Optimizing ED Seizure & SE Patient Management: *A Useful SE Treatment Protocol*

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Global Objectives

- Improve pt outcome in seizures and SE
- Know how to quickly evaluate seizing pts
- Know clinically how to use protocols
- Provide rationale ED use of AEDs
- Facilitate useful disposition, documentation
- Improve Emergency Medicine practice

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Session Objectives

- Present a relevant patient case
- Discuss key clinical questions
- State key learning points
- Review the procedure of SE management
- Evaluate the patient outcome and ED documentation

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A Clinical Case

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Patient Clinical History

- 37 yo male
- EMS to ED
- Generalized seizure at home,
- CFD: IV diazepam, resolved
- Hx TBI (remote) as seizure etiology
- On Phenobarbital and Dilantin
- Non-compliant in past
- No recent illness

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ED Presentation

- Post-ictal in ED
- Non-focal neurological exam
- No evidence of trauma or toxicity
- More appropriate, answers OK
- Pt then has a recurrent generalized seizure

- Is this patient an outlier?
- What is his optimal management?

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Why Do This Exercise?

- Status epilepticus is a medical emergency
- Few hospitals utilize a SE protocol
- A SE protocol improves patient outcome
- Guidelines exist that facilitate practice
- These efforts improve patient care, minimize risk, and enhance clinical practice

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Key Clinical Questions

- What are the key diagnostic issues?
- How can ED patient Rx be optimized?
- What guidelines direct our therapy?
- What drugs must be available for use?
- How can these drugs best be used?
- Over what time period should SE Rx occur?
- How should this SE Rx be documented?

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ED Seizure/SE Patients: *Key Clinical Concepts*

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Seizure/SE Pathophysiology

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Status Epilepticus

- Seizure > 5- 10 minutes
- Two seizures, no lucid interval
- Assumes ongoing seizure activity when unresponsive

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SE Pathophysiology

- Early compensation meets increased CNS metabolic needs (SBP, CBF ↑↑)
- Failure at 40-60 min, (SBP, CBF ↓↓)
- CNS tissue necrosis, morbidity

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SE Pathophysiology

- Glutamate toxic mediator
- CNS necrosis even if systemic complications fully treated
- HTN, fever, rhabdomyolysis, hypercarbia, hypoxia, infection

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AMS in Seizures/SE

- Mental status should improve by 20-40 minutes
- If pt remains comatose, consider subtle SE & EEG
- Up to 20% of comatose seizure pts are in subtle SE

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Two Non-GCSE Types

- Non-convulsive SE:
  - –Absence SE
  - –Complex-partial SE
- Subtle SE:
  - –Late generalized convulsive SE
  - –Coma, persistent ictal discharge
  - –Very grave prognosis

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Subtle SE

- Severe insult, ie hypoxic
- Comatose
- Limited motor activity
- Mortality exceeds 50%
- Stop the seizure
- EEG confirmation

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Seizure/SE Treatment Protocols

SE Protocols

- Few published protocols
- Fewer studied protocols
- Limited evidence for single approach
- No other supporting data for one way

- Internet protocols exist
- Similar AEDs utilized
- Protocols provide guidance

VA Coop Study

- Treiman, NEJM 1998
- Four treatments, 20 min endpoint
- GCSE, non-convulsive SE terminated

- Lorazepam 65%, phenobarbital 58%
- Diazepam and phenytoin 56%
- Phenytoin alone inferior 44%
- No use of fosphenytoin

SE Review Article

- Lowenstein, NEJM 1998
- Timed AED therapy
- Lorazepam, a phenytoin, phenobarbital
- Midazolam or propofol infusion

- IV valproate not included in protocol
- Pentobarbital not an ED drug
- EMS: IM midazolam

Pediatric SE Protocol

- Status Epilepticus Working Party
- British protocol, *Arch Dis Child*, 2000
- Lorazepam, a phenytoin, paraldehyde
- General anesthesia

- Phenobarbital, IV valproate not included
- No clear relationship to US practice
- Adult SE protocol applies in US

ACEP Seizure/SE Clinical Policy

Evidence Strength

- Strength (Class) of evidence
  - I: Randomized, double blind interventional studies for therapeutic effectiveness; prospective cohort for diagnostic testing or prognosis
  - II: Retrospective cohorts, case control studies, cross-sectional studies
  - III: Observational reports; consensus reports
- Evidence strength downgraded if flawed methodologically

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Recommendation Strength

- Strength of recommendations:
  - A (Standard): High degree of certainty based on Class I studies
  - B (Guideline): Moderate clinical certainty based on Class II studies
  - C (Option): Inconclusive certainty based on Class III evidence, consensus

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Sz/SE: Phenytoin Loading

What are effective phenytoin dosing strategies for preventing seizure recurrence in patients who present to the ED with a sub-therapeutic serum phenytoin level?

(outcome measure: short term seizure recurrence)

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Sz/SE: Phenytoin Loading

- Level C recommendation:
  - Administer an intravenous or oral loading dose of phenytoin or intravenous or intramuscular fosphenytoin, and restart daily oral maintenance dosing.

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Sz/SE SE Therapeutics

What agent(s) should be administered to a patient in status who continues to seize despite a loading dose of a benzodiazepine and a phenytoin?

(outcome measure: cessation of motor activity)

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Sz/SE SE Therapeutics

- Level C recommendation:
  - Administer one of the following agents intravenously: "high-dose phenytoin," phenobarbital, valproic acid, midazolam infusion, pentobarbital infusion, or propofol infusion.

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Sz/SE: EEG Monitoring

When should an EEG be performed in the ED?

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Sz/SE: EEG Monitoring

- Level C recommendation:
  - Consider an emergent EEG for patients suspected of being in non-convulsive SE or in subtle convulsive SE, for patients who have received a long-acting paralytic, or for patients who are in a drug-induced coma.

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SeizureStat©

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Using SeizureStat©

- FERNE software
- Provides various data
  - Written seizure/SE information
  - Therapies for urgent ED use
  - ACEP clinical policy recommendations
- Free from www.ferne.org website

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A Perspective on Procedures

- Critically ill ED patients
- A medical emergency
- Limited time and resources
- A need to act
- "Emergency physicians take a surgeon's approach to medical emergencies."
- We do procedures

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ED Seizure/SE Therapy: *The Procedure*

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Driving Principles

- Diagnose SE and subtle SE
- Stop the seizure, minimize complications
- Use a benzodiazepine and a phenytoin
- Consider valproate if pt on PO Depakote
- Consider the use of phenobarbital
- Be able to infuse midazolam or propofol
- Get an EEG with persistent coma

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Seizure/SE Rx Procedure

- Evaluate globally all resuscitation needs

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Seizure/SE Rx Procedure

- Evaluate globally all resuscitation needs
- Administer a benzodiazepine x 4
  - Diazepam 5 mg q 2-5 min
  - Lorazepam 2 mg q 2-5 min
  - Midazolam 2-5 mg q 2-5 min

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Seizure/SE Rx Procedure

- Evaluate globally all resuscitation needs
- Administer a benzodiazepine x 4
  - Diazepam 5 mg q 2-5 min
  - Lorazepam 2 mg q 2-5 min
  - Midazolam 2-5 mg q 2-5 min
- Order a fosphenytoin bolus infusion

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Seizure/SE Rx Procedure

- Infuse fosphenytoin 1 gr PE in 7-10 min

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Seizure/SE Rx Procedure

- Infuse fosphenytoin 1 gr PE in 7-10 min
- Repeat fosphenytoin 1 gr infusion

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Seizure/SE Rx Procedure

- Infuse fosphenytoin 1 gr PE in 7-10 min
- Repeat fosphenytoin 1 gr infusion
- Order an IV valproate infusion

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Seizure/SE Rx Procedure

- Infuse fosphenytoin 1 gr PE in 7-10 min
- Repeat fosphenytoin 1 gr infusion
- Order an IV valproate infusion
- Infuse IV valproate 1500 mg over 5 min

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Seizure/SE Rx Procedure

- Infuse fosphenytoin 1 gr PE in 7-10 min
- Repeat fosphenytoin 1 gr infusion
- Order an IV valproate infusion
- Infuse IV valproate 1500 mg over 5 min
- Order phenobarbital for bolus infusion

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Seizure/SE Rx Procedure

- Infuse fosphenytoin 1 gr PE in 7-10 min
- Repeat fosphenytoin 1 gr infusion
- Order an IV valproate infusion
- Infuse IV valproate 1500 mg over 5 min
- Order phenobarbital for bolus infusion
- Infuse phenobarbital 100-200 mg q5 min x 5

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Seizure/SE Rx Procedure

- Prepare for endotracheal intubation
- Prepare to infuse midazolam or propofol
- Complete a head CT
- Consult a neurologist for EEG monitoring
- Disposition to the ICU
- Document the SE therapy, complications, and expected outcome

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ED Treatment and Patient Outcome

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ED Patient Management

- Lorazepam 2 mg IVP x 6 over 25 min
- "I think the IV is out…"
- Generalized seizure continues
- IV access re-established
- Fosphenytoin 1 gram PE over 10 min
- Fosphenytoin 500 mg PE over 5 min
- Seizure ended, pt remained obtunded

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ED Diagnostic Evaluation

- Non-contrast CT negative
- Metabolic tests normal
- Toxicology screening negative
- Sub-therapeutic phenytoin level
- Sub-therapeutic phenobarbital level

- Diagnosis: Status Epilepticus

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Patient Outcome

- EEG in ICU, within 120 minutes
- Neuro consultation, no subtle SE
- Patient awoke completely in 12 hours
- Discharged from the ICU the next day
- No morbidity related to SE
- Discharged home two days later
- Told to take his meds as prescribed
- Neurology follow-up one week later

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ED Seizure & SE Patient Rx: *A Retrospective*

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ED SE Patient Rx Timeline

- 0-20 min: ABCs, benzodiazepines
- 20-40 min: Phenytoins
- 40-60 min: Phenobarbital/valproate
- 60-80 min: Midazolam/propofol
- 80-120 min: CT, Neurology, EEG, ICU

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Questions??

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