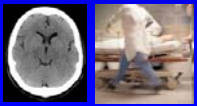



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**FERNE/MEMC Session:**

**Optimal Treatment of  
Neurological Emergencies  
Patients**



Edward P. Sloan, MD, MPH, FACEP



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**Featuring a Panel Discussion:**

**“Care of the Ill and  
Agitated Patient”**



Edward P. Sloan, MD, MPH, FACEP



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**2009 MEMC V Meeting**



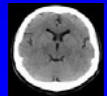
**Valencia, Spain  
16 September 2009**

Edward P. Sloan, MD, MPH, FACEP




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**Optimizing Seizure and  
SE Patient Management:  
Key Concepts &  
Clinical Policy Review**



Edward P. Sloan, MD, MPH, FACEP




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**Edward P. Sloan, MD, MPH**

**Professor**

**Department of Emergency Medicine  
University of Illinois at Chicago  
Chicago, Illinois**

Edward P. Sloan, MD, MPH, FACEP




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**Attending Physician  
Emergency Medicine**

**University of Illinois Hospital  
Swedish American Belvidere Hospital**

**Chicago, IL**

Edward P. Sloan, MD, MPH, FACEP



## Disclosures

- FERNE Chairman and President
- FERNE grants by industry
- Participation on industry-sponsored advisory boards and as lecturer in programs supported by industry
- ACEP Clinical Policy Committee
- 2009 MEMC Educational activities supported by an Educational Grant from Alexza Pharmaceuticals

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## Overview

- Seizure and SE patients are ill
- Care can easily be optimized
- Patient case presentation
- Review clinical policies
- Discuss how to learn
- Address obligations, options
- Conclude the case

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## A Seizure/SE Patient Case

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## Patient EMS Data

- 50?? yo male John Doe
- Generalized tonic-clonic seizure
- Chicago Fire Department
- Diazepam 5 mg IM, 15 mg IV
- Seizure continuous for 15 minutes +
- EMS to ED

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## Patient Clinical History

- Unknown meds
- Unknown medical history
- Hx Needs surgery next month ??
- EtOH ??
- Does not appear to be homeless
- Accucheck 119

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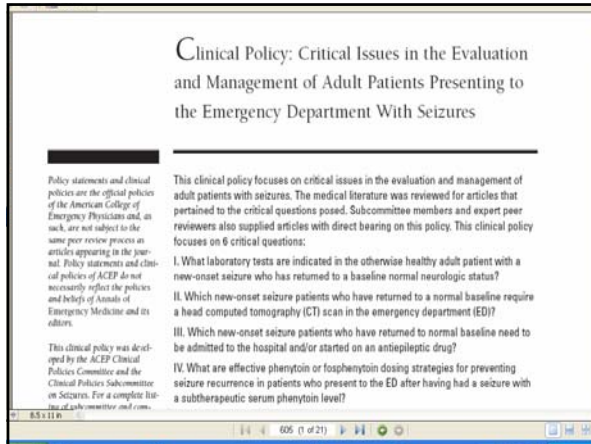


## ED Presentation

- Facial and shoulder twitching R
- Pt with gurgling BS
- Nasopharyngeal airway
- No evidence of trauma or toxicity
- IV access in neck
- Seizure x minutes

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## New Onset Sz: Lab Testing

- What lab tests are indicated in the otherwise healthy adult patient with a new onset seizure who has returned to a baseline normal neurological status?
- (Outcome measure: abnormal lab that changes management)

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## New Onset Sz: Lab Testing

- Level B recommendations:
  - Determine a serum glucose and sodium on patients with a first time seizure with no co-morbidities who have returned to their baseline
  - Obtain a pregnancy test in women of child bearing age
  - Perform a LP after a head CT either in the ED or after admission on patients who are immuno-compromised

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## New Onset Sz: Neuroimaging

- Which new onset seizure patients who have returned to a normal baseline require neuroimaging in the ED?
- (Outcome measure: abnormal CT)

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## New Onset Sz: Neuroimaging

- Level B recommendations:
  - When feasible, perform a head CT of the brain in the ED on patients with a first time seizure
  - Deferred outpatient neuroimaging may be utilized when reliable follow-up is available

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## New Onset Sz: Dispo/AED Use

- Which new onset seizure patients who have returned to normal baseline need to be admitted to the hospital and / or started on an AED?
- (Outcome measure: short term morbidity or mortality)

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## New Onset Sz: Dispo/AED Use

- Level C recommendations:
  - Patients with a normal neurological examination can be discharged from the ED with outpatient follow-up
  - Patients with a normal neurological examination and no co-morbidities and no known structural brain disease do not need to be started on an anti-epileptic drug in the ED

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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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## ACEP Summary

- Evidence based clinical policies are useful tools in clinical decision making
- Policy does not create a “standard of care”
- Provides a foundation for clinical practice at a national level

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## ACEP Summary

- The current literature does not support the creation of any “level A” recommendations
  - 2 of the 6 clinical questions have sufficient evidence to support “level B” recommendations
  - 4 of 6 recommendations are “level C”

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## Postscript

- What does the policy tell us, and how does it help us?
- What is relevant years later?
- Why should we care?

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## New Onset Seizure Patients

- Assure normal mental status
- Individualized care
- No risk
- Do the right thing
- Optimize patient outcome

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## Phenytoin Loading

- Choose a method that is useful
- Individualized care
- No risk
- Do the right thing
- Optimize patient outcome

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## Phenytoin Loading

- May impact long term AED choice over the short term
- This is a secondary concern
- Document partial seizure onset
- Inform the neurologist
- Consider consultation prior to loading with any AED

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## Refractory SE

- Optimize benzodiazepines use
- Use a phenytoin when indicated
- Other drugs then equal in efficacy
- Some choose general anesthesia
- Burst suppression
- IV midazolam, IV propofol

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## EEG Use

- To diagnose subtle SE
- When pt sedated, intubated
- Non-responsive without sedation
- Schedule for the ICU ASAP
- Duty of the neurologist and institution to provide this diagnostic test in a timely manner

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## This Clinical Policy

- This policy creates value for the practitioner
- No liability in variability, as long as something happens according to plan in support of the patient
- Your lawyers (and you) will be helped the most by reviewing and using this policy

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## Subsequent Policies

- 1993 EFA SE Guidelines in JAMA
- ~2000 attempt to revise
- Use only class I data, from RCCTs
- Only one publication
- VA cooperative study (*NEJM*, 1998)
- Proposes benzodiazepines
- Then it's dealer's choice (+ / -)
- No revision to date

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The New England Journal of Medicine

### A COMPARISON OF FOUR TREATMENTS FOR GENERALIZED CONVULSIVE STATUS EPILEPTICUS

DAVID M. TREIMAN, M.D., PATRICK D. MEYERS, M.P.A., NANCY Y. WALTON, Ph.D., JOSEPH F. COLLINS, Sc.D., CINDY COLLINS, R.Ph., M.S., A. JAMES ROWAN, M.D., ADRIAN HANDFORTH, M.D., EDWARD FAUGHT, M.D., VINCENT P. CALABRESE, M.D., BASIM M. UTHMAN, M.D., R. EUGENE RAMSAY, M.D., AND MEENAL B. MAMDANI, M.D., FOR THE VETERANS AFFAIRS STATUS EPILEPTICUS COOPERATIVE STUDY GROUP\*

#### ABSTRACT

**Background and Methods** Although generalized convulsive status epilepticus is a life-threatening emergency, the best initial drug treatment is uncertain. We conducted a five-year randomized, double-blind, multicenter trial of four intravenous regimens: diazepam (0.15 mg per kilogram of body weight) followed by phenytoin (18 mg per kilogram), lorazepam (0.1 mg per kilogram), phenobarbital (15 mg per kilogram), and phenytoin (18 mg per kilogram). Patients were classified as having either overt generalized status epilepticus (defined as easily visible generalized convulsions) or subtle status epilepticus (indicated by coma and ictal discharges on the electroencephalogram, with or without subtle convulsive

**S**TATUS epilepticus is a life-threatening emergency that affects 65,000<sup>1</sup> to 150,000<sup>2</sup> people in the United States each year. Generalized convulsive status epilepticus is the most common and most dangerous type.

Phenobarbital,<sup>3,5</sup> phenytoin,<sup>6-14</sup> diazepam plus phenytoin,<sup>15,16</sup> and lorazepam<sup>17,28</sup> have been advocated for the initial treatment of generalized convulsive status epilepticus, and each is used by a substantial number of physicians.<sup>3</sup> There are few data from controlled trials, however, to document the efficacy of these treatments, and they have not been directly compared. We therefore undertook this study to compare the efficacy of standard doses of these four drugs


## Big Picture

- It's time to review the clinical policy
- There are no new data to support our clinical care or the policy
- Industry only will support research
- Exception to informed consent
- NETT is one source of optimism
- There will be no short term change in our treatment paradigm

Edward P. Sloan, MD, MPH, FACEP 


## What Should You Do?

- Learn and know more
- Know your clinical options
- Treat efficiently and effectively
- Document well

Edward P. Sloan, MD, MPH, FACEP 

## Learn and Know More

- Read the ACEP clinical policy
- Learn at the *FERNE.org* website
- Read relevant clinical review articles
- Go to *Guidelines.gov*
- Read a clinical policy summary

Edward P. Sloan, MD, MPH, FACEP 

### Clinical Policy: Critical Issues in the Evaluation and Management of Adult Patients Presenting to the Emergency Department With Seizures

*Policy statements and clinical policies are the official policies of the American College of Emergency Physicians and, as such, are not subject to the same peer review process as articles appearing in the journal. Policy statements and clinical policies of ACEP do not necessarily reflect the policies and beliefs of Annals of Emergency Medicine and its editors.*

This clinical policy was developed by the ACEP Clinical Policies Committee and the Clinical Policies Subcommittee on Seizures. For a complete list of subcommittee members, visit [www.acep.org](http://www.acep.org).


This clinical policy focuses on critical issues in the evaluation and management of adult patients with seizures. The medical literature was reviewed for articles that pertained to the critical questions posed. Subcommittee members and expert peer reviewers also supplied articles with direct bearing on this policy. This clinical policy focuses on 6 critical questions:


- What laboratory tests are indicated in the otherwise healthy adult patient with a new-onset seizure who has returned to a baseline normal neurologic status?
- Which new-onset seizure patients who have returned to a normal baseline require a head computed tomography (CT) scan in the emergency department (ED)?
- Which new-onset seizure patients who have returned to normal baseline need to be admitted to the hospital and/or started on an antiepileptic drug?
- What are effective phenytoin or fosphenytoin dosing strategies for preventing seizure recurrence in patients who present to the ED after having had a seizure with a subtherapeutic serum phenytoin level?

85 x 116 605 (1 of 21)

### Education

## Web-based Learning: Website




[www.ferne.org](http://www.ferne.org) Edward P. Sloan, MD, MPH, FACEP 

### Education

## Web-based Learning: Video Slideshows

- Audio, video and slide content
- Able to access individual slides, specific content
- MS Producer, viewable with Windows Media Player



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 Foundation for Education and Research  
 in Neurological Emergencies

"Dedicated to improving the care of  
 with neurological emergencies  
 10 Year Anniversary 1997-2007

**ACEP Clinical Policy: Critical Issues in the Evaluation and Management of Adult Patients Presenting to the Emergency Department with Seizures**

Dr. Edward P. Sloan, MD, MPH, FACEP  
 Professor  
 Department of Emergency Medicine  
 University of Illinois at Chicago  
 Chicago, IL

[Meeting Main Page](#) [FERNE Homepage](#)  
[ACEP Seizure Clinical Policy](#)  
[PowerPoint Presentation](#)  
[Color Printable Slideshow](#)  
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Supported by Genentech, Inc, EMM Therapeutics, Inc and The Medicine Company.

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 Foundation for Education and Research  
 in Neurological Emergencies

"Dedicated to improving the  
 with neurological emergencies  
 10 Year Anniversary 1997-2007

**Managing ED Seizure and SE Patients:  
 When Do We Use Which Parenteral Antiepileptic Drugs, and Does It Depend on Oral AED Use?**

Edward P. Sloan, MD, MPH, FACEP  
 Professor  
 Department of Emergency Medicine  
 University of Illinois at Chicago  
 Chicago, IL

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[Workshop workbook](#) [Workbook answers](#)

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Seizure workshop supported by Ortho-McNeil Neurologics, Inc.

FERNE: Seizure, SE Pt Workshop Workbook Page 1 of 14

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 in Neurological Emergencies

**Treating Emergency Department Seizure and Status Epilepticus Patients: Optimal Treatment Workshop**

**Non-IV Parenteral AEDs**

1. List 5 anti-epileptic drugs (AEDs) that can be given intramuscular (IM) in an actively seizing patient.

- 1.
- 2.
- 3.

**EMERGENCY MEDICINE PRACTICE**  
 EBMEDICINE.NET  
 AN EVIDENCE-BASED APPROACH TO EMERGENCY MEDICINE

October 2006  
 Volume 8, Number 10

**The Swollen Extremity: A Systematic Approach To The Evaluation Of A Common Complaint**

It is another busy night in the emergency department; five admitted patients are waiting for beds and three patients are waiting for CT scans. Space and resources are limited. Your next patient is an obese, 35-year-old female visitor from Australia with no known medical problems. She tells you that she never comes to the emergency room, but decided to come in tonight because the pain in her right leg was keeping her awake. She has had mild to moderate pain in both knees "for a long time," but for the last two days her right lower leg has been progressively painful and swollen. She has been staying off her feet and taking ibuprofen, but the pain and swelling are not getting better. She also complains of a mild discomfort in her chest which she can not characterize. Her blood pressure is 140/90 mmHg, pulse is 100, respiratory rate is 20, temperature is 37.2°C, and her oxygen saturates to 98% on 2L O2. You note that her right ankle is mildly red and

**Authors**  
 Veronica Hileczuk, MD, FACEP  
 Attending Physician, Emergency Medicine, Assistant Clinical Professor, Columbia University Medical Center, New York Presbyterian Hospital, New York, NY.  
 Muhammad Wasseem, MD  
 Attending Physician, Emergency Medicine (Clinical Pediatrics), Assistant Clinical Professor, Weill Medical College of Cornell University, Lincoln Medical & Mental Health Center, Bronx, NY.  
 Ahsan Hyyeen, MD  
 Attending Physician, Emergency Medicine, Cabrini Medical Center, New York, NY.

**Peer Reviewers**  
 Marie-Carmelle Elie, MD  
 Assistant Professor, Division of Emergency Medicine, Division of Critical Care, Director of Emergency Critical Care, UMDNJ-University Hospital, Scotch Plains, NJ.  
 Nicholas Genes, MD, PhD

**PEDIATRIC EMERGENCY MEDICINE PRACTICE**  
 AN EVIDENCE-BASED APPROACH TO PEDIATRIC EMERGENCY MEDICINE EBMEDICINE.NET

July 2007  
 Volume 4, Number 7

**Fever Caused By Occult Infections In The 3-To-36-Month-Old Child**

Author  
 Timothy G. Givens, MD  
 Associate Professor of Emergency Medicine & Pediatrics, Vanderbilt University Medical Center, Nashville, TN

**Peer Reviewers**  
 Jeffrey Aron, MD  
 Professor of Clinical Pediatrics, Albert Einstein College of Medicine, Chief, Pediatric Emergency Service, Children's Hospital at Montefiore, Bronx, NY  
 Andrew DePiero, MD  
 Attending Physician, Division of Emergency Medicine, Alfred I. duPont Hospital for Children, Wilmington, DE  
 Assistant Professor of Pediatrics, Jefferson Medical College, Philadelphia, PA  
 Martin L. Hoffman, MD, FAAP, FACEP  
 Professor of Pediatrics, Division of Critical Care and Emergency Services, UT Health Sciences School of Medicine, Cordova, TN

**CME Objectives**  
 Upon completing this article, you should be able to:  
 1. Review and critically appraise existing pediatric

National Guideline Clearinghouse  
 www.guideline.gov

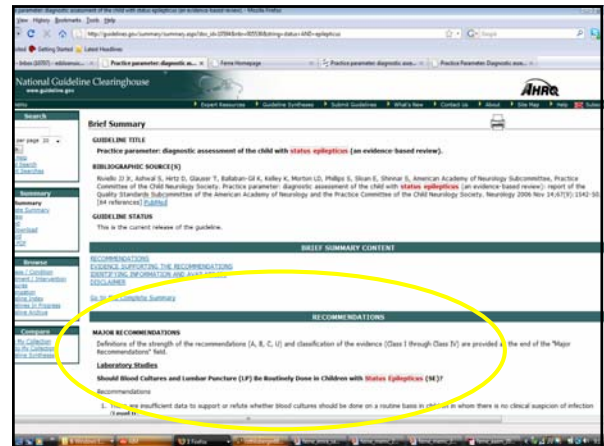
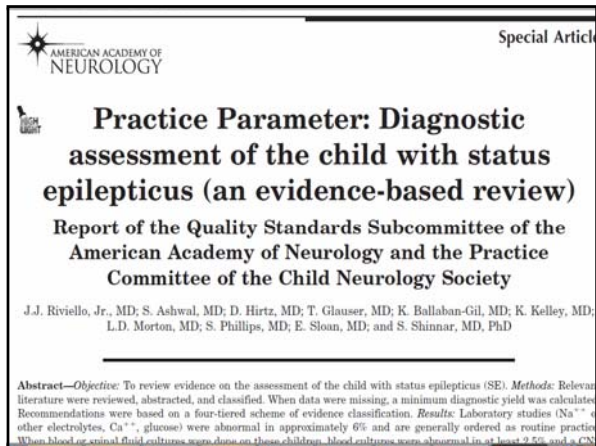
Search Results  
 Results per page: 20

Search criteria:  
 Keyword: status epilepticus

Your search found 17 related guidelines, which are listed below by relevance. Use the "Limit" buttons to narrow your search.

Items 1 to 17

- Practice parameter: diagnostic assessment of the child with status epilepticus. Lenox Hill Neurology Society - Medical Specialty Society. 2006 Nov. 9 pages. NGC:005536
- Diagnosis and management of status epilepticus in adults. A national clinical guideline. Scottish Intercollegiate Guidelines Network - National Government Agency (National Government Agency [Non-U.S.]). 2004 Oct. 525 pages. NGC:009925
- The diagnosis and management of the epilepsies in adults and children in primary and secondary care. National Government Agency [Non-U.S.]. 2004 Oct. 525 pages. NGC:009925
- Use of serum prolactin in diagnosing epileptic seizures. Report of the Therapeutics and Practice Committee of the American Academy of Neurology - Medical Specialty Society. 2005 Sep. 8 pages. NGC:005536



## Know Your Clinical Options

- Know if your institution has a policy or guideline that directs your care
- Know what meds are available to you, and how to get them to the pt
- Know your consultants, and how to get a hold of them
- Know when & how to get an EEG done

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## A Proposed Protocol


- 0-20 min: Initial evaluation and benzos
- 20-40 min: Fosphenytoin infusions
- 40-60 min: Phenobarbital or valproate infusions (levetiracetam?)
- 60-90 min: Continuous infusion AEDs
- 90-120 min: CT, neuro consult
- 120-150 min: ICU, EEG monitoring

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## Treat Efficiently & Effectively


- Look at the clock, watch time go by
- Know what therapies you will use
- Use therapies serially
- Order and plan therapies in parallel
- Make the seizure stop


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Education  
**Handheld Software: SeizureStat®**

SeizureStat® Available free from [www.ferne.org](http://www.ferne.org)

- Written at University of Illinois, Chicago
- Funded by FERNE
- Written materials
- Urgent SE protocol
- Information on 10 urgent meds



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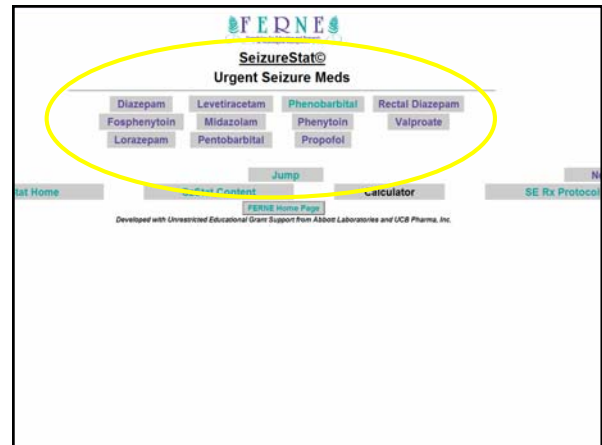


**SeizureStat®**  
**SeizureStat Content**

Written Information   ACEP Clinical Policy  
 Urgent Seizure Meds   Stat SE Rx Protocol  
 Seizure Therapeutics

Back   Jump   Next  
 SeizureStat Home   FERNE Home Page   SE Rx Protocol

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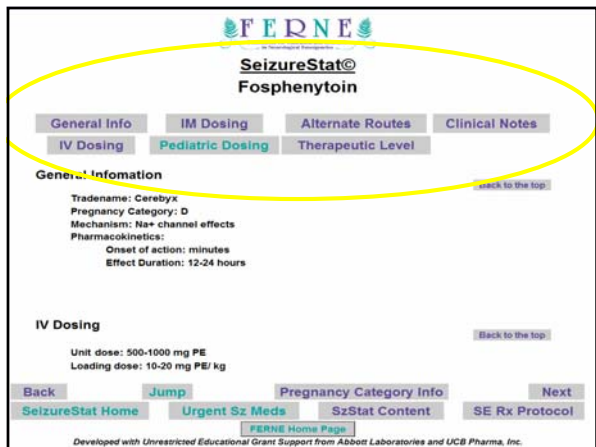
**SeizureStat®**  
**Urgent Seizure Meds**

Diazepam   Levetiracetam   Phenobarbital   Rectal Diazepam  
 Fosphenytoin   Midazolam   Phenytoin   Valproate  
 Lorazepam   Pentobarbital   Propofol

Jump

Back Home   SeizureStat Content   FERNE Home Page   Calculator   SE Rx Protocol

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**SeizureStat®**  
**Fosphenytoin**

General Info   IM Dosing   Alternate Routes   Clinical Notes  
 IV Dosing   Pediatric Dosing   Therapeutic Level

**General Information** Back to the top

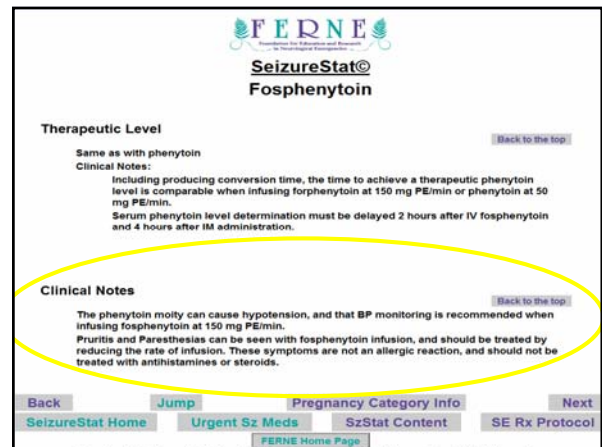
Tradename: Cerebyx  
 Pregnancy Category: D  
 Mechanism: Na<sup>+</sup> channel effects  
 Pharmacokinetics:  
 Onset of action: minutes  
 Effect Duration: 12-24 hours

**IV Dosing** Back to the top

Unit dose: 500-1000 mg PE  
 Loading dose: 10-20 mg PE/ kg

Back   Jump   Pregnancy Category Info   Next  
 SeizureStat Home   Urgent Sz Meds   SzStat Content   SE Rx Protocol

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**SeizureStat®**  
**Fosphenytoin**

**Therapeutic Level** Back to the top

Same as with phenytoin  
 Clinical Notes:  
 Including producing conversion time, the time to achieve a therapeutic phenytoin level is comparable when infusing fosphenytoin at 150 mg PE/min or phenytoin at 50 mg PE/min.  
 Serum phenytoin level determination must be delayed 2 hours after IV fosphenytoin and 4 hours after IM administration.

**Clinical Notes** Back to the top

The phenytoin moiety can cause hypotension, and that BP monitoring is recommended when infusing fosphenytoin at 150 mg PE/min.  
 Pruritis and Paresthesias can be seen with fosphenytoin infusion, and should be treated by reducing the rate of infusion. These symptoms are not an allergic reaction, and should not be treated with antihistamines or steroids.

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## Therapy Administration

- Order one medication
- Deliver the medication
- Order the next medication while administering the first one
- Repeat
- Make the seizure stop



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## Document Well: Medical

- Seizure history? Medical History?
- Partial seizure onset (aura)?
- Generalized seizure activity?
- AMS, post-ictal?
- Trauma? Toxins? Pregnancy?
- Neurological exam? Repeat exam?
- Family, PMD, EMS?

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## Document Well: Systems

- How was secondary injury prevented?
- How did your consultants assist you?
- How did you get your medications?
- How was AMS / coma addressed?
- How were CT, EEG quickly obtained?
- How was disposition optimized?

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## ED Patient Outcome

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## ED Patient Management

- Lorazepam 2 mg IVP x 5 over 10 minutes
- Persistent facial and R shoulder activity
- AMS: generalized seizure continues
- Fosphenytoin 1 gram PE over 10 min x 2
- Seizure ended, pt remained obtunded
- Intubation immediately followed
- Lidocaine, sux, rocuronium

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## ED Diagnostic Evaluation

- Non-contrast CT: Prior strokes, atrophy
- Metabolic tests normal
- Toxicology screening negative
- Phenytoin level cancelled
- Diagnoses:
  - AMS
  - Status Epilepticus
  - Respiratory Failure

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## Family Arrives, Pt History

- Pt with history refractory seizures
- Hx carotid artery occlusion R
- Due for carotid endarterectomy
- Phenobarbital & dilantin, compliant
- Prior history of SE treated at UIC
- No recent illness, trauma, EtOH
- No medic alert bracelet

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## Patient Outcome

- EEG in ED, within 150 minutes
- Neuro consultation, no subtle SE
- Admit to Neuro ICU
- Repeated doses of rocuronium
- Final disposition for carotid Rx

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## Conclusions

- Status epilepticus: medical emergency
- Take a surgeon's approach to Rx
- Know the disease and your options
- Guidelines exist that facilitate practice
- Utilize a treatment protocol
- Address the medical, systems issues
- Optimize SE patient outcomes

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## Questions?

[www.FERNE.org](http://www.FERNE.org)

[edsloan@uic.edu](mailto:edsloan@uic.edu)

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