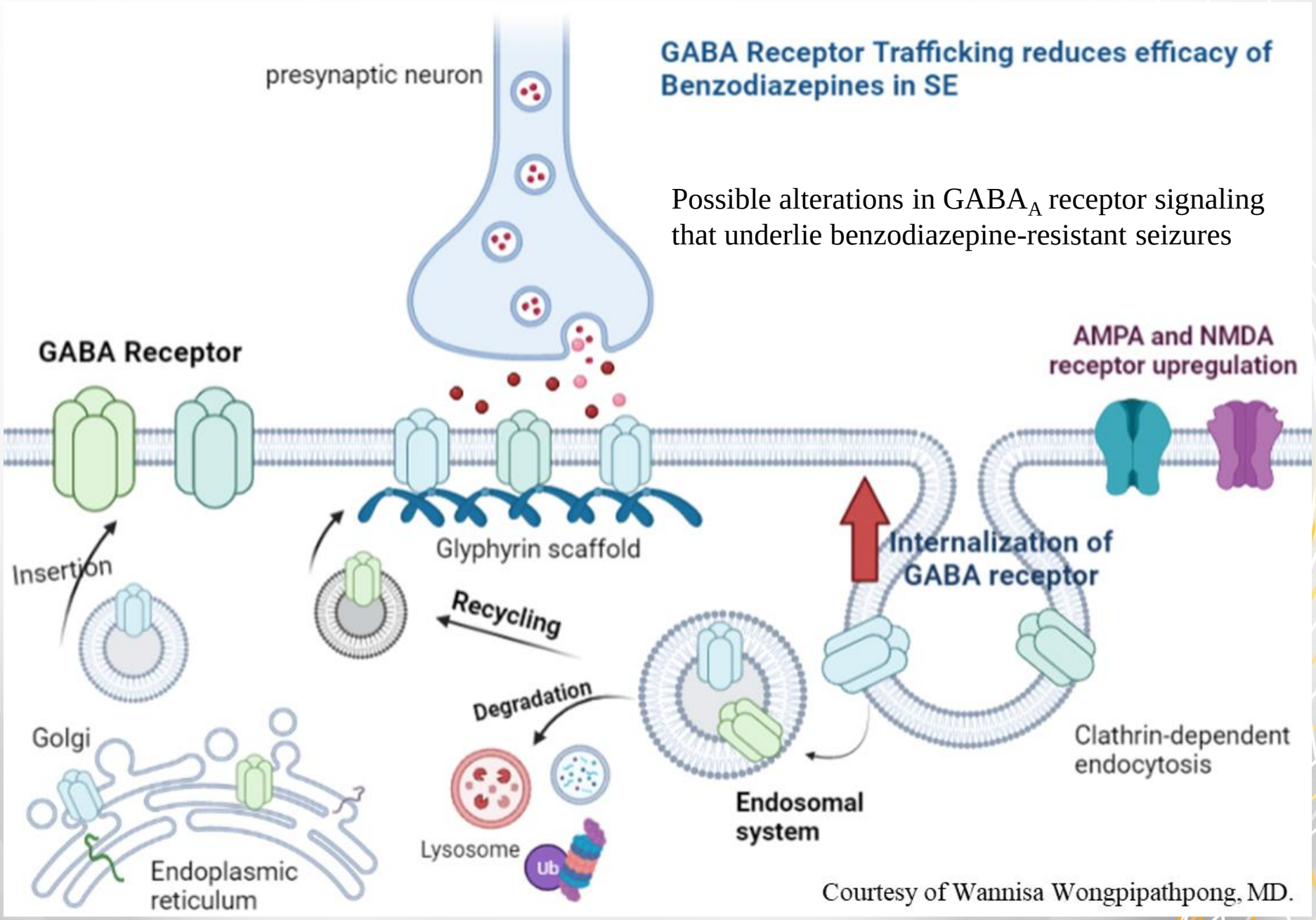
- Mechanism of action: SV2A modulation
- BRV is metabolized by CYP P 450 2C19, and is excreted in the urine with less than 10% as unchanged.
- BRV is more selective than LEV with a higher affinity to the target.
- BRV is more lipophilic than LEV, and has been shown an animal models to penetrate BBB more quickly than LEV.
- BRV is very attractive for use in emergency situations and critically ill SE patients(SE, RSE, SRSE). Need more BRV clinical trials.

Eur J Pharmacol. 2011 Aug 16;664(1-3):36-44.

Efficacy and tolerability of intravenous brivaracetam(BRV) for status epilepticus: A systematic review

- **Objectives:** This systematic review aimed to determine the efficacy and safety of IV BRV in the treatment of status epilepticus.
- **Results:** From a total of 34 studies identified, 5 uncontrolled studies with 77 patients were included in this review. Thirty-seven out of 77 patients (48%) with SE responded to IV BRV. Reported time to seizure cessation may be immediate from a few minutes to several hours after IV BRV treatment. Patients manifested with significant disability on Glasgow outcome scale (Median: 3) and modified Rankin scale (Mode: 5). Six patients [somnolence (5), worsening seizures (1)] had treatment emergent adverse events.
- **Conclusions:** Limited evidence from 5 uncontrolled studies involving a limited number of patients suggests that IV BRV may be efficacious and safe in terminating seizures among patients with SE or refractory SE.

J Neurol Sci. 2020 Jun 15;413:116799.



Possible alterations in $GABA_A$ receptor signaling that underlie benzodiazepine-resistant seizures

Epilepsia, 53(Suppl. 9):79–88, 2012

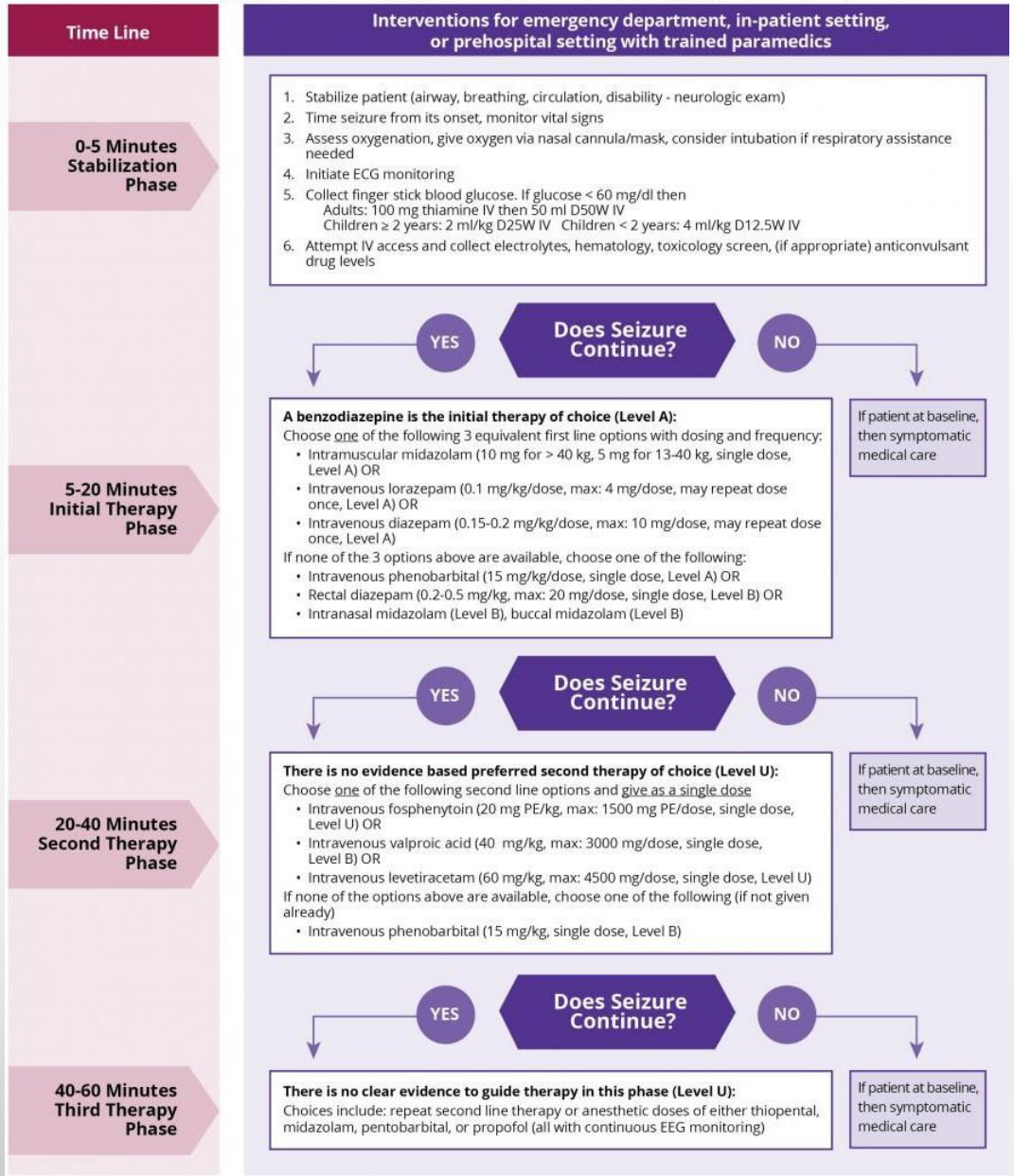
Evidence-Based Guideline: Treatment of Convulsive Status Epilepticus in Children and Adults: Report of the Guideline Committee of the American Epilepsy Society

- A benzodiazepine (specifically IM midazolam, IV lorazepam, or IV diazepam) is recommended as the initial therapy of choice, given their demonstrated efficacy, safety, and tolerability (level A, four class I RCTs).

Epilepsy Currents, Vol. 16, No. 1 (January/February) 2016 pp. 48–61

Proposed Algorithm for Convulsive Status Epilepticus

From "Treatment of Convulsive Status Epilepticus in Children and Adults," *Epilepsy Currents* 16.1 - Jan/Feb 2016



American Epilepsy Society

Disclaimer: This clinical algorithm/guideline is designed to assist clinicians by providing an analytic framework for evaluating and treating patients with status epilepticus. It is not intended to establish a community standard of care, replace a clinician's medical judgment, or establish a protocol for all patients. The clinical conditions contemplated by this algorithm/guideline will not fit or work with all patients. Approaches not covered in this algorithm/guideline may be appropriate.

SENSE registry

- Factors predicting cessation of SE in clinical practice

  - **Time** is the brain.

  - **Adequate doses** of benzodiazepines and anti-seizure medications is crucial for the treatment of SE.

The bolus dose is lower than recommended in most cases and, in a relevant number of patients, benzodiazepines were not used as first-line agents.

TABLE 3 First treatment steps

First step		**Successful (%)**	**Bolus dose**
Lorazepam	318	52 (16)	0.03 mg/kg
Diazepam	44	11 (25)	0.13 mg/kg
Midazolam	85	20 (23)	0.1 mg/kg
Clonazepam	211	29 (14)	0.013 mg/kg
Several benzodiazepines	188	35 (19)	
Levetiracetam	158	36 (22)	15 mg/kg
Other	45	6 (13)	
Total	1049	154 (15)	
Second step		**Successful (%)**	**Bolus dose**
Latency first step to second step	Median	40 min IQR 10-120 min	
Lorazepam	38	8 (21)	0.025 mg/kg
Diazepam	4	1 (25)	0.13 mg/kg
Midazolam	8	2 (25)	0.07 mg/kg
Clonazepam	30	10 (33)	0.014 mg/kg
Levetiracetam	534	233 (44)	21 mg/kg
Valproate	111	47 (42)	20 mg/kg
Lacosamide	38	10 (27)	2.5 mg/kg
Phenytoin	13	3 (23)	10 mg/kg
Propofol	48	23 (48)	2.3 mg/kg
Other	28	10 (36)	
Total	852	347 (41)	

IQR, 25/75 interquartile range.

Epilepsia.2018 Oct;59 Suppl 2:150-154

ESETT trial in 2019

Trial of Three Anticonvulsant Medications for Status Epilepticus			
MULTICENTER, RANDOMIZED, DOUBLE-BLIND TRIAL			
384 children and adults with benzodiazepine-refractory status epilepticus	Levetiracetam 60 mg/kg	Fosphenytoin 20mg/kg	Valproate 40 mg/kg
Disappearance of clinically evident seizures and improved responsiveness at 60 minutes	47%	45%	46%
In the context of benzodiazepine-refractory convulsive status epilepticus, the anticonvulsant drugs levetiracetam, fosphenytoin, and valproate each led to seizure cessation and improved alertness by 60 minutes in approximately half the patients, and the three drugs were associated with similar incidences of adverse events.			

N Engl J Med 2019;381:2103-13.

Hypothermia for Neuroprotection in Convulsive SE (HYBERNATUS Study Group)

- In a multicenter trial, we randomly assigned 270 critically ill patients with CSE who were receiving mechanical ventilation to hypothermia (32 to 34°C for 24 hours) in addition to standard care or to standard care alone
- The primary outcome was a good functional outcome at 90 days, defined as a Glasgow Outcome Scale (GOS) score of 5. The main secondary outcomes were mortality at 90 days, progression to EEG confirmed status epilepticus, refractory status epilepticus on day 1, “super-refractory” status epilepticus (resistant to general anesthesia), and functional sequelae on day 90.
- **Conclusion:** In this trial, induced hypothermia added to standard care was not associated with significantly better 90-day outcomes than standard care alone in patients with convulsive status epilepticus.

N Engl J Med. 2016 Dec 22;375(25):2457-2467.

Convulsive Refractory Status Epilepticus (CRSE)

Early phase
Premonitory SE, impending SE

Established SE

Refractory SE

Super-refractory SE

Seizure. 2017 Jan;44:65-73.

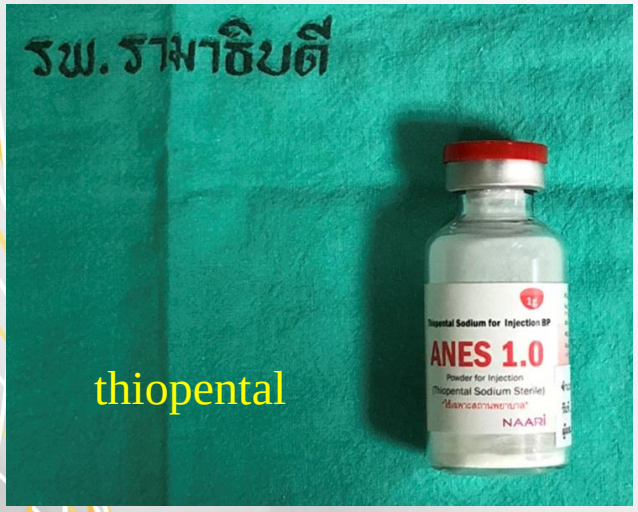
Treatment of Refractory Convulsive Status Epilepticus: A Comprehensive Review by the American Epilepsy Society Treatments Committee

- No class I or II randomized controlled trials have been performed on the treatment of CRSE.
- Mostly insufficient evidence exists on the efficacy of stopping clinical CRSE using brivaracetam(BRV), lacosamide(LCS), levetiracetam (LEV), valproate(VPA), ketamine, midazolam (MDZ), pentobarbital (PTB; and thiopental), and propofol (PRO) either as the last ASM or compared to others of these drugs.
- Adrenocorticotropic hormone, IVIG, corticosteroids, magnesium sulfate, and pyridoxine have been used in special situations but have not been studied for CRSE.

Epilepsy Currents 2020, Vol. 20(5) 245-264

CRSE

- Choice of anesthetic agents
  - A systematic review did not reveal relevant differences in termination of SE analyzing data from retrospective studies on barbiturates, midazolam, and propofol



thiopental

midazolam

propofol

Epilepsia. 2002 Feb;43(2):146-53.

Lancet Neurol 2011 Oct;10(10):922-30.

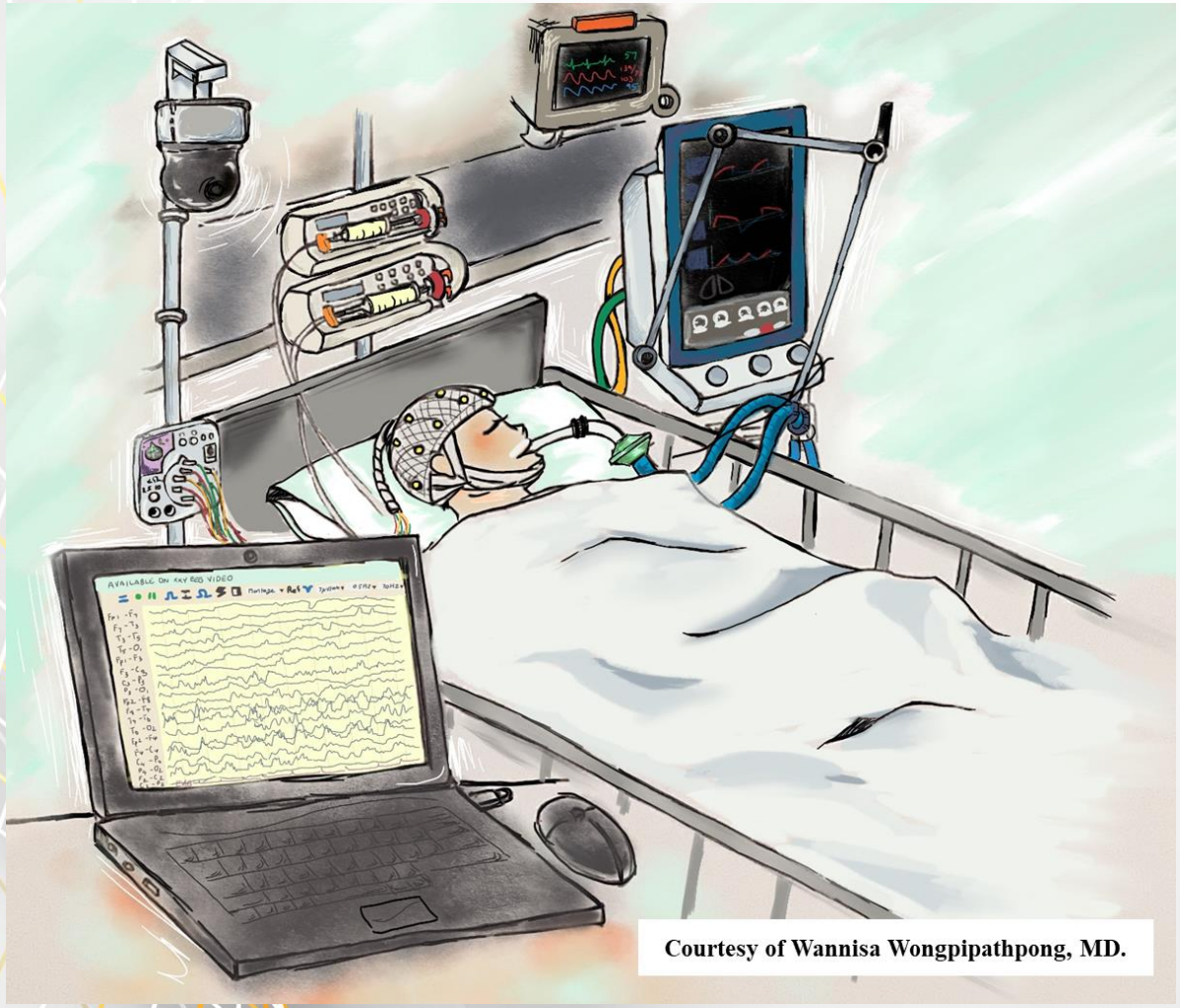
Epilepsy Currents 2020, Vol. 20(5) 245-264

Salzburg EEG consensus criteria for non-convulsive status epilepticus

Patients without known epileptic encephalopathy
• EDs > 2.5 Hz, or
• EDs ≤ 2.5 Hz or rhythmic delta/theta activity (> 0.5Hz) AND one of the following: - EEG and clinical improvement after IV AED*, or - Subtle clinical ictal phenomena, or - Typical spatiotemporal evolution**
Patients with known epileptic encephalopathy
• Increase in prominence or frequency when compared to baseline with observable change in clinical state
• Improvement of clinical and EEG* features with IV AEDs
* If EEG improvement without clinical improvement, or if fluctuation without definite evolution, this should be considered possible NCSE.
** Increment onset(increase in voltage and change in frequency), or evolution in pattern(change in frequency > 1Hz or change in location), or decrementing termination(voltage and frequency).
EDs: epileptiform discharges(spikes, polyspikes, sharp-waves, sharp-and-wave complexes) IV AED: intravenous antiepileptic drugs

Epilepsy Behav: E&B 2015;49(August)158–63

continuous EEG (cEEG) monitoring

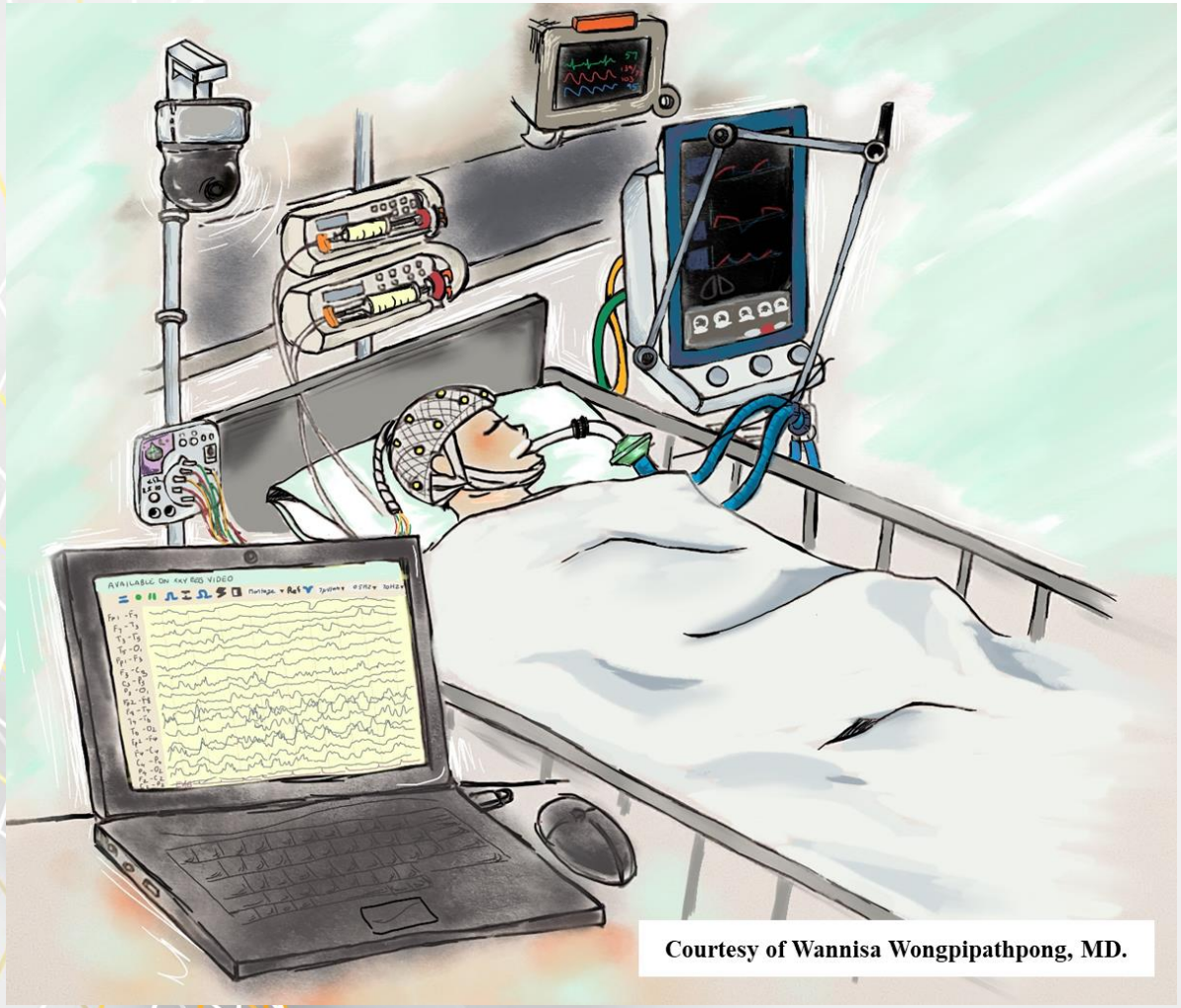


ICU EEG	Year
Consensus Statement on Continuous EEG in Critically Ill Adults and Children, Part I: Indications	2015
Consensus Statement on Continuous EEG in Critically Ill Adults and Children, Part II: Personnel, Technical Specifications, and Clinical Practice	2015
Continuous EEG Monitoring in Critical Care	
American Clinical Neurophysiology Society's Standardized Critical Care EEG Terminology: 2021 Version	2021

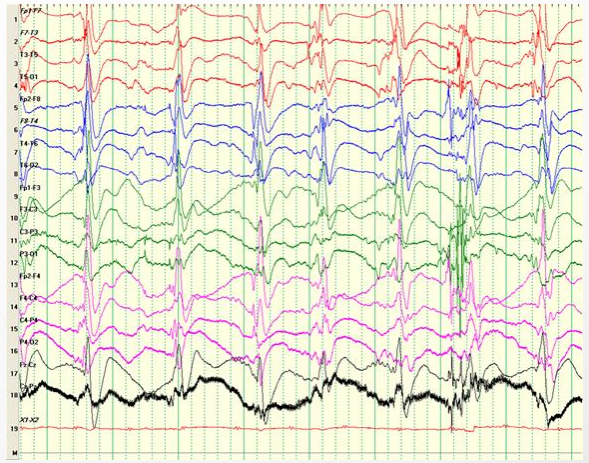
https://www.acns.org/practice/guidelines

EEG endpoints in CRSE

continuous EEG (cEEG) monitoring

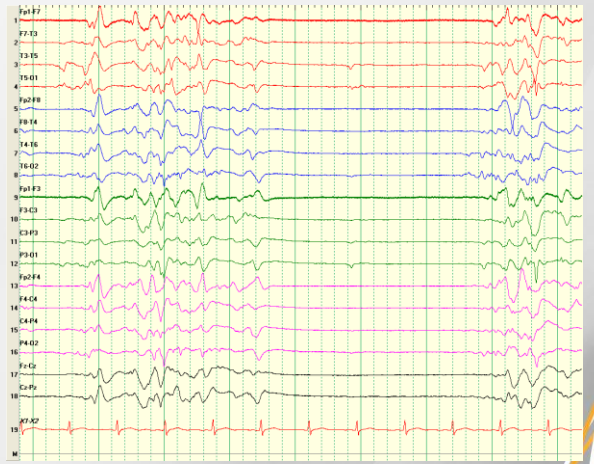


no electrographic seizure for 24-48 hrs



vs

burst suppression for 24-48 hrs



Super-refractory status epilepticus (SRSE)

Adults with SRSE

	Level of evidence	Comment
Therapeutic hypothermia	insufficient evidence	
Vagus nerve stimulation	insufficient evidence	
Inhalational anesthetics	insufficient evidence	
Brain surgery	insufficient evidence	Focal resection of a well-localized ictal zone in noneloquent cortex is recommended.
Perampanel	insufficient evidence	Possible role in the treatment of postanoxic seizure
Pregabalin	insufficient evidence	
Topiramate	insufficient evidence	

2020 American Epilepsy Society (AES) comprehensive review
Epilepsy Curr. 2021 Mar 10:1535759721999670.

SRSE

- Successful use of pure cannabidiol for the treatment of super-refractory status epilepticus
  - case report

- Brivaracetam (BRV)
  - may be useful in SRSE
  - small number of pts

Seizure. 2016 Feb;35:56-8.

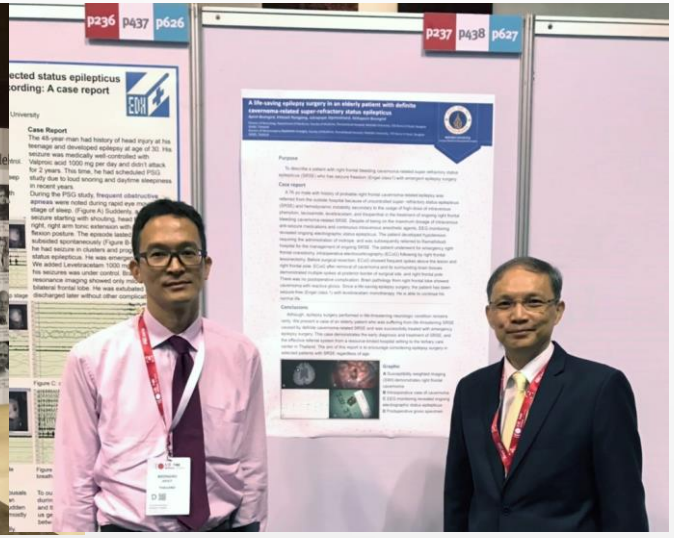
Epilepsy Behav Case Rep .2018 Jul 17;10:141-144.

Epilepsy Behav. 2017 May;70(Pt A):177-181.

33rd International Epilepsy Congress

Bangkok Thailand

22-26 June 2019



A life-saving epilepsy surgery in an elderly patient with definite cavernoma-related super-refractory status epilepticus

Apisit Boongird, Kittawit Rungjang, Jukrapope Jitpimolmard, Atthaporn Boongird

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Division of Neurosurgery, Department of surgery, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, 270 Rama VI Road, Bangkok 10400, Thailand

Mahidol University
Faculty of Medicine Ramathibodi Hospital

Purpose

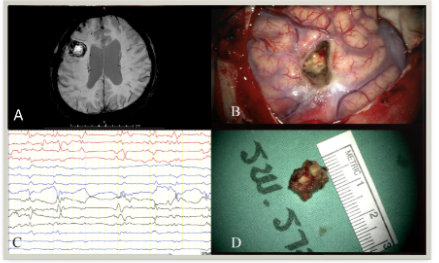
To describe a patient with right frontal bleeding cavernoma-related super-refractory status epilepticus (SRSE) who has seizure freedom (Engel class1) with emergent epilepsy surgery.

Case report

A 76 yo male with history of probable right frontal cavernoma-related epilepsy was referred from the outside hospital because of uncontrolled super- refractory status epilepticus (SRSE) and hemodynamic instability secondary to the usage of high-dose of intravenous phenytoin, lacosamide, levetiracetam, and thiopenthal in the treatment of ongoing right frontal bleeding cavernoma-related SRSE. Despite of being on the maximum dosage of intravenous anti-seizure medications and continuous intravenous anesthetic agents, EEG monitoring revealed ongoing electrographic status epilepticus. The patient developed hypotension requiring the administration of inotrope, and was subsequently referred to Ramathibodi hospital for the management of ongoing SRSE. The patient underwent for emergency right frontal craniotomy, intraoperative electrocorticography (ECoG) following by right frontal lesionectomy. Before surgical resection, ECoG showed frequent spikes above the lesion and right frontal pole. ECoG after removal of cavernoma and its surrounding brain tissues demonstrated multiple spikes at posterior border of surgical site, and right frontal pole. There was no postoperative complication. Brain pathology from right frontal lobe showed cavernoma with reactive gliosis. Since a life-saving epilepsy surgery, the patient has been seizure-free (Engel class 1) with levetiracetam monotherapy. He is able to continue his normal life.

Conclusions

Although, epilepsy surgery performed in life-threatening neurologic condition remains rarity. We present a case of an elderly patient who was suffering from life-threatening SRSE caused by definite cavernoma-related SRSE and was successfully treated with emergency epilepsy surgery. This case demonstrates the early diagnosis and treatment of SRSE, and the effective referral system from a resource-limited hospital setting to the tertiary care center in Thailand. The aim of this report is to encourage considering epilepsy surgery in selected patients with SRSE regardless of age.



Graphic

A Susceptibility weighted imaging (SWI) demonstrates right frontal cavernoma.
B Intraoperative view of cavernoma
C EEG monitoring revealed ongoing electrographic status epilepticus
D Postoperative gross specimen

Epilepsia. 2019;60(S2):5–248.

Postanoxic status epilepticus

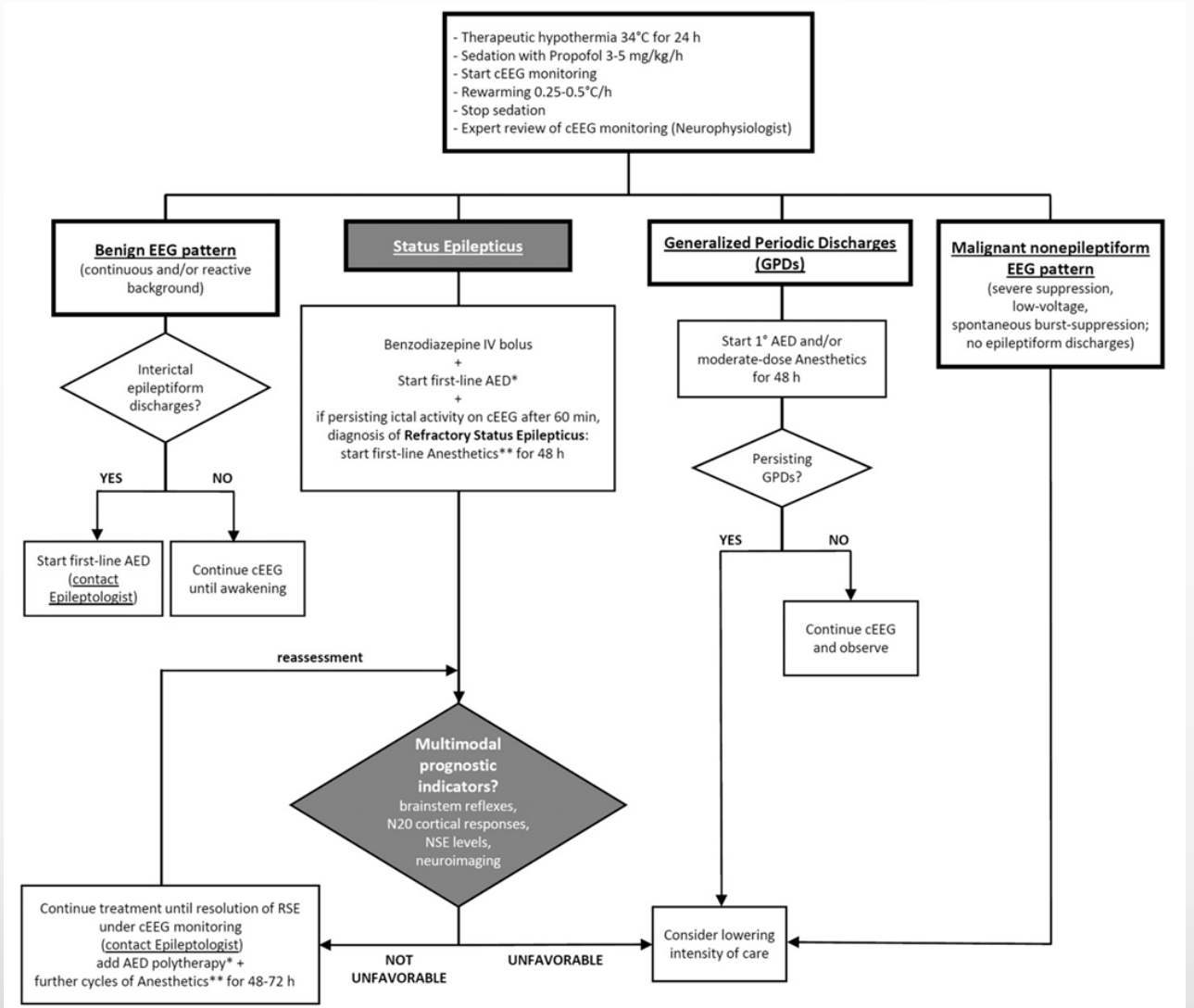


Fig. 1. Standardized protocol for treatment of hypoxic–ischemic encephalopathy in ICU. *Antiepileptic drugs (loading dose). First-line: valproate 30 mg/kg iv bolus; levetiracetam 40 mg/kg iv bolus; phenytoin (if contraindication to valproate/levetiracetam AND absent cardiac risks) 20 mg/kg iv bolus. Second-line: lacosamide 400 mg iv bolus; topiramate 300–500 mg oral loading; perampanel 6–12 mg oral loading. Maintenance daily doses according to usual schedules for each AED. **Anesthetics. First-line: propofol 1–2 mg/kg iv bolus + 2–6 mg/kg/h iv maintenance, target burst-suppression guided by cEEG (60–70% BSR) ± midazolam. Second-line: thiopental 5–15 mg/kg iv bolus + 0.5–10 mg/kg/h iv maintenance, target burst-suppression guided by cEEG (60–70% BSR); ketamine 1.5–3 mg/kg iv bolus + 1–5 mg/kg/h iv maintenance, target typical ketamine pattern, no epileptiform discharges ± midazolam. BSR = burst suppression rate (% of time the waveform is isoelectric over the previous 60 s). iv = intravenous.

Neurological outcome of postanoxic refractory status epilepticus after aggressive treatment

Epilepsy Behav. 2019 Dec;101(Pt B):106374.

Prognostication was based on the first 5 days of cEEG monitoring

- **Benign EEG pattern:** continuous or reactive (or both) EEG background activity at any time point, with no episodes of SE or GPDs.
- **RSE pattern**: one or more episodes of RSE at any time point, with no episodes of GPDs < 2.5 Hz at any time, independently of EEG background activity.
- **GPD pattern**: one or more episodes of GPDs < 2.5 Hz at any time point, independently of EEG background activity or RSE.
- **Malignant nonepileptiform EEG pattern**: consistently discontinuous and unreactive EEG background activity, with no episodes of SE or GPDs at any time.

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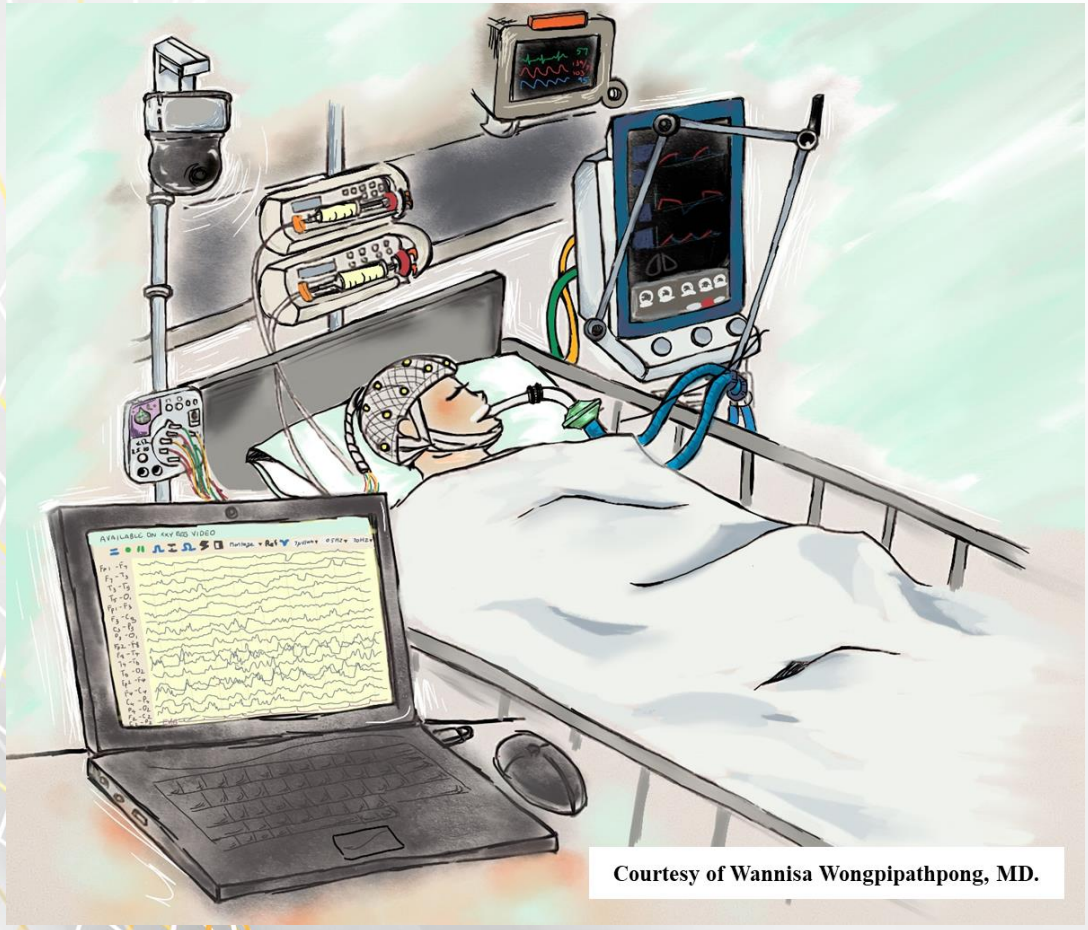
Survival and good neurological outcome(CPC* 1 or 2) at 6 months



continuous EEG (cEEG) monitoring applied on day 1

Benign EEG pattern (72.4% and 71.1%)

RSE pattern (54.3% and 44.4%)

GPD pattern (15.4% and 0%)

Malignant nonepileptiform EEG pattern (2.4% and 0%)

*Cerebral Performance Category (CPC) ranges from 1 (good cerebral performance) to 5 (brain death)

Epilepsy Behav. 2019 Dec;101(Pt B):106374.

Treatment of electroencephalographic status epilepticus after cardiopulmonary resuscitation (TELSTAR)

Study protocol for a randomized controlled trial

adult patients with postanoxic encephalopathy and electroencephalographic status epilepticus after successful cardiopulmonary resuscitation, admitted to the ICU, in whom continuous EEG monitoring is started within 24 hours after admission

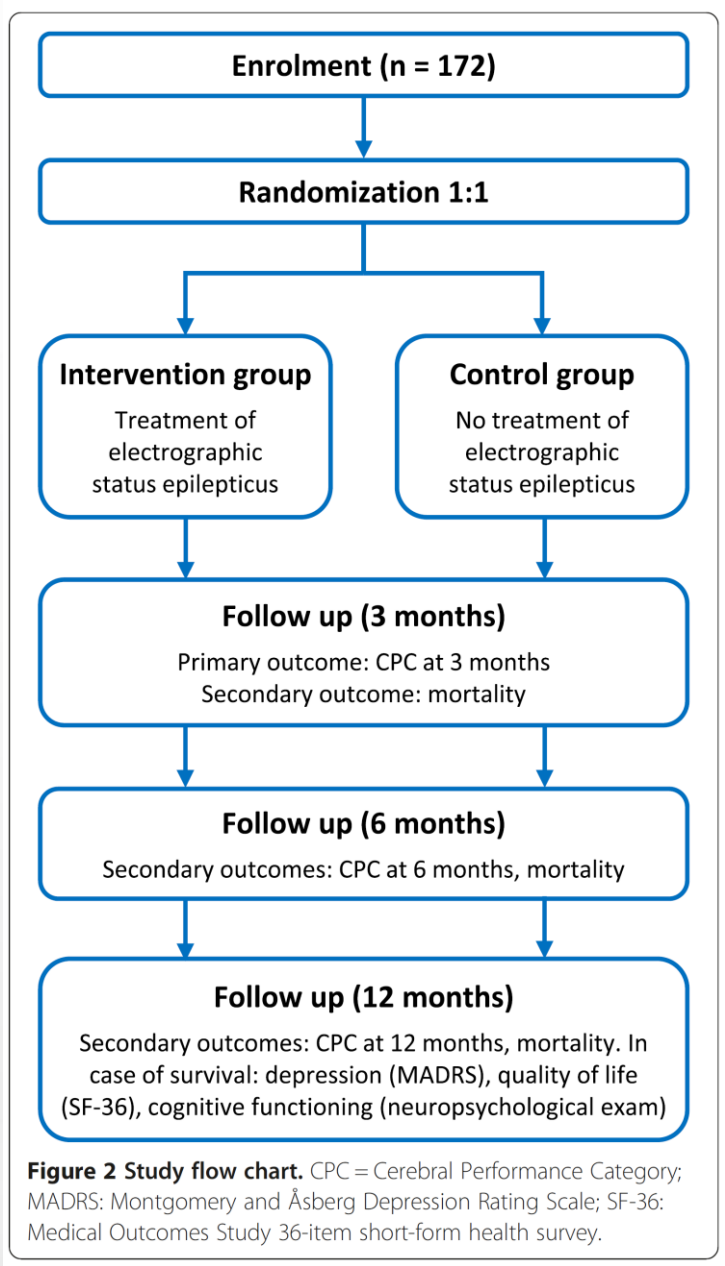


Figure 2 Study flow chart. CPC = Cerebral Performance Category; MADRS: Montgomery and Åsberg Depression Rating Scale; SF-36: Medical Outcomes Study 36-item short-form health survey.

http://clinicaltrials.gov/show/NCT02056236 Ruijter et al. Trials 2014, 15:433

Non-convulsive status epilepticus (NCSE)

Randomized trial of lacosamide versus fosphenytoin for nonconvulsive seizures (TRENdS)

- IV Lacosamide bolus of 400mg versus Fosphenytoin 20mg phenytoin equivalents (PE)/kg, both over 30 minutes

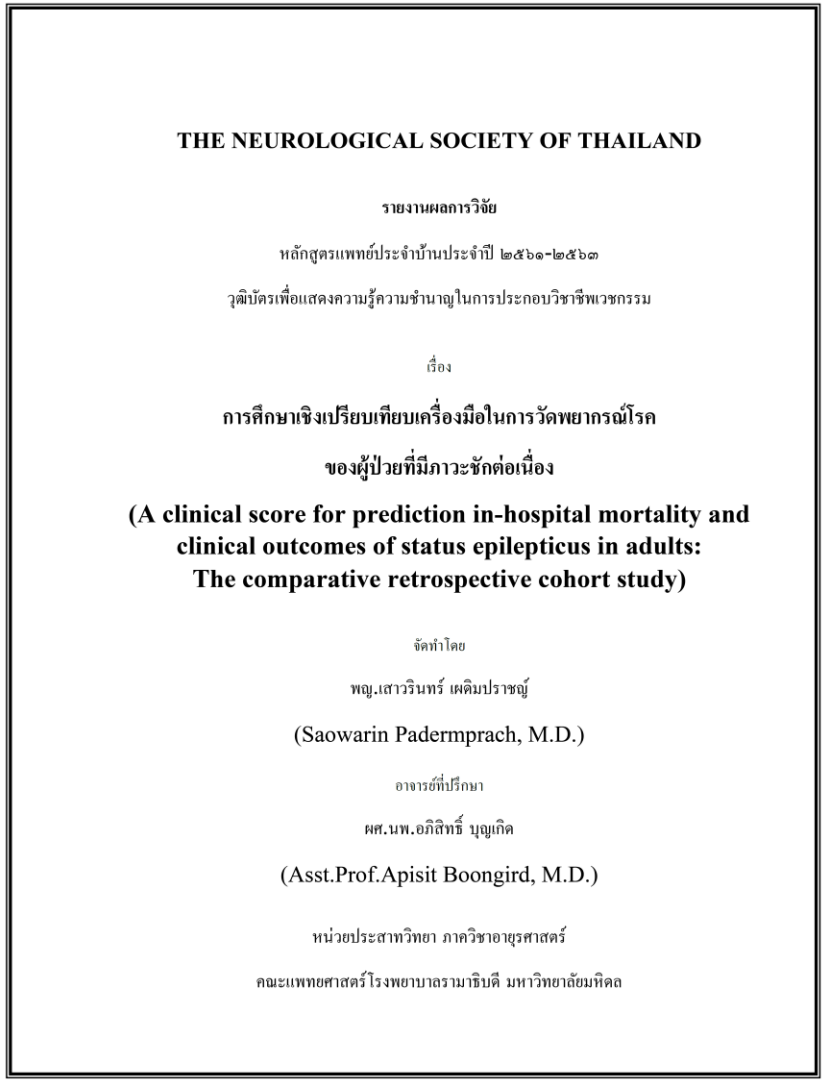
  - lacosamide was noninferior to fosphenytoin in the treatment of nonconvulsive seizures in patients on continuous electroencephalogram (EEG).

The Treatment of Recurrent Electrographic Nonconvulsive Seizures (TRENdS) study Ann Neurol 2018;83(06):1174–1185

Outcome predictors

Outcome predictors

	Year	References
Status epilepticus severity score (STESS)	2015	Clin Neurol Neurosurg. 2015 Dec;139:96-9.
Epidemiology-based Mortality score in SE (EMSE)	2015	Neurocrit Care. 2015 Apr;22(2):273-82.
END-IT score	2016	Crit Care. 2016 Feb 25;20:46.
Modified STESS (mSTESS)	2016	Eur J Neurol. 2016 Oct;23(10):1534-40.



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รายงานผลการวิจัย

หลักสูตรแพทย์ประจำบ้านประจำปี ๒๕๖๑-๒๕๖๓

วุฒิบัตรเพื่อแสดงความรู้ความชำนาญในการประกอบวิชาชีพเวชกรรม

เรื่อง

การศึกษาเชิงเปรียบเทียบเครื่องมือในการวัดพยากรณ์โรค

ของผู้ป่วยที่มีภาวะชักต่อเนื่อง

(A clinical score for prediction in-hospital mortality and clinical outcomes of status epilepticus in adults: The comparative retrospective cohort study)

จัดทำโดย

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(Saowarin Padermprach, M.D.)

อาจารย์ที่ปรึกษา

ผศ.นพ.อภิสิทธิ์ บุญเกิด

(Asst.Prof.Apisit Boongird, M.D.)

หน่วยประสาทวิทยา ภาควิชาอายุรศาสตร์

คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล

Abstract

Objective:

To compare the sensitivity and specificity of status epilepticus prognostic scores including STESS, mSTESS, and END-IT for predicting in-hospital mortality of status epilepticus(SE) patients.

Material and Methods:

This was a single-center, retrospective cohort analysis, conducted from Jan 2014 to Dec 2019 at Ramathibodi Hospital. The participants were diagnosed with SE and underwent continuous EEG monitoring. SE patients with postanoxic SE, incomplete data, no EEG data were excluded. Prognostic scores were calculated on each patient and ROC curves were performed at each score. In addition, the optimal cutoff values for each score were considered. The performances of the values were compared in bar chart.

Results:

A total of 119 patients were included in this study. Mean age was 59.76 years with the total of 58(48.7) men and 61(51.2) women. The worst SE types were 47 (39.4%) generalized convulsive SE, 65(54.6%) non convulsive SE in coma, and 7(5.8%) others. AUCs were similar for STESS(0.551;95%CI,0.442-0.661), mSTESS(0.583;95%CI,0.475-0.691) and END-IT (0.532;95%CI,0.425-0.640) for prediction of in-hospital mortality. However, the capacity of these 3 scores were still unsatisfactory for in-hospital mortality prediction due to the low AUCs. The optimal cutoff values were 4 for STESS, 5 for mSTESS, and 4 for END-IT with mSTESS optimal values showed the best performance from high PPV, NPV and sensitivity.

Conclusion:

The SE prognostic scores (STESS, mSTESS, END-IT) demonstrated similar results for predicting in-hospital mortality. Further studies on prognostic scores are suggested to facilitate the better clinical treatment decisions.

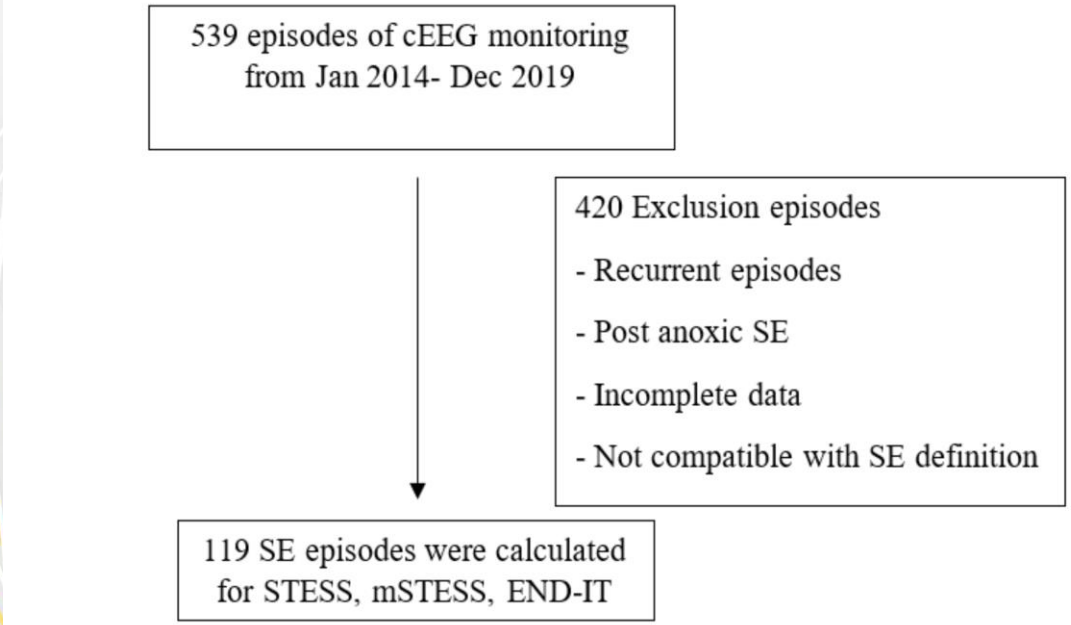

Fig.1 Flow chart. EEG, electroencephalography; SE, status epilepticus; STESS, Status Epilepticus Severity Score; mSTESS, modified Status Epilepticus Severity Score; END-IT, Encephalitis-NCSE-Diazepam resistance-Imaging abnormalities-Tracheal intubation

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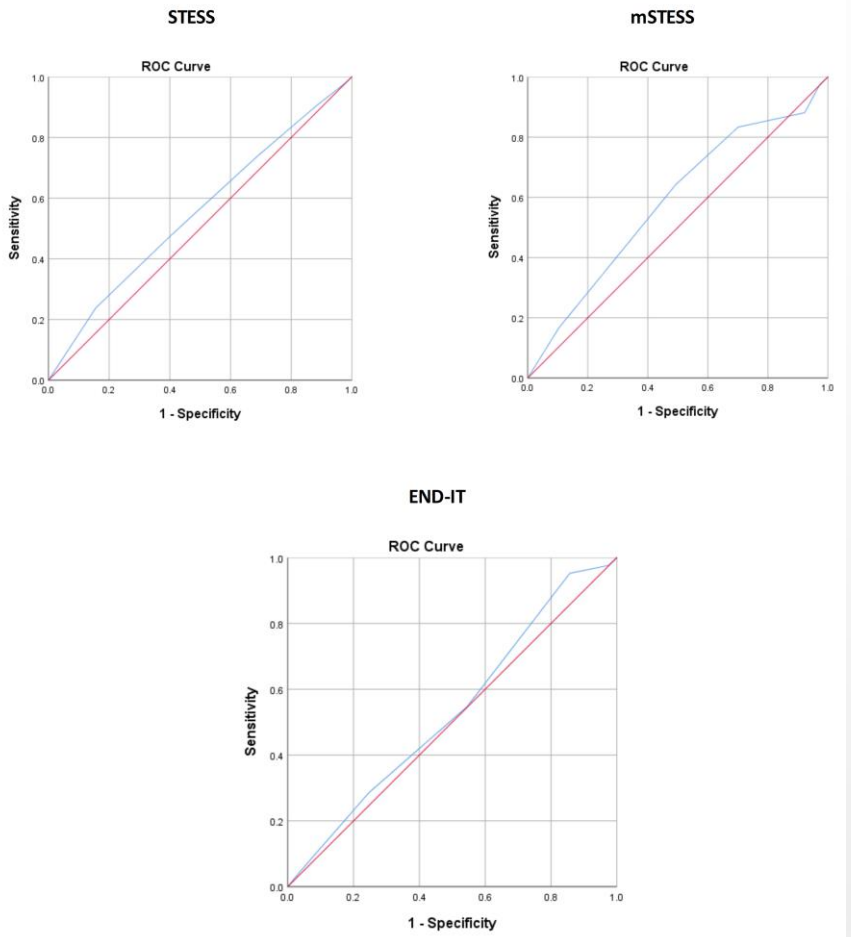

Fig. 2. Capacity of STESS, mSTESS, and END-IT to predict in-hospital mortality. STESS, Status Epilepticus Severity Score; mSTESS, modified Status Epilepticus Severity Score; END-IT, Encephalitis-NCSE-Diazepam resistance-Imaging abnormalities-Tracheal intubation

Score performance using optimal cut-off values for in-hospital mortality

The optimal cut-off values of the predictive score were 4 for STESS, 5 for mSTESS and 4 for END-IT score, respectively. With these selected cut-off values, mSTESS showed the highest PPV(0.39), NPV(0.77), and sensitivity(0.83), whereas END-IT showed the highest specificity (0.45). For the accuracy, mSTESS and END-IT cut-off values were similar(0.49). The performances of cut-off values were shown in figure3. From the comparison of these values, mSTESS cut-off value showed the highest tendency in the prediction of in-hospital mortality due to high PPV, NPV, and sensitivity. However, according to low AUCs of ROC curves shown above ,all of these cut-off values may not be suitable for predicting in-hospital mortality.

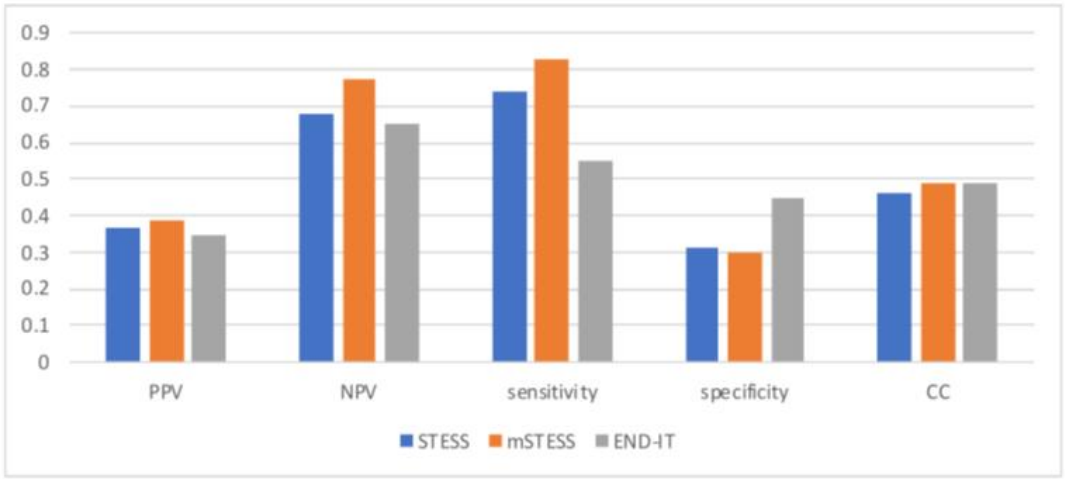

Fig. 3. The comparison bar chart for the performances of optimum cutoff points of STESS, mSTESS, END-IT. PPV, positive predictive value; NPV, negative predictive value; CC, correctly classified episodes.

Saowarin Padermprach, M.D.; Apisit Boongird, M.D.

Conclusions

- For the management of status epilepticus, time is the brain.

  - Time (t1) when a seizure is likely to be prolonged leading to continuous seizure activity

  - Time (t2), when a seizure may cause long term consequences (including neuronal injury, neuronal death, alteration of neuronal networks and functional deficits)

- Optimal management of AEDs in critically ill is challenging given altered physiology, polypharmacy, and nonpharmacological interventions. SE in critically ill requires a multidisciplinary approach.

Thank you