December 2016

CCHCS Care Guide: Seizure Disorders

SUMMARY

GOALS
- Identify and classify type of seizure
- Avoid drug-drug interactions
- Minimize seizures through appropriate therapy
- Minimize adverse events, including potentially avoidable hospitalizations

TREATMENT OPTIONS

Initiating Medication
- Medication is not indicated after a first seizure in most patients. Evaluate need for therapy on an individual basis.
- Offer AEDs after first tonic-clonic seizure if:
  - Prior history of absence, myoclonic or focal seizures
  - Congenital neurologic defect
  - Electroencephalography (EEG) with epileptic discharge
  - Recurrence risk unacceptable to patient
- Medication selection is dependent in part on seizure class and epilepsy syndrome.
- Optimize monotherapy before considering second agent.
- Encourage adherence, monitor side-effects, ensure good control is maintained and educate patient.
- AEDs usually not indicated for provoked seizures. Treat underlying cause if possible. Discontinue prophylactic AEDs unless seizures reoccur.

Drug-Resistant Seizures
- If seizures are uncontrolled, or patient is not seizure free at maximally tolerated doses of initial AED, consider changing to a different first line AED. Titrate new medication to therapeutic level prior to tapering initial AED.
- Consider psychogenic nonepileptic seizure diagnosis. Pseudoseizures may have psychologic or psychogenic etiology (see page 2).
- Consult neurology if seizures are not well controlled on two medications.

CDCR Housing/Activity Restrictions
- Complete a CDCR 7410, Comprehensive Accommodation Chrono for bottom bunk.
- Consider lower tier also in selected cases.
- Issue restrictions on driving, operating heavy equipment, working with heat, and working at heights.

Status Epilepticus
- The principal goal of treatment is to emergently stop seizure activity. The initial treatment strategy includes simultaneous assessment and management of airway, breathing, and circulation (obtain IV access, administer O2, and secure the airway as needed), check vital signs, fingerstick glucose, seizure abortive drug treatment (i.e., lorazepam) and emergent transport to a higher level of care (see pages 3 & 6).

MONITORING
- Measure baseline CBC, BUN/creatinine, LFTs, electrolytes, and albumin prior to starting AED therapy.
- Monitor CBC, BUN/creatinine, LFTs, electrolytes as indicated.
- Monitor for adverse effects.
- Obtain AED level to establish baseline when stable dose is achieved for agents where drug levels are useful to monitor adherence or when seizure control changes. (AEDs are sometimes drugs of abuse in CDCR/CCHCS.)
- Primary Care Provider (PCP) follow-up frequency will vary on case by case basis. Well-controlled patients may be seen at 180 day intervals.
- AED dosing is based primarily on side effects and seizure control, rather than AED levels.

EVALUATION

New Onset Seizures (See page 3 for more details)

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Differential Diagnosis</th>
<th>Classification</th>
<th>Clinical Factors and Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epilepsy is a neurologic disorder characterized by recurring seizures (altered cerebral function due to excessive and abnormal electrical discharges of brain cells).</td>
<td>Acute symptomatic or “provoked” seizures: seizures which occur in the setting of stroke, traumatic brain injury, metabolic derangement (e.g., hypoglycemia, hyponatremia, drug/alcohol withdrawal, drug intoxication, medications, and encephalitis). Unless seizures recur they are not considered epilepsy. Nonepileptic paroxysmal disorders: syncope, psychological disorders, sleep disorders, paroxysmal movement disorders, migraine, miscellaneous neurologic events. In the elderly: transient ischemic attack (TIA), transient global amnesia, drop attacks.</td>
<td>- Identify seizure type(s) and/or epilepsy syndrome (see page 7).</td>
<td>- Identify what happened before, during, and after the attack as well as any potential triggers. - EEG if epilepsy is suspected. - For new onset seizure, perform magnetic resonance imaging (MRI) of the head without and with contrast if epilepsy is suspected. - Computed tomography (CT) head without contrast is preferred in new-onset posttraumatic seizure, for urgent assessment, or when MRI is contraindicated.</td>
</tr>
</tbody>
</table>

Information contained in the Care Guide is not a substitute for a health care professional's clinical judgment. Evaluation and treatment should be tailored to the individual patient and the clinical circumstances. Furthermore, using this information will not guarantee a specific outcome for each patient. Refer to “Disclaimer Regarding Care Guides” for further clarification.

1
### EVALUATION CONTINUED

#### SEIZURE TYPES

**PSEUDOSEIZURES OR PSYCHOGENIC NONEPILEPTIC SEIZURES**

**DEFINITION:** Psychogenic nonepileptic seizures (PNES) are episodes of movement, sensation, or behaviors resembling epilepsy unaccompanied by physiologic central nervous system dysfunction.

**DIAGNOSIS:**
- Often misdiagnosed with epilepsy (epilepsy may also be present in 5-10% or more of PNES patients). More than 2/3rd of PNES patients are female.
- Diagnosis is based on a constellation of findings, the probability of PNES increases with the number of features unusual in epilepsy. Detailed history, physical examination, observation during seizures, and psychological evaluation are required for diagnosis.
- Video-electroencephalography (vEEG) is useful for diagnosis of PNES. Observation of typical seizures without accompanying EEG abnormalities is diagnostic.

**FINDINGS SUGGESTIVE OF PNES**

**Clinical Features:**
- Gradual onset of seizures
- Long seizure duration (2-3 minutes or more)
- Waxing and waning symptoms during seizure, nonphysiologic progression
- Disorganized, asymmetrical motor activity, side to side head movements, pelvic movements (especially thrusting), opisthotonos
- Eyes often closed, resistance to eye opening during seizure (highly suggestive of PNES)
- Ictal crying, weeping
- Seizures triggered by suggestion
- Rapid recovery after seizure, awake and oriented
- Rare incontinence, tongue biting on tip (not side of tongue)

**Historical Features:**
- High seizure frequency
- No response to AEDs or possibly increase in seizures with AED therapy.
- Associated psychiatric disorders
- History of sexual or physical abuse
- No history of injury from seizures
- Recurrent status epilepticus with frequent emergency room visits or hospitalizations
- Failure to respond to therapy for status epilepticus
- Seizures occur only when alone or only when others are present

**TREATMENT OF PNES**

- Thoughtful approach to informing patient of diagnosis
- Withdrawal of prescribed AEDs
- Treatment of underlying psychological disorders

### NEW ONSET SEIZURE

**Diagnostic evaluation of patients with first time seizures:**

- Establish whether or not the event was a seizure. Obtain a complete description of the seizure including behaviors, movements, duration, level of consciousness, etc. (both ictal & postictal), from the patient and observers.
- Consider possible correctable systemic problems such as an acute medical condition (e.g., hypoglycemia, hyponatremia), syncope, arrhythmia, neurologic illness, or injury (e.g., TIA, stroke, TBI, movement disorder, meningitis, anoxic encephalopathy).
- Perform and document a complete physical and neurological examination.
- Labs: Obtain blood tests to identify abnormalities in electrolytes, glucose, calcium, magnesium, hepatic and renal function, and a toxicology screen when clinically indicated.
  - Depending on the clinical situation, a lumbar puncture may also be indicated to rule out infection, hemorrhage, etc.
  - Serum prolactin measurement: Prolactin elevation (>2X baseline), measured 10 to 20 minutes after a suspected event, is a useful adjunct for the differentiation of generalized tonic–clonic or complex partial seizure from a psychogenic nonepileptic seizure but it is not sensitive enough to rule out epilepsy (i.e., does not distinguish an epileptic seizure from syncope).
SUMMARY

NEW ONSET SEIZURE (continued)

○ EEG: Perform an EEG if epilepsy is suspected. A Negative EEG does not rule out epilepsy.
  • When indicated, the EEG should be completed soon after the seizure (within 2 weeks).
  • Photic stimulation (to detect any light/visually triggered epileptic response) and hyperventilation should generally be part of the standard EEG assessment.
○ Imaging: MRI should be performed if epilepsy is suspected. MRI with and without contrast is the modality of choice for brain imaging in most patients with epilepsy. CT has a role in the urgent assessment of seizures, or when MRI is contraindicated.
• Indications for referral/hospitalization at provider discretion:
  ○ Patients presenting with a first unprovoked seizure
  ○ Seizure characterized by a prolonged postictal state or incomplete recovery (status epilepticus)
  ○ Seizure associated with a systemic illness that may require evaluation and treatment
  ○ History of head trauma (loss of consciousness, retrograde/anterograde amnesia, mental status changes, vomiting)
• Seizure type: Seizure class and epilepsy syndrome are classified on clinical grounds, assisted by neurophysiologic and imaging studies. Seizure class has important implications in the choice of antiepileptic drugs (see Page 7).
• Medications: Carbamazepine, phenytoin, and valproic acid are all formulary medications and can all be regarded as first-line for all seizure types (see page 7).

POSTTRAUMATIC SEIZURES

• Seizures following TBI:
  ○ Older age (>65 years) is a risk factor for posttraumatic epilepsy.
  ○ The risk of posttraumatic epilepsy is slightly higher in women.
  ○ Neuroimaging (MRI or CT) is indicated in all patients with a new seizure after trauma.
• Early seizures (occurring within first week after TBI) commonly due to intracranial hematoma, depressed skull fracture, and/or severe injury:
  ○ 25% of early posttraumatic seizures occur within the first hour.
  ○ 50% of early posttraumatic seizures occur within the first 24 hours.
  ○ Although early seizures after TBI may not recur, patients are often treated with AEDs due to the risk of status epilepticus or aggravation of other injuries.
• Late seizures (occurring >1 week after TBI) are likely to represent epilepsy.
• Long term AED treatment is recommended after a first late posttraumatic seizure due to high rate of recurrence.
• Prophylactic AEDs are NOT recommended to prevent late seizures or posttraumatic epilepsy in patients who have NOT had a late posttraumatic seizure.
• The more severe the head injury, the longer the patient is at risk for late seizures.
• Approximately 80% of posttraumatic epilepsy develops within two years of a head injury.

STATUS EPILEPTICUS

• Status Epilepticus refers to the occurrence of a continuous unremitting clinical and/or electrographic seizure activity with a duration longer than five minutes, or recurrent seizure activity without recovery between seizures.
• Status epilepticus requires emergent, targeted treatment to reduce patient morbidity and mortality. Status epilepticus can lead to brain injury and must be treated without delay.
• Causes:
  ○ Non-adherence with AED treatment
  ○ Drug (alcohol, barbiturates, baclofen, and/or benzodiazepines) withdrawal syndromes
  ○ Brain injury from trauma, subarachnoid hemorrhage, tumors or cerebral metastases, stroke, infection, cerebral anoxia, or hypoxia
  ○ Metabolic disturbances (e.g., hypoglycemia, hepatic encephalopathy, uremia, pyridoxine deficiency, hyponatremia, hyperglycemia, hypocalcemia, hypomagnesemia)
• Prognosis: Depends most strongly on the underlying etiology and duration of the status.
• Recommended Therapy: (See algorithm on Page 6).

References
Randolph W. Evans, MD. FAAN. “Post-traumatic seizures and epilepsy.” UpToDate. Sept 24, 2010
UpToDate. Status Epilepticus in Adults “Recommendations of the Epilepsy Foundation of America's Working Group on Status Epilepticus.” JAMA 1993, 270:854
SUDDEN UNEXPECTED DEATH IN EPILEPSY (SUDEP)

- Defined specifically as the sudden, unexpected, witnessed or unwitnessed, nontraumatic, or nondrowning death in patients with epilepsy with or without evidence for a seizure, and excluding documented status epilepticus, in which autopsy does not reveal a structural or toxicological cause of death.

- SUDEP causes 2-18% of all deaths in patients with epilepsy and as high as 0.5-1% a year in those with refractory epilepsy. Noted risk factors:
  - Frequent convulsive seizures (>1/month)
  - Medication nonadherence
  - Subtherapeutic AED level
  - Age 20–45 years
  - Generalized tonic-clonic seizures
  - Polytherapy
  - Duration of epilepsy (>10 years)
  - Alcoholism
  - Male gender

Possible etiologies suggested include:

- Cardiogenic – ictal bradycardia and even asystole
- Pulmonary – ventilator failure with ictal hypoxemia and hypercapnia
- Primary neurologic – sudden, persistent cerebral electrical silence after a seizure

- Aggressive treatment of refractory epilepsy, including referral to a comprehensive epilepsy center and consideration of epilepsy surgery is appropriate in high risk patients.

The American Epilepsy Society and the Epilepsy Foundation have determined that information regarding the risk of SUDEP should be disclosed to all patients with a diagnosis of epilepsy as part of a comprehensive educational program.

EPILEPSY: CONTRACEPTION, PREGNANCY AND HORMONE REPLACEMENT THERAPY

- Preconception counseling is recommended to minimize risk of complications.
  - Be aware of established drug-drug interactions between AEDs and oral contraceptive therapy.
    - Contraceptive therapy failure may occur with AEDs, which are inducers of the cytochrome P-450 system.
  - Folic acid supplementation (0.4 – 0.8 mg daily) is recommended for all women of child-bearing age to minimize the risk of neural tube defects.
  - Women taking AEDs (especially carbamazepine or valproic acid) are recommended to take 10 times the recommended dose of folate supplementation (4 mg daily) by the American College of Obstetrics and Gynecology.
  - AEDs are associated with major fetal malformations (e.g., neural tube defects) and impaired cognitive outcomes in newborns.

- Prenatal screening for patients being treated with AEDs is recommended.
  - Determine need for AEDs and minimize AED dosing during pregnancy, while still controlling seizures.
    - If possible, avoid valproate and multi-AED therapy during the first trimester of pregnancy to reduce the risk of major congenital malformations.
    - If possible, avoid phenytoin and phenobarbital during pregnancy to prevent cognitive impairment in newborn.
  - Monitor both total and free plasma AED levels during pregnancy; (lamotrigine may need more frequent monitoring):
    - At 5-6 weeks, 10 weeks, and then at least once each trimester.
    - Also measure in the first or second week postpartum.
  - Advise oral vitamin K supplementation (10 – 20 mg/day) in the last month of pregnancy for women taking enzyme-inducing AEDs (e.g., phenytoin, phenobarbital, topiramate, carbamazepine, oxcarbazepine).
  - Breast-feeding is not contraindicated with AED therapy, though use of lamotrigine or sedating drugs may be exceptions.
  - Among postmenopausal women, AED use is associated with greater bone density loss.
CCHCS Care Guide: Seizure Disorders

Patient Presenting with a History of Seizures

1. Seizure activity and class (type) documented? Date of last seizure?
   - NO: Attempt accurate seizure classification. Neurology consult if necessary
   - YES: Seizure activity within the past 2 years? Positive EEG?
     - NO: Consider neurology consult to taper and eventually stop AED. Continue low-bunk chemo until seizure free off AEDs for 12 months
     - YES: Is patient on AED?
       - NO: Start AED per seizure class. Neurology consult if necessary
       - YES: Review AED and seizure class
         - Is AED appropriate for seizure class?
           - NO: Consider indicated AED (see page 7) Titrate to therapeutic level or maintenance dose then titrate off other drug.
           - YES: Check adherence and obtain baseline AED level if stable. (see page 8)
             - Is AED effective and well tolerated?
               - NO: Consider potential reasons for AED failure:
                 - Incorrect diagnosis
                 - Inadequate dose
                 - Subtherapeutic level
                 - AED-Drug interaction
                 - Poor adherence
                 - Refractory seizures
               - YES: Monitor labs and AED level as needed. Follow-up within 6 months if in good control

Consider referral to neurologist, if:
- Diagnosis is in question
- Focal findings on the neurologic examination or EEG, or a history suggestive of a focal seizure

Options:
- Recheck history and physical
- Review Medication Reconciliation
- Dosage increase
- If uncontrolled on maximally tolerated dose, change to alternate AED (monotherapy is preferred). Titrate new drug to therapeutic level or adequate maintenance range then taper off first agent.
- Polytherapy-Add a second AED with a different mechanism of action in patients who have failed multiple monotherapy trials. If the second drug is not helpful, taper off either the 1st or 2nd agent before starting a new AED.
- A third AED should generally be added only upon neurology recommendation.
- Consider neurology consult

Adapted from NCCHC Clinical Guideline Epilepsy. Oct 2006
**CCHCS Care Guide: Seizure Disorders**

**SUMMARY**

**DECISION SUPPORT**

**PATIENT EDUCATION/SELF MANAGEMENT**

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**ACUTE SEIZURE TRIAGE AND TREATMENT AREA MANAGEMENT**

**Immediate Action - First 5 Minutes**
1. Take measures to avoid injury
2. ABC’s - Protect/secure the airway
3. O2 administration through nasal cannula
4. Monitor vital signs (blood pressure, pulse, respiratory rate, temperature, and O2 Saturation)
5. Fingertip glucose
6. Obtain history (patient, custody, nursing, others, chart)
7. Perform a neurological exam (check level of consciousness, weakness, hyperreflexia, Babinski sign, automatisms, focal asymmetric features)
8. Obtain venous sample for blood glucose, AED drug level (with clear clinical indications), CBC, chem panel

**STATUS EPILEPTICUS MANAGEMENT**

1. Notify PCP, Notify EMS for transport to higher level of care.
2. Maintain the airway, do not force anything through clenched teeth.
3. Loosen clothing, place patient in left lateral decubitus position, do not restrain patient.
4. Start O2 at 2-4 L/min via nasal cannula, place on Pulse Oximeter keep O2 saturation >92%.
5. IV access (start with one, place additional one when time allows after treatment).
6. Administer 50 ml of 50% glucose and thiamine 100 mg IV if hypoglycemic or blood glucose level not available.
7. Administer: Lorazepam 2mg IV given slow IV push over 1 minute.
   - a. Wait 1 minute for response.
   - b. If continued seizure activity then give 2nd dose lorazepam 2 mg IV given slow IV push over 1 minute.
   - c. Wait 5-10 minutes.
   - d. If seizure activity continues give 3rd dose of lorazepam 2 mg IV given slow IV push over 1 minute.
   - e. Wait 1 minute for response.
   - f. If seizure activity continues give 4th dose of lorazepam 2 mg IV given slow IV push over 1 minute.
   (NOTE: Typically lorazepam 8 mg total dose is maximum—however for continued seizures see below*.)
   - g. If no IV access give midazolam 10 mg IM one time (if weight >40 kg).
8. While waiting for transport, start second IV, draw blood for blood glucose, CBC, chem panel and AED level if indicated.
9. Monitor closely while awaiting transport.

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**Seizure persist?**

**YES**

Patients with Episode of Status Epilepticus should be evaluated at hospital and AED levels checked and adjusted, or additional AED started.

Hospitalization likely if:
- Prolonged postictal state,
- Incomplete recovery,
- Systemic illness,
- Head trauma.

**NO**

**Emergent transport to higher level of care**

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1. Consider extra dose of current AED
2. Reevaluate AED therapy:
   - AED level and frequency of seizure activity
   - Maintenance dose as needed
3. Monitor for at least 2 hours in TTA. Follow-up with PCP within 5 days or as clinically indicated

If postictal state persists

Consider referral to higher level of care.

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*If seizure activity continues after 8 mg of Lorazepam can consider additional doses- Per Up To Date “no definite maximum dose of lorazepam, clinicians to be guided by clinical effect (including on blood pressure) and seizure control.” Watch for respiratory depression.*

Reference: Up to Date Convulsive status epilepticus in adults: Treatment and prognosis Sept 2016
Seizures that cannot be clearly diagnosed into one of the preceding categories should be considered unclassified until further information allows their accurate diagnosis.

INTERNATIONAL CLASSIFICATION OF EPILEPTIC SEIZURES WITH TREATMENT RECOMMENDATIONS*

<table>
<thead>
<tr>
<th>Major Class—Seizure</th>
<th>Subset of Class</th>
<th>Antiepileptic Drugs (Bold = Formulary)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PARTIAL (FOCAL) SEIZURES</strong></td>
<td>Simple—Consciousness Not Impaired</td>
<td>Carbamazepine Phenytoin Lamotrigine Oxcarbazepine</td>
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<tr>
<td></td>
<td></td>
<td>Valproic acid Gabapentin Topiramate Levetiracetam Primidone Phenobarbital Pregabalin Felbamate</td>
</tr>
<tr>
<td></td>
<td>Complex—Consciousness Impaired (most common type of seizure in epileptic adults)</td>
<td></td>
</tr>
<tr>
<td><strong>GENERALIZED SEIZURES</strong></td>
<td>Absence (Non-Convulsive) (Petit Mal)</td>
<td>Valproic Acid Ethosuximide Lamotrigine Levetiracetam Zonisamide Clonazepam</td>
</tr>
<tr>
<td></td>
<td>Myoclonic (Convulsive)</td>
<td>phenytoin Valproic acid Carbamazepine Lamotrigine Topiramate Oxcarbazepine Levetiracetam Primidone Phenobarbital</td>
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<tr>
<td></td>
<td>Clonic (Jerking)</td>
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<tr>
<td></td>
<td>Tonic (Stiffening)</td>
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</tr>
<tr>
<td></td>
<td>Tonic-Clonic (Grand Mal)</td>
<td></td>
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<tr>
<td></td>
<td>Atonic</td>
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</tbody>
</table>

*Seizures that cannot be clearly diagnosed into one of the preceding categories should be considered unclassified until further information allows their accurate diagnosis. International League Against Epilepsy—Classification—last revised 11/2010
Note that although there is evidence to support the use of these medications for these seizure types, the medication may not be indicated for this use by the United States Food and Drug Administration.
**Antiepileptic Drugs:**

The CCHCS pharmacy will switch from brand to generic medication unless “Do Not Substitute” and “Nonformulary” processes are followed. Note: The American Academy of Neurologists does not recommend automatic generic substitution of AEDs without physician’s approval due to the variation allowed by the FDA between brand and generic medications. These small variations may have adverse effects for patients. However, generic substitution of AEDs may be appropriate with patient and physician approval.

- AEDs have many side effects and drug interactions. Important adverse effects and interactions are noted in this Care Guide. Refer to product information for full discussion.
- AEDs significantly interact with each other. Whenever an AED is added or removed from a treatment regimen, close monitoring for changes in efficacy or adverse effects of other AED agents is required.
- AEDs significantly interact with many other medications. Review of product information is important when adding or changing medication regimens.
- Anticonvulsants variably interact with many contraceptive medications. Refer to product information for full discussion. Alternate contraceptive methods are usually required.
- Therapy with anticonvulsants should not be abruptly discontinued to avoid rebound effects.
- Monitor for emergence or worsening of depression, suicidal thoughts or behavior, and/or unusual changes in mood or behavior.
- Monitoring of AED blood levels is often done inappropriately. In many cases, levels were obtained before steady state or without a clear medical indication.
- Monitoring of AED blood levels is often done inappropriately. In many cases, levels were obtained before steady state or without recording collection time. Furthermore, many levels were obtained without a clear medical indication. Levels are generally useful to monitor drug adherence or to identify an effective therapeutic level for a particular patient.

### Common Antiepileptic Drugs: Formulary (Listed Alphabetically by Generic Name)

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage*</th>
<th>Side Effects*</th>
<th>Contraindications / Comments*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbamazepine TEGRETOL®</td>
<td>Indications: Partial seizures (simple or complex), generalized tonic-clonic seizures and mixed seizure patterns</td>
<td>Drowsiness, dizziness, blurred or double vision, lethargy, headache, nausea, vomiting, diarrhea, hypotension, agitation, increased LFTs, rash, pruritus, AV block</td>
<td>Drug Levels Therapeutic: 4-12 mcg/ml Monitoring of levels not routinely indicated unless to assess adherence or suspected toxicity. Dosage of drug based on seizure control and side effects. Toxic levels: &gt;15 mcg/ml Timing: Just before morning dose Time to steady state: &gt;1 month</td>
</tr>
<tr>
<td>IR (Immediate release): 100 mg chewable tablet, 200 mg tablet</td>
<td>IR tablets: Initial Dose: 200 mg orally twice daily Titration: Increase dose weekly by 200 mg/day to max 1600 mg/day in divided doses, three to four times a day. Usual dose: 800 to 1200 mg/day. Max recommended dose: 1600 mg/day. Give with food Half-Life: 25-65 hours initial doses, 12-17 hours after repeated doses (3 to 5 weeks) due to autoinduction 100 mg chewable tabs — Only for half tablet dosing of carbamazepine 200 mg (100 mg dose). Do not use multiple tabs to make up higher doses.</td>
<td></td>
<td>Contraindications Hypersensitivity to drug/class/component. Hypersensitivity to TCAs. History of bone marrow suppression. Use with an MAOI, or use within 14 days of discontinuing a MAOI. Concomitant use of nefazodone or delavirdine or other nonnucleoside reverse transcriptase inhibitors.</td>
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<td></td>
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<td></td>
<td>Renal Impairment Dose reduction not required. HD: Supplemental dose not needed.</td>
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<td></td>
<td>Hepatic Impairment Use with caution. Consider dose reduction.</td>
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<td></td>
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<td></td>
<td>Pregnancy (D) Positive evidence of fetal risk.</td>
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<td></td>
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<td></td>
<td>Lactation Probably safe. Usually compatible with breast-feeding per the American Academy of Pediatrics. Monitor infant for side effects.</td>
</tr>
</tbody>
</table>

*Bold= Formulary

*See prescribing information for complete description of dosing, adverse effects and drug interactions.
### Indications:
- Partial seizures, Generalized tonic-clonic seizures, or Lennox-Gastaut seizures (Adjunctive)

### Adjunctive—(IR):
- Weeks 1-2: 25 mg/day; Weeks 3-4: 50 mg/day.
- Increase daily dose every 1-2 weeks by 25-50 mg/day.
- Usual maintenance dose: 100-200 mg/day.

### Adjustment for AED regimens containing valproate (IR):
- Weeks 1-2: 25 mg/day; Weeks 3-4: 50 mg/day.
- Increase daily dose every 1-2 weeks by 25-50 mg/day.
- Usual maintenance dose: 300-500 mg/day in 2 divided doses.

### Adjustment for enzyme-inducing AED regimens (e.g., carbamazepine, phenytoin, phenobarbital, primidone) without valproate (IR):
- Weeks 1-2: 50 mg/day; Weeks 3-4: 100 mg/day in 2 divided doses.
- Increase daily dose every 1-2 weeks by 100 mg/day.

### Half-Life:
- 12 - 59 hours

### Rash, drowsiness, nausea, dizziness, ataxia, blurred vision, aplastic anemia, pancytopenia

### Black Box Warning
Skin rashes which may be severe and potentially life-threatening have been reported; risk may be increased by coadministration with valproic acid.

### Drug interactions:
1. Level is increased by many drugs (e.g., valproic acid, others).
2. Level is decreased by enzyme-inducing drugs (e.g., phenytoin, carbamazepine, phenobarbital, others).

### Drug Levels
The value of monitoring plasma concentrations of lamotrigine has not been established.

### Contraindications
Hypersensitivity to lamotrigine or any component of the formulation.

### Renal Impairment
Use caution.

### Hepatic Impairment
Mild impairment: No adjustment required.
Moderate-to-severe impairment without ascites: Decrease doses by ~25%; adjust as clinically indicated.
Moderate-to-severe impairment with ascites: Decrease doses by ~50%; adjust according to clinical response.

### Pregnancy (C)
Lamotrigine has been found to decrease folate concentrations in animal studies.

### Lactation
Enters breast milk; effects unknown.

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### Levetiracetam
#### Indications:
- Partial Seizures and Generalized Seizures (Alternative)

#### Initial Dose (IR):
- 500 mg twice daily

#### Titration (IR):
- Increase by 1000 mg/day every two weeks to 3000 mg/day

#### Maintenance dose:
- 3000 mg/day

#### Maximum dose:
- 3000 mg/day (1500 mg twice daily)

#### Half-Life:
- 6-8 hours

### Dizziness, headache, anorexia, vomiting, asthenia, abnormal behavior, irritability, psychosis, somnolence, fatigue, cough, ataxia, syncope, impaired coordination, vertigo, depression, diarrhea, diplopia.

Rare severe reactions including toxic epidermal necrolysis and Stevens-Johnson syndrome.

### Drug interactions:
- Methotrexate, carbamazepine

### Drug Levels
No recommended target level and no clear correlation between trough and therapeutic response. Usual level associated with response 12-46 mcg/ml. Measurement useful to assess adherence.

### Contraindications
Hypersensitivity to drug/class/component. There are no contraindications listed in manufacturer's labeling.

### Renal Impairment
Dose adjustments are based on CrCl adjusted for body surface area (BSA).
Adjust dose for CrCl <80 mL/min/1.73 m² HD. Dose adjustment needed.

### Hepatic Impairment
No adjustment.

### Pregnancy (C)
There are no adequate well-controlled studies in pregnant women.

### Lactation
Not recommended.
### COMMON ANTI convulsants: Formulary (listed alphabetically by generic name)

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage Forms*</th>
<th>Side Effects*</th>
<th>Contraindications / Comments*</th>
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<tbody>
<tr>
<td>Oxcarbazepine TRILEPTAL®</td>
<td>IR (Immediate-release) Tablet: 150 mg, 300 mg, 600 mg</td>
<td>Dizziness, somnolence, headache, ataxia, fatigue, vertigo, abnormal gait, tremor, diplopia, nystagmus, abnormal vision, vomiting, nausea, abdominal pain, fatigue</td>
<td>Drug Levels Monitoring drug levels is not generally indicated. Maximum dose is determined by side effects and/or adequacy of seizure control. Time to peak, serum: 4.5 hours (tablets).</td>
</tr>
<tr>
<td></td>
<td>Oral suspension: 300 mg/5ml</td>
<td><strong>Hyponatremia</strong>: Clinically significant hyponatremia (sodium &lt;125 mmol/L) can develop during use; monitor serum sodium, particularly during the first three months of therapy or in patients at risk for hyponatremia.</td>
<td><strong>Contraindications</strong>: Hypersensitivity to oxcarbazepine or any component of the formulation.</td>
</tr>
<tr>
<td></td>
<td>Cost IR Tabs $$$$-$$$$$ Susp $$$$$-$$$$$</td>
<td><strong>Drug interactions</strong>:</td>
<td><strong>Renal Impairment</strong>: Adjust dose for CCl &lt;30 ml/min.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1) Level is decreased by enzyme-inducing drugs (phenytoin, phenobarbital, verapamil, valproate).</td>
<td><strong>Hepatic Impairment</strong>: No adjustment for mild to moderate impairment, no data in severe disease; use with caution.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) May increase phenytoin and phenobarbital levels, may reduce efficacy of oral contraceptives and felodipine and other CCBs.</td>
<td><strong>Pregnancy (C)</strong>: There are no adequate clinical trials in pregnant women. Avoid as oxcarbazepine is similar to carbamazepine which is known to cause harm to fetus.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3) HCV drugs, HIV drugs, warfarin</td>
<td><strong>Lactation</strong>: Not recommended.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4) Avoid alcohol due to increased sedative effects of combination.</td>
<td><strong>Important Note</strong>: Avoid use in patients with the genetic marker HLA-B<em>1502 allele as there is an increased risk for Stevens-Johnson syndrome or toxic epidermal necrolysis during treatment. Consider genotyping for HLA-B</em>1502 allele before starting therapy in patients with lineage to genetically at-risk populations.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td><strong>Drug Levels</strong>: Therapeutic serum/plasma concentration: 10-20 mcg/ml (total), 1-2 mcg/ml (free). <strong>Note</strong>: Appropriate drug level is that which provides seizure control with acceptable side effects (may be &lt;10 mcg/ml or &gt;20 mcg/ml in some cases). <strong>Toxic Levels</strong>: Usually &gt;20 mcg/ml (total), &gt;2 mcg/ml (free) <strong>Timing</strong>: 24 hours after oral load, or just prior to next dose <strong>Time to Steady State</strong>: 7-10 days, highly variable.</td>
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<td></td>
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<td></td>
<td><strong>Titrating (after a loading dose)</strong>: If rapid therapeutic levels needed, initial levels may be drawn within 24 hours (oral loading dose) to help determine maintenance dose or need to reload. <strong>Contraindications</strong>: Hypersensitivity to phenytoin, other hydantoins, or any component of the formulation. Concomitant use with delavirdine or rilpivirine.</td>
</tr>
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<td></td>
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<td></td>
<td><strong>Renal Impairment</strong>: CCl ≤10 ml/min—dosage adjustment and serum concentration monitoring may be necessary. <strong>Hepatic Impairment</strong>: Patients with hepatic disease or impaired liver function may show early signs of toxicity. Monitor free phenytoin levels closely. Dosage adjustments may be necessary. <strong>Pregnancy (D)</strong>: Positive evidence of fetal risk, but the benefits may be acceptable despite risk, if the drug is needed in a life-threatening situation. <strong>Lactation</strong>: Excreted into breast milk. Breast-feeding is not recommended.</td>
</tr>
</tbody>
</table>

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*See prescribing information for complete description of dosing, adverse effects and drug interactions.
### SUMMARY

**COMMON ANTIPELLEPTIC DRUGS: FORMULARY (LISTED ALPHABETICALLY BY GENERIC NAME)**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage Forms*</th>
<th>Side Effects*</th>
<th>Contraindications / Comments*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valproic acid DEPAKENE®</td>
<td>Capsule: 250 mg</td>
<td>Indications: Complex partial seizures: monotherapy or adjunctive therapy. Simple and complex absence seizures: monotherapy or adjunctive therapy. Drug of choice for absence seizures.</td>
<td></td>
</tr>
<tr>
<td>Oral solution: 250 mg/5ml</td>
<td>Initial Oral Dose: Seizures: 10-15 mg/kg/day. Administer doses &gt;250 mg/day in divided doses (regular and delayed usually one to three times/day, ER, usually once daily)</td>
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<tr>
<td>Divalproex sodium DEPAKOTE®</td>
<td>Titration: Increase by 5-10 mg/kg/day at weekly intervals until therapeutic levels are achieved; maintenance 30-60 mg/kg/day. Maximum dose: 60 mg/kg/day.</td>
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</tr>
<tr>
<td>Tablet DR (delayed-release): 125 mg, 250 mg, 500 mg</td>
<td>Swallow whole, take with a full glass of water. If needed, take with food to reduce GI effects.</td>
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<tr>
<td>Tablet ER (extended-release): 250 mg, 500 mg</td>
<td>Half-Life: 9-16 hours</td>
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</tbody>
</table>

**DECISION SUPPORT**

**OTHER ANTIPELLEPTIC DRUGS: NONFORMULARY (LISTED ALPHABETICALLY BY GENERIC NAME)**

<table>
<thead>
<tr>
<th>Medication</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Ethosuximide ZARONTIN®</td>
<td>Capsule: 250 mg</td>
<td>Indications: Generalized seizures. Non-convulsive—Control of Absence (petit mal) epilepsy.</td>
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</tr>
<tr>
<td>Oral syrup: 250 mg/5ml</td>
<td>Initial Dose: 250 mg orally twice daily</td>
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<tr>
<td>Titration:</td>
<td>May increase by 250 mg/day as needed every 4 to 7 days until seizure control is achieved or to a maximum daily dose of 1.5 g/day in divided doses.</td>
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<td></td>
</tr>
<tr>
<td>Half-Life: 50-60 hours (adults)</td>
<td>Aggressiveness, ataxia, concentration impaired, dizziness, drowsiness, euphoria, fatigue, headache, hyperactivity, inability to concentrate, irritability, lethargy, hirsutism, urticaria, increased libido, abdominal pain, anorexia, cramps, diarrhea, epigastric pain, hematuria (microscopic), vaginal bleeding, myopia, hicups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warnings/Precautions: Blood dyscrasias. Monitor blood counts periodically, especially if signs/symptoms of infection develop. Associated with cases of SLE. Stevens-Johnson Syndrome. Avoid ethanol.</td>
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</tr>
<tr>
<td>Drug Interactions: Ethosuximide may elevate phenytoin serum levels. Valproic acid has been reported to both increase and decrease ethosuximide levels. CYP3A4 Inducers (Strong): May increase the metabolism of CYP3A4 Substrates while CYP3A4 Inhibitors (Strong): May decrease the metabolism of CYP3A4 Substrates.</td>
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<tr>
<td>Drug Levels</td>
<td>Therapeutic: 40-100 mcg/ml</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toxic levels: &gt;150 mcg/ml. Monitor levels primarily for adherence. Dosage of drug based on seizure control and side effects.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contraindications</td>
<td>Hypersensitivity to drug/class/component. Contraindicated with hepatic impairment, mitochondrial disorders and urea cycle disorders.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renal Impairment</td>
<td>No adjustment needed in renal failure. Close monitoring of valproic acid serum concentrations may be warranted to ensure adequate dosage due to reduced protein binding.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatic Impairment</td>
<td>Reduce dose with moderate liver impairment. Contraindicated with severe liver disease. Close monitoring of valproic acid serum concentrations may be warranted to ensure adequate dosage due to reduced protein binding.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnancy (D)</td>
<td>Do not administer to women who are pregnant or of childbearing age unless absolutely necessary. Positive evidence of fetal risk.</td>
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<td></td>
</tr>
<tr>
<td>Lactation</td>
<td>Valproate is excreted in breast milk. Caution should be exercised when administered to a nursing woman. Of note, usually compatible with breast-feeding per the American Academy of Pediatrics.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PATIENT EDUCATION/Self Management**

- **CCHCS Care Guide: Seizure Disorders**
- **Drug Levels**
  - Therapeutic: 50-100 mcg/ml (valproic acid). Seizure control may improve at levels >100 mcg/ml. Some patients may experience control with higher or lower serum levels, but toxicity may occur at levels of 100-150 mg/ml. Monitor levels primarily for adherence. Dosage of drug based on seizure control and side effects.
  - Toxic levels: >175 mcg/ml
- **Contraindications**
  - Hypersensitivity to drug/class/component. Contraindicated with hepatic impairment, mitochondrial disorders and urine cycle disorders.
- **Renal Impairment**
  - No adjustment needed in renal failure. Close monitoring of valproic acid serum concentrations may be warranted to ensure adequate dosage due to reduced protein binding.
- **Hepatic Impairment**
  - Reduce dose with moderate liver impairment. Contraindicated with severe liver disease. Close monitoring of valproic acid serum concentrations may be warranted to ensure adequate dosage due to reduced protein binding.
- **Pregnancy (D)**
  - Do not administer to women who are pregnant or of childbearing age unless absolutely necessary. Positive evidence of fetal risk.
- **Lactation**
  - Valproate is excreted in breast milk. Caution should be exercised when administered to a nursing woman. Of note, usually compatible with breast-feeding per the American Academy of Pediatrics.

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*See prescribing information for complete description of dosing, adverse effects and drug interactions.
### Other Antiepileptic Drugs: Nonformulary (listed alphabetically by generic name)

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage Forms*</th>
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</thead>
</table>
| Felbamate        | **FELBATOL®**<br> Tablet: 400 mg, 600 mg<br>Suspension: 600 mg/5ml<br>Cost: $$$ | **Indications**: Not a first line antiepileptic. Partial seizure, with and without generalization; Lennox-Gastaut seizures<br>**Initial dose monotherapy**: 1200 mg/day in 3 to 4 divided doses<br>**Titration**: The dose may be increased under close clinical supervision, in 600 mg increments every two weeks to 2400 mg/day based on response. If clinically necessary, may increase dose to 3600 mg/day.<br>**Half-Life**: 20 hours<br>**Best absorbed on empty stomach.**<br>**NA/DOT**<br>**Drug Interactions**: Increases levels of phenytoin, valproic acid, phenobarbital, active carbamazepine metabolite. | **Therapeutic Drug Levels**<br>- Monitoring of levels not indicated, dose is titrated to clinical response.<br>- Time to peak, serum: 3-5 hours<br>**Contraindications**<br>- Hypersensitivity to felbamate, or any component of the formulation; history of blood dyscrasia; history of hepatic dysfunction.<br>**Renal Impairment**<br>- Dosage adjustments are recommended. Decrease starting and maintenance doses by 50% in renally impaired patients<br>HD: Dose after dialysis, no supplement.<br>PD: No supplement.<br>**Hepatic Impairment**—Contraindicated<br>- Felbamate should not be used in patients with a history of hepatic impairment. |}
| Gabapentin       | **NEURONTIN®**<br> IR (Immediate Release) Capsule: 100 mg, 300 mg, 400 mg<br>IR (Immediate Release) Tablet: 600 mg, 800 mg<br>Cost: $$ | **Indications**: Partial Seizures (Adjunctive—Not monotherapy)<br>**Initial (IR)**: 300 mg 3 times daily<br>**Titration (IR)**: Increase dosage based on response and tolerability. Usual dose: 300-600 mg 3 times daily Maximum dose for seizures: doses up to 2400 mg/day have been well tolerated.<br>**Half-Life**: 5-7 hours<br>**Must be NA/DOT and crushed/floatated** | **Drug Levels** Not necessary.<br>**Contraindications** Hypersensitivity to drug/class/component.<br>**Renal Impairment** Adjust dose for CrCl <60 ml/min<br>**Hepatic Impairment** No adjustment.<br>**Pregnancy (C)** There are no adequate well-controlled studies in pregnant women. Felbamate may be used during pregnancy only if clearly needed. |}
| Phenobarbital     | **LUMINAL®**<br> Tablet: 15 mg, 30 mg, 60 mg, 100 mg<br>Cost: $$ | **Indications**: Generalized and partial seizures (Alternative)<br>**Dosing**: 50-100 mg two to three times daily<br>**Half-Life**: 50 - 120 hours<br>**NA/DOT**<br>**Drug Interactions**: Diazines, protease inhibitors. Level is increased by valproic acid, phenytoin, clonazepam, other drugs. Potentiates effects of alcohol or other sedatives. May decrease levels of phenytoin, oxcarbazepine, lamotrigine, warfarin, HCV drugs, HIV drugs | **Drug levels**<br>- Therapeutic: 10-40 mcg/ml<br>- Toxic: > 40 mcg/ml<br>- Monitor levels primarily for adherence. Dosage of drug based on seizure control and side effects.<br>**Contraindications** Hypersensitivity to barbiturates or any component of the formulation; known sensitivity to other barbiturates; history of blood dyscrasia; history of hepatic dysfunction.<br>**Renal Impairment** Adjust dose for CrCl <10 ml/min<br>**Hepatic Impairment** No dose reduction recommended.<br>**Pregnancy (D)** Positive evidence of risk to fetus.<br>**Lactation** Small amounts excreted into breast milk. Use with caution per American Academy of Pediatrics.<br>**Avoid use in geriatric patients** |
### Other Antiepileptic Drugs: Nonformulary (Listed Alphabetically by Generic Name)

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage Forms*</th>
<th>Side Effects*</th>
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</tr>
</thead>
</table>
| **Pregabalin**  
LYRICA®  
Capsule: 25 mg, 50 mg, 75 mg, 100 mg, 150 mg, 200 mg, 225 mg, 300 mg  
Cost $$$  
**Indications:** Partial seizures (adjunctive therapy)  
**Dosing:**  
**Initial:** 150 mg per day in divided doses (75 mg two times a day or 50 mg three times a day)  
**Titration:** Dose may be increased based on tolerability and effect  
Maximum dose: 600 mg/day  
Administered with or without food.  
**Half-Life:** 6 hours  
| Peripheral edema, dizziness, somnolence, ataxia, headache, tremor, blurred vision, diplopia, weight gain, xerostomia, infection, accidental injury  
**Drug interactions:**  
No known significant interactions.  
| **Drug levels**  
No data for efficacy of drug level monitoring. Dosage of drug based on efficacy and side effects.  
**Contraindications**  
Hypersensitivity to pregabalin or any component of the formulation.  
**Renal Impairment**  
Adjust dose for CrCl ≤ 60 ml/min  
**Hepatic Impairment**  
No adjustment.  
**Pregnancy**  
There are no adequate clinical trials in pregnant women.  
**Lactation**  
Not recommended.  |
| **Primidone**  
MYSOLINE®  
Tablet: 50 mg, 250 mg  
Cost $-$$  
**Indications:** Partial and generalized tonic-clonic seizures (Alternative)  
**Dosing:**  
**No previous treatment**  
**Initial:** Days 1-3: 100-125 mg at bedtime  
**Titration:**  
Days 4-6: 150-125 mg twice daily  
Days 7-9: 100-125 mg 3 times daily  
Day 10 to maintenance: 250 mg 3 times daily  
Usual dose: 250 mg 3-4 times daily  
**Maximum dose:** 2 g/day  
**Receiving other anticonvulsants**  
**Initial:** 100-125 mg at bedtime and gradually increased as other drug is gradually decreased; continue until satisfactory dosage level achieved for the combination or the other medication is completely discontinued  
Administer with food to minimize GI irritation  
**Half-Life:** 3-23 hours, phenobarbital is active metabolite– half life 75-126 hours  
| Ataxia, drowsiness, emotional disturbances, fatigue, hyperirritability, morbilliform skin eruptions, anorexia, nausea, vomiting, impotence, agranulocytosis, granulocytopenia, megaloblastic anemia (idiosyncratic), red cell aplasia/hypoplasia, diplopia, nystagmus  
**Drug interactions:**  
(1) Level is increased by valproic acid and phenytoin.  
(2) May reduce levels of HCV drugs, HIV drugs, warfarin.  
| **Drug Levels**  
Therapeutic: 5-12 mcg/ml.  
Must measure both primidone and phenobarbital levels. Primidone at steady state in 2 days, phenobarbital in 20 days. Time to peak serum: ~3 hours (variable)  
**Contraindications**  
Hypersensitivity to primidone or any component of the formulation. Hypersensitivity to phenobarbital; porphyria.  
**Renal Impairment**  
Adjust dosing interval for CrCl ≤ 50 ml/min. Avoid in renal failure if possible.  
**Hepatic Impairment**  
Monitor plasma levels and adjust dose accordingly.  
**Pregnancy (D)**  
Positive evidence of risk to fetus.  
**Lactation**  
Not recommended.  |
| **Topiramate**  
TOPAMAX®  
IR (Immediate Release) Tablet: 25 mg, 50 mg, 100 mg, 200 mg  
Capsule (IR sprinkles): 15 mg, 25 mg  
Cost $ - $$  
**Indications:** Generalized tonic-clonic seizure and partial seizures (monotherapy or adjunctive)  
**Initial Dose:** 25 mg twice daily  
**Titration:** Increase at weekly intervals by 25-50 mg/day (daily dose given in two divided doses-use slow titration ration rate when used as adjunctive therapy) until response  
Usual dose: 100-200 mg twice daily.  
**Maximum dose:** 400 mg/day  
**Half-Life:** 21 hours  
| Somnolence, dizziness, nervousness, ataxia, psychomotor slowing, speech problems, memory difficulties, behavior problems, confusion, difficulty concentrating, nystagmus, metabolic acidosis, Stevens-Johnson syndrome, toxic epidermal necrolysis, weight loss, depression, fatigue, hyperthermia (severe), hepatotoxicity  
**Drug interactions:**  
Level is decreased by enzyme-inducing drugs (phenytoin, carbamazepine, phenobarbital).  
| **Drug Levels**  
Monitoring of levels not indicated, dose is titrated to clinical response.  
Time to peak serum: 1-4 hours  
**Contraindications**  
Hypersensitivity to drug/component.  
**Renal Impairment**  
Reduce dose with CrCl <70 ml/min  
**Hepatic Impairment**  
Use with caution.  
**Pregnancy (D)**  
Use during pregnancy can cause cleft lip and/or palate.  
**Lactation**  
Enteres breast milk, use caution.  |
# ACUTE SEIZURE DRUGS:

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Lorazepam</td>
<td>Indications: Status epilepticus</td>
<td>CNS: Akathisia, amnesia, ataxia, confusion, depression, disorientation, dizziness, headache, visual disturbances, weakness. Respiratory depression, nausea, hypotension</td>
<td>Drug Levels Monitoring of levels not indicated, dose is titrated to clinical response.</td>
</tr>
<tr>
<td>ATIVAN®</td>
<td>Status epilepticus: IV: Lorazepam 2mg IV given slow IV push over 1 minute</td>
<td></td>
<td>Contraindications Hypersensitivity to lorazepam or any component of the formulation (cross-sensitivity with other benzodiazepines may exist); sleep apnea or severe respiratory failure; acute narrow angle glaucoma (dilates pupils).</td>
</tr>
<tr>
<td>Injectable</td>
<td>Wait 1 minute for response. If continued seizure activity then give 2nd dose lorazepam 2 mg IV given slow IV push over 1 minute.</td>
<td>Drug Interactions: Potentiates other CNS depressants including alcohol. Increases levels of Phenytoin.</td>
<td>Renal Impairment Possible risk of propylene glycol toxicity with IV use.</td>
</tr>
<tr>
<td>solution: 2 mg/ml</td>
<td>Wait 5-10 minutes, If seizure activity continues, give 3rd dose of lorazepam 2 mg IV given slow IV push over 1 minute.</td>
<td></td>
<td>Hepatic Impairment Use cautiously. Avoid use in hepatic failure.</td>
</tr>
<tr>
<td></td>
<td>Wait 1 minute for response. If seizure activity continues, give 4th dose of lorazepam 2 mg IV given slow IV push over 1 minute.</td>
<td></td>
<td>Pregnancy (D) Positive evidence of risk to fetus.</td>
</tr>
<tr>
<td></td>
<td>Usual maximum dose: 8 mg**</td>
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<td>Lactation Not recommended.</td>
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<tr>
<td></td>
<td>Note: Monitor for possible circulatory and respiratory depression. Use with caution in debilitated/elderly patients.</td>
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<tr>
<td></td>
<td>NA / DOT</td>
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</tbody>
</table>

| Midazolam        | Indications: Status epilepticus | Common Reactions: sedation, nausea, vomiting, injection site pain, hiccups, hypotension, agitation, dystonia, amnesia, diplopia, disinhibition, confusion, ataxia, weakness, dysarthria, euphoria, rash | Contraindications Hypersensitivity to drug/class. |
| VERSED®          | Dose: Status epilepticus: 10 mg IM once (if weight > 40 kg) | Serious Reactions: respiratory depression, apnea, respiratory failure, cardiac arrest, hypotension, bradycardia, tachycardia, syncope, seizures, CNS stimulation, paradoxical dependency, abuse bronchospasm anaphylaxis/anaphylactoid reaction, withdrawal sx if abrupt D/C | Renal Impairment Caution if renal impairment. |
| Injectable        | Note: Use with caution in debilitated/elderly patients |  | Hepatic Impairment Caution if hepatic impairment. |
| Solution: 5 mg/ml|  | Pregnancy Consider alternative during pregnancy; possible risk of teratogenicity based on conflicting human data with other benzodiazepines. |  |
|                  |  | Lactation Safety conditional; safety may vary with different populations or dosing. |  |

**BOLD= Formulary

*See prescribing information for complete description of dosing, adverse effects and drug interactions.

**There is no definite maximum dose of lorazepam; clinicians should be guided by the clinical effect (including on blood pressure and respiratory depression) and seizure control.

### PATIENT EDUCATION/Self Management

**Seizure Disorder: What You Should Know**

#### What is a Seizure?
- A seizure happens when nerve signals in the brain are not working right.

#### What causes seizures?
A seizure can happen for many reasons. You may have a seizure if you:
- Hurt your head
- Had a brain injury at birth
- Have a brain infection or a tumor
- Have a stroke
- Have been abusing drugs
- Suddenly stop using a substance you are addicted to, like alcohol or drugs
- Your blood sugar is too low

#### How are seizures treated?
- The right treatment for seizures depends on what causes them
- Treatment for seizures is different for each person
- If you have more than one seizure you may need anti-seizure medicines
- You may need to try different medicines before health care staff finds a treatment that works well
- Your primary care provider may need to make many changes to your medication to control your seizures

#### Can people die from having a seizure disorder?
Most people who have seizures live a full life span. However, there are some things about living with seizure disorder that can increase the risk of early death which include:
- Accidents such as drowning, burning, choking, or falling during a seizure
- People with a seizure disorder may have more risk for depression and suicide
- Very long seizures or many seizures that happen one after another (called status epilepticus), can be life-threatening
- Very rarely, people with a seizure disorder may die suddenly, without explanation

**Good seizure control and use of safety measures can reduce the risk of seizure related death**

#### How Can I Take Care of Myself?
- Take your prescribed medication regularly, the way your primary care provider ordered
- Do not start taking any other medications, including over-the-counter and herbal supplements, without checking with your primary care provider first
- Keep a record of seizures as they occur
- Stay away from alcohol, illegal drugs, and medications not prescribed for you
- Avoid activities that have a risk of head injuries, such as climbing ladders or contact sports
- Stay away from jobs that could put you in danger
- See your primary care provider regularly as scheduled

#### At your housing area, work or school:
- Tell your “cellie”, friends, boss, or teacher(s) at school that you may have a seizure
- Let them know what to do if one happens

#### What Other People Should do if You Have a Seizure
- Help you lie down on a bed or the floor
- Loosen the clothes around your neck and take off eyeglasses
- Check to make sure you are breathing
- Turn you on your side if you start to throw up
- Move you only if needed to keep you from getting hurt (for example, by hitting furniture)

#### People who are helping you should NOT:
- Try to hold you down
- Put anything in your mouth while you are having a seizure

#### For Women: What if I am pregnant?
- Some anti-seizure medicines can affect the health of your baby. You should tell your primary care provider right away if you are pregnant
- Anti-seizure medicine can lessen the effects of some birth control methods
- If you are of child-bearing age, you should talk to your primary care provider about your plans for pregnancy
**EDUCACIÓN PARA EL PACIENTE/CONTROL PERSONAL DEL CASO**

### TRASTORNO CONVULSIVO: LO QUE DEBE SABER

#### ¿Qué es una convulsión?
- Una convulsión sucede cuando las señales nerviosas en el cerebro no funcionan correctamente.

#### ¿Qué es lo que causa las convulsiones?
Una convulsión puede ocurrir por muchas razones. Es posible que tenga una convulsión si:
- Se lastima la cabeza.
- Tuvo una lesión cerebral al nacer.
- Tiene una infección o tumor cerebral.
- Tiene un derrame cerebral.
- Ha estado abusando de las drogas.
- De repente deja de usar una sustancia a la cual Ud. es adicto, como el alcohol o las drogas.
- Su nivel de azúcar en la sangre es demasiado bajo.

#### ¿Cómo se tratan las convulsiones?
- El tratamiento correcto para las convulsiones depende de lo qué las causa.
- El tratamiento para las convulsiones es diferente para cada persona.
- Si tiene más de una convulsión, es posible que necesite tomar medicamentos anticonvulsivos.
- Es posible que tenga que probar diferentes medicamentos antes de que el personal de atención médica encuentre un tratamiento que funcione bien.
- Su médico de atención primaria podría tener que realizar muchos cambios en su medicación para controlar sus convulsiones.

#### ¿El trastorno convulsivo puede ocasionar la muerte?
La mayoría de las personas que tienen convulsiones viven una vida plena. Sin embargo, hay algunos aspectos relacionados con el hecho de vivir con un trastorno convulsivo que pueden aumentar el riesgo de muerte prematura, los cuales incluyen:
- Accidentes, tales como ahogamiento, quemaduras, asfixia o caídas durante una convulsión.
- Las personas con un trastorno convulsivo podrían tener mayor riesgo de depresión y suicidio.
- Tener convulsiones muy largas o muchas convulsiones consecutivas (conocido como estatus epiléptico) puede poner en peligro la vida.
- En muy raras ocasiones, las personas con un trastorno convulsivo pueden morir repentinamente sin ninguna razón aparente.

**Tener un buen control de la convulsión y poner en práctica las medidas de seguridad puede reducir el riesgo de convulsiones relacionadas con la muerte.**

#### ¿Cómo puedo cuidarme?
- Tomé regularmente los medicamentos recetados de la forma en que su médico de atención primaria le indicó.
- No comience a tomar ningún otro medicamento, incluidos los suplementos sin prescripción y los naturales, sin verificar primero con su médico de atención primaria.
- Mantenga un registro de las convulsiones a medida que ocurran.
- No consuma alcohol, drogas ilegales y medicamentos que no se le prescribieron.
- Evite las actividades que impliquen riesgo de lastimarse la cabeza, tales como subirse a escaleras o realizar deportes de contacto.
- No realice trabajos que podrían ponerlo en peligro.
- Consulte con su médico de atención primaria regularmente, según lo programado.

**En su lugar de residencia, trabajo o estudio:**
- Dígale a su compañero(a) de celda, a sus amigos, a su jefe o profesor(es) que podría tener una convulsión.
- Indíquelas qué deben hacer si tiene una convulsión.

### Lo que deben hacer las otras personas si usted tiene una convulsión
- Ayudarlo a acostarse en una cama o en el suelo.
- Aflojar las prendas de vestir alrededor de su cuello y quitarle los anteojos.
- Asegurarse de que está respirando.
- Ponerlo de costado si comienza a vomitar.
- Moverlo únicamente si es necesario para evitar que se lastime (por ejemplo, al golpear un mueble).

#### Las personas que lo están ayudando NO deberían:
- Tratar de sujetarlo.
- Colocar algo en su boca mientras convulsiona.

### Para las mujeres: ¿qué pasa si estoy embarazada?
- Algunos medicamentos anticonvulsivos pueden afectar la salud de su bebé. Debería informarle inmediatamente a su médico de atención primaria si está embarazada.
- Los medicamentos anticonvulsivos pueden disminuir los efectos de algunos métodos anticonceptivos.
- Si se encuentra en edad fétil, le recomendamos que hable con su médico de atención primaria sobre sus planes de embarazo.