Current Guidelines For Management Of Seizures In The Emergency Department

In this issue of EM Practice Guidelines Update, 3 practice guidelines that address the management of seizures are reviewed. The recommendations within the 3 documents focus on decisionmaking around the patient with seizures refractory to first-line therapy, the management of patients with an unprovoked first seizure, and options for anticonvulsant drug delivery.

Status epilepticus complicates up to 7% of seizures in the emergency department (ED), with a significant mortality rate.1 Patients with ongoing seizures demand immediate general resuscitative and specific therapeutic maneuvers; good evidence exists to direct clinicians in managing these dangerous presentations. Stable seizure patients commonly seek emergency care for first-time seizures, breakthrough seizures, or unrelated complaints that affect their ongoing anticonvulsant therapy. High-quality trials examining issues that arise in the care of these patients are few; however, consensus-based recommendations offer guidance to clinicians navigating controversial testing and treatment scenarios.

Practice Guideline Impact
- Intravenous (IV) lorazepam is first-line therapy for active seizures. Patients who continue to seize after 2 benzodiazepine doses should be treated with propofol or barbiturates.
- Diagnostic lumbar puncture is indicated in immunocompromised patients with an unprovoked first seizure.
- EEG monitoring is indicated to rule out nonconvulsive status epilepticus in patients receiving aggressive therapy for generalized convulsive status epilepticus.
This document was developed by a group of neurologists organized by the American Academy of Neurology (AAN) in collaboration with the American Epilepsy Society; the methodology is adapted from the AAN Clinical Practice Guideline Process Manual.3 The group identified 5 questions based on a literature search from 1966 to 2004, and it was carried out according to explicit criteria. Article inclusion and exclusion criteria are specified and selected details around the review process are described.

Evidence was evaluated for quality according to predefined, specified criteria and assigned to 1 of 4 classes (I, II, III, IV). Recommendations were graded at 4 levels: A, B, C, U, based primarily on the strength of evidence for each question. Level A: established as true; Level B: probably true; Level C: possibly true; Level U: data inadequate or conflicting. The target provider population is not defined. The Practice Parameter applies to adults 18 years of age and older presenting with a first unprovoked seizure (ie, excluding patients with diagnosed seizure disorders and seizures resulting from an obvious cause such as trauma and stroke).

The Conflict of Interest statement notes “Drafts of the guidelines have been reviewed by at least 3 AAN committees, a network of neurologists, Neurology peer reviewers, and representatives from related fields,” and “The AAN forbids commercial participation in, or funding of, guideline projects.” The authors report no conflicts of interest. The following questions and recommendations are abstracted from the Practice Parameter. To view the original document in its entirety, click here: http://www.neurology.org/cgi/reprint/69/21/1996

In an adult presenting with an apparently unprovoked first seizure, should an EEG be ordered routinely?

**Recommendation 1 (Level B):** For an adult with an apparent unprovoked first seizure, the EEG should be considered as part of the neurodiagnostic evaluation, because it has a substantial yield.

**Recommendation 2 (Level B):** For an adult with an apparent unprovoked first seizure, the EEG should be considered as part of the neurodiagnostic evaluation because it has value in determining risk of seizure recurrence.

In an adult presenting with an apparent unprovoked first seizure, should a brain imaging study (CT, MRI) be routinely ordered?

**Recommendation 3 (Level B):** For an adult presenting with an apparent unprovoked first seizure, brain imaging studies using CT or MRI should be considered as part of the neurodiagnostic evaluation.

In an adult presenting with an apparent unprovoked first seizure, should blood counts, blood glucose, and electrolyte panels be routinely ordered?

**Recommendation 4 (Level U):** There are insufficient data to support or refute routine recommendation of laboratory tests such as blood glucose, blood counts, and electrolyte panels for an adult presenting with an apparent unprovoked first seizure, though they may be helpful in specific clinical circumstances.

In an adult presenting with an apparent unprovoked first seizure, should lumbar puncture be routinely performed?

**Recommendation 5 (Level B):** There are insufficient data to support or refute recommending routine lumbar puncture in the adult initially presenting with an apparent unprovoked first seizure; however, in special clinical circumstances (eg, febrile patients), it may be helpful.

In an adult presenting with an apparent unprovoked first seizure, should toxicologic screening be routinely ordered?

**Recommendation 6 (Level B):** There are insufficient data to support or refute a routine recommendation for toxicology screening; however, it may be helpful in specific clinical circumstances.
Clinical Policy: Critical Issues In The Evaluation And Management Of Adult Patients Presenting To The Emergency Department With Seizures. ¹

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his document was developed by a committee and subcommitte organized and funded by the American College of Emer-
gency Physicians (ACEP). Panel members are listed; their affiliations/qualifications are not. The group identified 6 critical ques-
tions and utilized an explicit strategy for their literature search and review. Evidence was evaluated for quality according to predefined criteria and sorted into 4 classes (I, II, III, or X-fatally flawed). Recommendations were graded based on the strength of evidence for each question: A: high degree of certainty; B: moderate degree of cer-
tainty; C: based on preliminary, inconclusive, or conflicting evidence or panel consensus. Disclosures were reported for the subcommittee for this policy. The policy targets clinicians working in hospital-based EDs. The guidelines presented in the policy apply to adult patients presenting to the ED with seizures. Pediatric patients are excluded.

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?

Recommendation 1 (Level B): Determine a serum glucose and sodium level on patients with a first-time seizure with no comorbidities who have returned to their baseline.

Recommendation 2 (Level B): Obtain a pregnancy test if a woman is of childbearing age.

Recommendation 3 (Level B): Perform a lumbar puncture, after a head computed tomography (CT) scan, either in the ED or after admission, on patients who are immunocompromised.

Which new-onset seizure patients who have returned to a normal baseline require a head CT scan in the ED?

Recommendation 4 (Level B): When feasible, perform a neuroimaging of the brain in the ED on patients with a first-time seizure.

Recommendation 5 (Level B): Deferred outpatient neuroimaging may be used when reliable follow-up is available.

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?

Recommendation 6 (Level C): Patients with a normal neurologic examination can be discharged from the ED with outpatient follow-up.

Recommendation 7 (Level C): Patients with a normal neurologic examination, no comorbidities, and no known structural brain disease do not need to be started on an antiepileptic drug in the ED.

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?

Recommendation 8 (Level C): Administer an intravenous or oral loading dose of phenytoin or intravenous or intramuscular fosphenytoin, and restart daily oral maintenance dosing.

What agent(s) should be administered to a patient in status epilepticus who continues to seize after having received benzodiazepine and phenytoin?

Recommendation 9 (Level C): Administer 1 of the following agents intravenously: “high-dose phenytoin,” phenobarbital, valproic acid, midazolam infusion, pentobarbital infusion, or propofol infusion.

When should EEG testing be performed in the ED?

Recommendation 10 (Level C): Consider an emergent EEG in patients suspected of being in nonconvulsive status epilepticus or in subtle convulsive status epilepticus, patients who have received a long-acting paralytic, or patients who are in a drug-induced coma.

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Initial pharmacological treatment of generalized convulsive status epilepticus (GCSE)

Recommendation 2 (Level A): Treat partial status epilepticus and GCSE with lorazepam 4 mg IV; repeat in 10 minutes if seizures persist. Phenytoin 15 to 18 mg/kg or equivalent fosphenytoin is recommended "if necessary." An alternate regimen is diazepam 10 mg IV followed by phenytoin 15 to 18 mg/kg or equivalent fosphenytoin; repeat diazepam in 10 minutes if seizures persist.

Pharmacological treatment for refractory GCSE and subtle status epilepticus

Recommendation 3 (Level GPP): Infuse anesthetic doses of midazolam, propofol, or barbiturates titrated against an EEG burst suppression pattern. Initiate treatment with non-sedating antiepileptic agents simultaneously. Thiopental: 100 to 200 mg bolus over 20 seconds with 50 mg boluses every 2 to 3 minutes until seizures are controlled, then infusion 3 to 5 mg/kg/hr. Pentobarbital: 10 to 20 mg/kg bolus followed by an infusion of 0.5 to 3 mg/kg/hr. Midazolam: 0.2 mg/kg bolus followed by an infusion of 0.1 to 0.4 mg/kg/hr. Propofol: 2 mg/kg bolus followed by an infusion of 5 to 10 mg/kg/hr.

Pharmacological treatment for non-convulsive status epilepticus (NCSE)

Recommendation 4 (Level GPP): Ongoing NCSE is less dangerous than GCSE; therefore, non-anesthetizing anticonvulsants may be tried initially. Phenobarbital: 20 mg/kg IV. Valproic acid: 25 to 45 mg/kg IV infused at a maximum rate of 6 mg/kg/min.
Another AAN Practice Parameter published in the same issue as the guideline abstracted here looked specifically at the utility of brain CT in the ED in various populations of patients who present with seizure.\textsuperscript{6} Their conclusions are similar to the recommendations made in the abstracted report on evaluating the first seizure; in addition, the panel makes a class II recommendation that patients who present with chronic seizures are more likely to have an abnormal brain CT if there is an abnormal neurologic examination, a predisposing history of neurologic disease, or a focal seizure onset.

The EEG provides important information regarding prognosis and seizure classification; however, it is not required in the ED when dangerous etiologies of seizure have been ruled out and the patient has returned to clinical baseline. The chief indications for performing an emergent EEG are to assess the patient paralyzed and intubated for status epilepticus, and to rule out nonconvulsive status epilepticus in the patient with altered mentation, especially in patients who do not return to baseline after a generalized seizure. The emergency clinician is not compelled to initiate anticonvulsant therapy in uncomplicated cases; however, this decision is ideally made in collaboration with the neurologist who will see the patient in follow-up.

Although fosphenytoin can be infused more quickly than phenytoin, it does not work faster or cause fewer adverse effects than phenytoin and should not be routinely used in place of its much less expensive parent.\textsuperscript{7,8} Fosphenytoin is preferred in cases where the patient cannot complain of pain if extravasation occurs (eg, a comatose patient) or when intramuscular delivery is required. In patients who will not be quickly discharged from the department, oral phenytoin loading is underutilized; in uncomplicated patients at low risk for immediate recurrent seizure, oral loading is effective and offers benefits of convenience, cost, and safety.\textsuperscript{8,9}
### References


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**Objectives:** Upon completion of this article, you should be able to: (1) Describe the pharmacologic approach to ongoing seizures not responsive to initial benzodiazepine therapy; (2) Identify the diagnostic workup routinely indicated in the unprovoked first seizure; (3) Identify the indications for EEG monitoring in the emergency department.

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