CCHCS Care Guide: Seizure Disorders

SUMMARY | **DECISION SUPPORT** | **PATIENT EDUCATION / SELF MANAGEMENT**

GOALS

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

ALERTS

- Signs and symptoms of drug toxicity
- Ensure antiepileptic drug (AED) adherence
- Seizures lasting > 5 minutes
- History of traumatic brain injury (TBI)
- Contraception, pregnancy, and menopause

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 ✓ EEG with epileptic discharge ✓ Recurrence risk unacceptable to patient • Medication selection 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 physiologic or psychogenic etiology. (Refer to page 2) • Consult neurology if seizures are not well controlled on two medications
CDCR Housing / Activity Restrictions	• Complete a CDCR Form 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	Check airway, breathing and circulation (ABC), give oxygen via nasal cannula, check vital signs, and finger-stick glucose, 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)
- PCP follow-up frequency will vary on case by case basis. Well-controlled patients may be seen at 180 day intervals
- AED dosing based is primarily on side effects and seizure control, rather than AED levels

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EVALUATION

New Onset Seizures (See page 3 for more details)			
Diagnosis	Differential Diagnosis	Classification	Clinical Factors and Diagnosis
Epilepsy is a neurologic disorder characterized by recurring seizures (altered cerebral function due to excessive and abnormal electrical discharges of brain cells).	*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	• Identify seizure type(s) and/or epilepsy syndrome (page 7) • Distinguish between focal or generalized seizures	• 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

Evaluation cont'd on page 2

EVALUATION CONT'D

ESTABLISHED SEIZURES			
History	**Medication Review**	**Diagnostic Evaluation**	**AED Discontinuation and Withdrawal**
• Obtain past medical history of seizures. Attempt to obtain pre-incarceration history and medical records. • Identify seizure type or description, number, and frequency of seizures • Assess for changes in seizure control	• Assess drug adherence Failure to respond to usual AEDs should prompt a review of epilepsy diagnosis and adherence to medication(s) • Consider drug interactions when new medications are added, AEDs are added or changed, or seizure control changes • Monitor for adverse effects / toxicity, drug interactions, efficacy, and AED levels when indicated	• EEG has limited use in management of chronic seizures/ epilepsy • Consider EEG with changes in patient's seizure pattern or class or worsening mental status • Neuroimaging: Perform emergently when a new focal deficit, persistent altered mental status, fever, acute head trauma, intractable headache, history of cancer, or suspected immune deficiency is present	• Discontinuation of AEDs in patients with clearly established seizure disorders is not generally recommended due to the high risk of seizure recurrence, even after long seizure free intervals on therapy • When discontinuation of AED is considered (e.g. for patient in whom epilepsy diagnosis is unclear or those who have been seizure free for two years), most schedules aim for a six to nine month taper, with dose reductions at three month intervals. More rapid tapers have been studied but are associated with higher rates of seizure recurrence

SEIZURE TYPES

PSEUDOSEIZURES or PSYCHOGENIC NONEPILEPTIC SEIZURES (PNES)*

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 2/3 of PNES patients are female.
- Diagnosis is based on 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	Historical 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)	• 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 ER 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 (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. (Does not distinguish an epileptic seizure from syncope)

*UpToDate: Psychogenic nonepileptic seizures, Alan B Ettinger, M.D. 12/16/2011

SEIZURE TYPES CONT'D

NEW ONSET SEIZURE (cont'd)

- EEG: Perform EEG if epilepsy is suspected. (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 without and with 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:
  (1) Patients presenting with a first unprovoked seizure
  (2) Seizure characterized by a prolonged postictal state or incomplete recovery (status epilepticus)
  (3) Seizure associated with a systemic illness that may require evaluation and treatment
  (4) 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 than men
  - 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% 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 head injury

STATUS EPILEPTICUS

- Status Epilepticus refers to the occurrence of a single unremitting seizure with a duration longer than five to ten minutes or frequent clinical seizures without an interictal return to the baseline clinical state.
  (Some sources define status epilepticus as a condition characterized by seizures lasting for at least 30 minutes that are either continuous or rapidly repeating, such that recovery or return to full consciousness does not occur between attacks.)
- Causes:
  - Non-adherence with AED treatment
  - Drug (alcohol, barbiturates, baclofen, and/or benzodiazepines) withdrawal syndromes
  - Brain tumors or cerebral metastases, stroke, head trauma, subarachnoid hemorrhage, 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
- Recommended Therapy: (See algorithm on Page 6)

*References

National Clinical Guideline Centre (NCGC). *The Epilepsies.* Clinical Guidelines. July 2010
American Academy of Neurology. *Use of serum prolactin in diagnosing epileptic seizures.* Neurology 2005; 65; 668
National Clinical Guideline Center (NCGC). *The Epilepsies.* Clinical Guidelines. July 2010
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

SEIZURE TYPES CONT'D

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

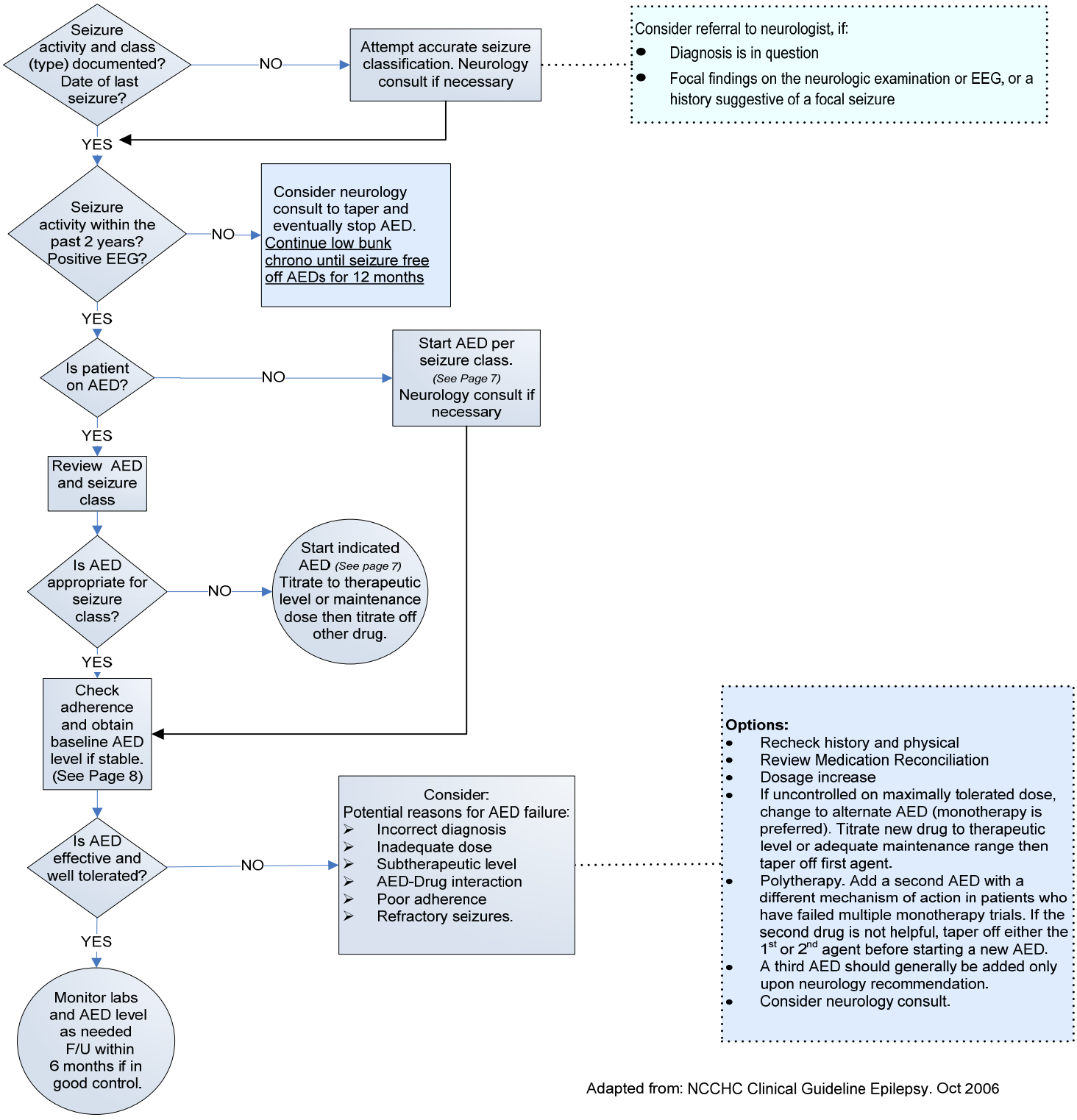
  Primary neurologic – sudden, persistent cerebral electrical silence after a seizure
- Aggressive treatment of refractory epilepsy, including referral to a comprehensive epilepsy center and consideration of epilepsy surgery is appropriate in high risk patients

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 (HRT)

- 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 potential 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 (VPA) 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

Patient Presenting with a History of Seizures



Adapted from: NCCHC Clinical Guideline Epilepsy. Oct 2006

ACUTE SEIZURE TTA MANAGEMENT

Immediate Action - First 5 Minutes
1. Take measures to avoid injury.
2. ABC's - Protect/secure the airway
3. O_2 administration through nasal cannula
4. Monitor vital signs – blood pressure, pulse, respiratory rate, temperature, and O_2 Saturation
5. Fingerstick 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

Single unremitting seizure lasting >5-10 minutes or frequent seizures without full recovery between seizures?

NO

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.

YES

STATUS EPILEPTICUS MANAGEMENT

1. Maintain the airway
2. IV access (at least 2 IVs)
3. Administer 50 ml of 50% glucose and thiamine 100 mg IV if hypoglycemic or blood glucose level not available.
4. Administer:
   1st IV: Lorazepam 0.02 mg/kg IV (max dose 0.1 mg/kg), or
   Diazepam 0.1 mg/kg IV, or
   Midazolam 0.05 mg/kg IV
   Wait 1 minute for response, repeat
   2nd IV: Phenytoin 20 mg/kg at 25-50 mg/min* or
   Fosphenytoin 20 mg/kg PE (Phenytoin Equivalents) /kg. Given at 100-150 mg PE/minute*
5. Monitor closely

Seizure Persist?

NO

Monitor closely.
Transfer to CTC if available.
Consider hospitalization:
- If prolonged postictal state
- Incomplete recovery
- Systemic illness
- Head trauma
- As clinically indicated

YES

Emergent transport to higher level of care

*Cardiac monitoring required
Adjust infusion rates to individual patients. Maximum doses listed are not always required.
References:Mark M. Stecker, MD, PhD. *Status epilepticus in adults*. UpToDate. Feb 2, 2011
Adapted from: In Focus. Seizure Disorder. CCHCS. Page 242. April 2010

TABLE 1—INTERNATIONAL CLASSIFICATION OF EPILEPTIC SEIZURES WITH TREATMENT RECOMMENDATIONS*

Major Class—Seizure	Subset of Class	Antiepileptic Drugs (Bold = Formulary)	
PARTIAL (FOCAL) SEIZURES	Simple—Consciousness Not Impaired	Drugs of Choice	Alternatives
	• Focal motor symptoms, without or with a Jacksonian march (e.g., twitching in a finger, advancing to the entire hand or limb), versive (version of the eyes and the head toward one side), postural (involuntary movements and posturing of the body), phonatory (incoherent speech and sounds) • Somatosensory or special sensory symptoms (visual, auditory, olfactory, gustatory, vertiginous) • Autonomic symptoms or signs (including epigastric discomfort, pallor, sweating, etc)	Carbamazepine Phenytoin Lamotrigine Oxcarbazepine	Valproic acid Gabapentin Topiramate Levetiracetam Primidone Phenobarbital Pregabalin Felbamate
	Complex—Consciousness Impaired (most common type of seizure in epileptic adults)		
	• Simple partial - followed by impairment of consciousness • Impairment of consciousness / automatisms (involuntary motor activity). Behavior without conscious control (facial grimacing, gesturing, chewing, lip smacking, repeating phrases) • Psychic symptoms (disturbance of higher cerebral function). Usually occurs with impairment of consciousness and classified as complex partial. Dysphasic, cognitive, dysmnesic (e.g., déjà-vu), affective (e.g., fear), hallucinations		
GENERALIZED SEIZURES	Absence (Non-Convulsive) (Petit Mal)	Drugs of Choice	Alternatives
	• Typical— momentary break in consciousness of thought or activity, staring spells. Occur in childhood usually resolve in teen years. • Atypical—absence seizures with other seizure types (tonic, atonic, myoclonic). May persist for life.	Valproic Acid Ethosuximide	Lamotrigine Levetiracetam Zonisamide Clonazepam
	Myoclonic (Convulsive)	Drugs of Choice	Alternatives
	• Myoclonic— sudden brief shock-like contractions of one or more muscle groups, usually arms • Myoclonic Tonic-muscle stiffening, groaning and loss of consciousness • Myoclonic Atonic-without muscle stiffness	Phenytoin Valproic acid Carbamazepine	Lamotrigine Topiramate Oxcarbazepine Levetiracetam Primidone Phenobarbital
	Clonic (Jerking)		
	• Clonic seizures—rhythmic jerking movements of both arms, legs, neck, and face		
	Tonic (Stiffening)		
	• Tonic seizures– sudden muscle stiffness, often associated with impaired consciousness and falling to the ground		
	Tonic-Clonic (Grand Mal)		
	• Abrupt loss of consciousness with muscle stiffness/rigidity followed by rapid contraction and relaxation		
	Atonic		
	• Atonic ("drop attacks") - sudden spontaneous falls with complete recovery in seconds or minutes. No recognized loss of consciousness and the event is remembered		

*Seizure 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.

COMMON ANTIEPILEPTIC DRUGS: FORMULARY (LISTED ALPHABETICALLY BY GENERIC NAME)

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 details for specific drugs
- 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
- Therapy with anticonvulsants should not be abruptly discontinued to avoid rebound effects
- Anticonvulsants variably interact with many contraceptive medications. Refer to product information for full discussion. Alternate contraceptive methods are usually required
- 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

MEDICATION	DOSAGE FORMS	SIDE EFFECTS	CONTRAINDICATIONS / COMMENTS
Carbamazepine TEGRETOL® IR (Immediate release): 100 mg chewable tabs 200 mg ER * (Extended release): 200 mg, 400 mg tabs Liquid: 100 mg/5 ml *Formulary Item Cost IR- $ ER -$$ -$$$	Indications: Partial seizures and generalized seizures (Convulsive) IR tablets Initial Dose 200 mg orally twice daily Titration Increase dose weekly by 200 mg/day to max 1600 mg/day two to four times a day. Rare patients may require up to 2400 mg/day. Full effect: 3 months ER: Initial Dose 200 mg ER orally twice daily. Titration Increase dose weekly by 200 mg/day to max 1600 mg/day. Suspension: 100 mg/5 ml (give in 4 divided doses) Give with food Half-Life: 25-65 hours initial doses, 14-27 hours (carbamazepine induces its own metabolism) Avoid abrupt withdrawal.	Drowsiness, dizziness, blurred or double vision, lethargy, headache, nausea, vomiting, diarrhea, hyponatremia, agranulocytosis, thrombocytopenia, increased LFTs, rash, pruritus, AV block. enzyme inducer. Black Box Warnings Asian ancestry; Perform HLA-B 1502 allele test prior to initiation for those of Asian ancestry. Those testing positive should not be treated unless benefit clearly outweighs risk. (Increased risk of development of Stevens Johnson syndrome or toxic epidermal necrolysis), monitor CBC, LFT's, and electrolytes periodically. Blood dyscrasias; Potentially fatal blood cell problems have occurred. Possibly increased risk in those with initially low wbc counts. Monitor CBC (baseline, every 12 wks for 12 months, then annually). Drug interactions: Appropriate Use—be familiar with prescribing information, particularly regarding use with other drugs. (1) Level is decreased by enzyme-inducing drugs (e.g.,phenytoin, phenobarbital, others). (2) Level is increased by many drugs, (e.g., erythromycin, propoxyphene, isoniazid, cimetidine, fluoxetine, others)	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: >15 mcg/ml Timing: just before morning dose Time to steady state: >1month Contraindications Hypersensitivity to drug/class/component. Hypersensitivity to TCAs. MAOIs use within last 14 days. Renal Impairment Clcr <10: decrease dose 25% HD/PD: supplemental dose not needed Hepatic Impairment Caution Pregnancy (D) Positive evidence of fetal risk Lactation Probably safe. Compatible with breast-feeding per the American Academy of Pediatrics
Levetiracetam KEPPRA® Tabs: 250 mg, 500 mg, 750 mg, 1000 mg 100 mg/ml solution (IV) Formulary Cost $$$	Indications: Partial Seizures and Generalized Seizures (Alternative) Initial Dose Initial: IR 500 mg twice daily, ER 1000 mg once daily Titration Increased by 1000 mg/day to 3000 mg at two week intervals Maximum: 3000 mg/day (IR 1500 mg twice daily, ER 3000 mg once daily) Maintenance dose: 3000 mg/day Half-Life: 6-8 hours	CNS: Dizziness, headache, ataxia, somnolence, diplopia, syncope, impaired coordination, vertigo, depression, memory impairment, fatigue GI: vomiting and diarrhea. Rare severe reactions including toxic epidermal necrolysis and Stevens-Johnson syndrome. Suicidal ideation. Drug interactions: No significant drug interactions.	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 Adjust dose for Clcr <80 ml/min Hepatic Impairment No adjustment Pregnancy (C) There are no adequate well-controlled studies in pregnant women Lactation Not recommended

COMMON ANTIEPILEPTIC DRUGS: FORMULARY (LISTED ALPHABETICALLY BY GENERIC NAME)

MEDICATION	DOSAGE FORMS	SIDE EFFECTS	CONTRAINDICATIONS / COMMENTS
Oxcarbazepine TRILEPTAL® Tabs: 150 mg, 300 mg, 600 mg, 300 mg/5ml Formulary Cost $$	Indications: Partial seizures, generalized seizures, (alternative-convulsive seizures) Dosing: Initial: 300 mg twice daily Initiation of monotherapy; adjunctive therapy and conversion to monotherapy on partial seizures Titration: Monotherapy (patients not receiving prior AEDs) - Increase dose every third day by 300 mg/day to a dose of 1200 mg/day in two divided doses. Dose may be increased up to 2400 mg/day to enhance efficacy as tolerated. Adjunctive therapy – Increase by 600 mg/day at approximate weekly intervals. Conversion to monotherapy – As noted initially: 300 mg twice daily while simultaneously reducing the dose of concomitant AEDs. Half-Life: 4-9 hrs	CNS and GI most common, especially at higher doses. Dizziness, somnolence, headache, ataxia, fatigue, vertigo, abnormal gait, tremor, diplopia, nystagmus, abnormal vision. Vomiting, nausea, abdominal pain. Initial CNS side effects usually improve as tolerance develops. Generally better tolerated and less toxic than carbamazepine but more costly. Hyponatremia: Clinically-significant hyponatremia (sodium <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. Drug interactions: Level is decreased by enzyme-inducing drugs (phenytoin, phenobarbital, verapamil, valproate). May increase phenytoin and phenobarbital levels, may reduce efficacy of oral contraceptives and felodipine and other CCBs. Avoid alcohol due to increased sedative effects of combination.	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) Contraindications: Hypersensitivity to oxcarbazepine or any component of the formulation Renal Impairment– Adjust dose for Clcr <30 ml/min Hepatic Impairment-No adjustment for mild to moderate impairment, no data in severe disease Pregnancy (C) 'There are no adequate clinical trials in pregnant women. Avoid as oxcarbamazepine similar to carbamazepine which is known to cause harm to fetus. Lactation: Not recommended
Phenytoin DILANTIN® 50 mg Chewable tablets ER: 30 mg, 100 mg* capsule 200 mg, 300 mg Suspension: 125 mg/5 ml Injectable: 50 mg/ml vial *Formulary Item Cost $$	Indications: Generalized tonic-clonic (grand mal), status epilepticus, complex partial seizures; prevention of seizures following head trauma/ neurosurgery Loading Dose 15-20 mg/kg (give oral loading dose in three divided doses) Maintenance Dose 300-400 mg/day or 4-6 mg/kg/day in three to four divided doses or one to two divided doses using extended release (usual range: 300-600 mg/day) Status Epilepticus IV: Loading dose: 15-20 mg/kg Administer slowly at rate not to exceed 50 mg/minute. Dosage adjustment in obesity Use adjusted body weight (ABW) ABW = [(ABW – Ideal Body Weight (IBW)) x 1.33]+IBW. Maximum loading dose: 2000 mg Oral Suspension: Shake well, give in two to three divided doses. Absorption impaired with continuous NG feeding. Half-Life: Variable depending on dose and patient factors, 7-42 hours Steady-state reached in 5-10 days	Nystagmus, ataxia, impaired concentration, slurred speech, dizziness, drowsiness, lethargy, coma, hypotension, bradycardia, cardiac arrhythmia, rash, fever, constipation, nausea, vomiting, gingival hypertrophy, enlargement of lips, folic acid depletion, osteomalacia, hyperglycemia, leukopenia, thrombocytopenia, agranulocytosis, hepatitis, systemic lupus erythematosus (SLE). Increased suicidal ideation. Chronic use: gingival hyperplasia, acne, hirsutism in up to 50% of patients. Black Box Warnings Hypotension with rapid infusion IV infusion must be administered slowly at rate not to exceed 25-50 mg/min (healthy adults) or 10-20 mg/min (elderly or cardiac patients) to avoid serious cardiovascular effects. Drug interactions (1) Level is decreased by enzyme-inducing drugs (e.g., carbamazepine, phenobarbital, others). (2) Level is increased by many drugs (e.g.,isoniazid, sulfonamides, fluoxetine, others IM use: Although approved for IM. use, IM. administration is not recommended due to erratic absorption and pain on injection. Fosphenytoin may be considered.	Drug Levels Therapeutic: 10-20 mcg/ml (total), 1-2 mcg/ml (free); Note: appropriate drug level is that which provides seizure control with acceptable side effects (may be <10 mcg/ml or >20 mcg/ml in some cases). Toxic Levels: usually >20 mcg/ml (total), >2 mcg/mL (free) Timing: 2-4 hours after IV load, 24 hours after oral load, or just prior to next dose Time to Steady State: 7-10 days, highly variable Titration (after a loading dose): If rapid therapeutic levels needed, initial levels may be drawn after one hour (I.V. loading dose) or within 24 hours (oral loading dose) to help determine maintenance dose or need to reload. Contraindications Hypersensitivity to phenytoin, other hydantoins, or any component of the formulation. Renal Impairment Phenytoin level difficult to interpret in renal failure. Monitor free phenytoin levels. Hepatic Impairment Mild liver disease, usual doses OK; clearance may be very reduced in cirrhosis, monitor free phenytoin levels, adjust dose. Pregnancy (D) Positive evidence of fetal risk Lactation Probably safe. Compatible with breast-feeding per the American Academy of Pediatrics

COMMON ANTIEPILEPTIC DRUGS: FORMULARY (LISTED ALPHABETICALLY BY GENERIC NAME)

MEDICATION	DOSAGE FORMS	SIDE EFFECTS	CONTRAINDICATIONS / COMMENTS
Valproic acid DEPAKENE® 250 mg Cap* 250 mg/5ml syrup* Divalproex sodium DEPAKOTE® 125, 250, 500 mg DR-Tab 125mg Sprinkle DEPAKOTE ER 250 mg, 500 mg ER-Tab 100 mg/mL (5ml-vial)* IV *Formulary Items DR-Delayed Release Cost $	Indications: Complex partial seizures: monotherapy or adjunctive therapy. Simple and complex absence seizures: monotherapy or adjunctive therapy. Drug of choice for absence Initial Oral Dose: Seizures: 10-15 mg/kg/day Administer doses >250 mg/day in divided doses (regular and delayed usually one to three times/day, ER, usually once daily) Titration Increase by 5-10 mg/kg/day at weekly intervals until therapeutic levels are achieved; maintenance 30- 60 mg/kg/day. Usual adult dose; 1000 –2500 mg/day Swallow whole, if needed, take with food or lots of water to reduce GI effects Half-Life: 9-16 hours	Significant: (>10%): headache, somnolence, dizziness, insomnia, nervousness, pain, alopecia, nausea, vomiting, diarrhea, abdominal pain, dyspepsia, anorexia, thrombocytopenia, diplopia, blurred vision, infection, flu-like syndrome. Many more lower incidence. Life threatening low incidence: Stevens Johnson syndrome, TEN, suicidal behavior/ ideation, bone marrow suppression, others Black Box Warnings Hepatotoxicity preceded by malaise, weakness, facial edema, anorexia and vomiting Pregnancy teratogenic (weigh benefits/risks). Pancreatitis Life threatening, may occur at start of use or after many years Drug interactions Level is decreased by enzyme-inducing drugs (e.g., phenytoin, carbamazepine, and phenobarbital, others). Level is increased by erythromycin, aspirin, amitriptyline	Drug Levels Therapeutic: Epilepsy: 50-100 mcg/ml (valproic acid), seizure control may improve at levels >100 mcg/ml, 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 Timing: Just before morning dose Time to steady state: 2-4 days Contraindications Hypersensitivity to drug/class/component Contraindicated with hepatic impairment Renal Impairment No adjustment needed in renal failure Hepatic Impairment Reduce dose with moderate liver impairment Contraindicated with severe liver disease. Pregnancy (D) Positive evidence of fetal risk Lactation Probably Safe. Compatible with breast-feeding per the American Academy of Pediatrics
OTHER ANTIEPILEPTIC DRUGS: NONFORMULARY (LISTED ALPHABETICALLY BY GENERIC NAME)			
Ethosuximide ZARONTIN® 250 mg cap, 250 mg/5ml Nonformulary Cost $$	Indications: Generalized seizures (Non-convulsive—Absence) Initial Dose: 250 mg orally twice daily Titration: Increase by 250 mg as needed every four to seven days up to 1.5 g/day in divided doses Half-Life: 20-60 hours	Aggressiveness, ataxia, concentration impaired, dizziness, drowsiness, euphoria, fatigue, headache, hyperactivity, inability to concentrate, irritability, lethargy, hirsutism, pruritus, rash, Stevens-Johnson syndrome, urticaria, increased libido, abdominal pain, anorexia, cramps, diarrhea, epigastric pain, hematuria (microscopic), vaginal bleeding, myopia, hiccups, others. Warnings/Precautions: Blood dyscrasias. Monitor blood counts periodically, especially if signs/symptoms of infection develop. Associated with cases of SLE. Increased risk of suicidal thoughts/behavior with various antiepileptics (regardless of indication). Avoid ethanol	Drug Levels: Therapeutic:40-100 mcg/ml Toxic levels: >150 mcg/ml. Monitor levels primarily for adherence. Dosage of drug based on seizure control and side effects. Timing of levels: just before next dose Time to steady state: 12 days Contraindications History of hypersensitivity to succinimides Renal Impairment Use with caution Clcr <10, reduce dose 25% HD: give dose after dialysis PD: no adjustment, no supplement Hepatic Impairment: Use with caution Pregnancy (C) There are no adequate well-controlled studies in pregnant women Lactation Enters breast milk and possibly unsafe. Use caution
Felbamate FELBATOL® Tabs: 400 mg, 600 mg 600 mg/5ml Nonformulary Cost $$$	Indications: Not a first line antiepileptic. Partial seizures (Alternative, used as adjunctive or monotherapy) Initial dose monotherapy 1200 mg/day in divided doses three or four times/day Titration: increase dose under close clinical supervision, raising the dosage in 600 mg increments every two weeks to 2400 mg/day based on response. May increase to 3600 mg/day as clinically indicated Half-Life: 20 hours Best absorbed on empty stomach. NA/DOT	CNS: Somnolence, headache, fever, dizziness, insomnia, fatigue, nervousness. GI: vomiting, nausea, constipation, dyspepsia. Suicidal ideation, nervousness, abnormal thinking, emotional lability, ataxia, depression, anxiety, stupor, malaise, agitation, psychological disturbances, aggressive reaction, euphoria. Chest pain, facial edema, palpitation, tachycardia. Skin rash, acne, pruritus, bullous eruption, urticaria. Hypophosphatemia, intramenstrual bleeding, hypokalemia, hyponatremia. Black Box Warnings: Aplastic anemia. Hepatic Failure Measure AST/ALT, cbc, bilirubin before and during therapy Drug Interactions: Increases levels of phenytoin, valproic acid, phenobarbital, active carbamazepine metabolite	Therapeutic Drug Levels Monitoring of levels not indicated, dose is titrated to clinical response. Time to peak, serum: 3-5 hours Contraindications Hypersensitivity to felbamate, any component of the formulation; or known sensitivity to other carbamates; history of any blood dyscrasia; hepatic dysfunction Renal Impairment Decrease starting and maintenance doses by 50%. HD: dose after dialysis, no supplement. PD: no supplement. Hepatic Impairment Contraindicated Pregnancy (C) There are no adequate well-controlled studies in pregnant women Lactation: Enters breast milk. Not recommended

OTHER ANTIEPILEPTIC DRUGS: NONFORMULARY (LISTED ALPHABETICALLY BY GENERIC NAME)

MEDICATION	DOSAGE FORMS	SIDE EFFECTS	CONTRAINDICATIONS / COMMENTS
Gabapentin NEURONTIN® Caps: 100 mg, 300 mg, 400 mg, Tabs: 600 mg, 800 mg, 50 mg/ml solution Nonformulary Cost $$	Indications: Partial Seizures (Adjunctive—Not monotherapy) Initial: 300 mg daily Titration: 300 mg daily x 3 days 300 mg twice daily x 3 days 300 mg AM & 600 mg PM x 3 days 600 mg twice daily x 3 days Increase by 300 mg weekly - Maximum dose for seizures: 1200 mg/day Half-Life: 5-7 hours Must be NA/DOT and crushed/ floated	Dizziness, somnolence, ataxia, fatigue, GI upset, dyspnea, leukopenia. Dermatologic reactions including erythema multiforme, Stevens-Johnson syndrome, rash with eosinophilia. Drug interactions: Potentiates CNS depressants.	Drug Levels No recommended target level and no clear correlation between trough and therapeutic response. Full effect: Three months including titration Contraindications Hypersensitivity to drug/ class/component. No abrupt withdrawal Renal Impairment Adjust dose for Clcr<50/ml/min Hepatic Impairment No adjustment Pregnancy (C) There are no adequate well-controlled studies in pregnant women. Adverse fetal effects Lactation: Probably safe
Lamotrigine LAMICTAL® Tabs: 25 mg, 100 mg, 150 mg, 200 mg IR tablet Tabs: 25 mg, 50 mg, 100 mg, 200 mg XR (Extended Release) Tabs: 25 mg (14s), 50 mg (14s), and 100 mg (7s) ODT ® (orally disintegrating) Nonformulary Cost IR—$ XR- $$$	Indications Partial Seizures and Generalized Seizures (Adjunctive) Initial 25 mg/day for weeks one and two, then increase to 50 mg/day for weeks three and four. Titration Titrate dose to effect; after week four, increase daily dose every one to two weeks by 50 mg/day; Maintenance dose: 225-375 mg/day in two divided doses. Note For patients taking lamotrigine with valproic acid alone, the usual maintenance dose is 100-200 mg/day Half-Life 12-62 hours	Rash, fever, drowsiness, especially in first eight weeks of therapy. Nausea, dizziness, ataxia, blurred vision, aplastic anemia, pancytopenia, suicidal ideation. 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: Level is increased by many drugs (e.g., valproic acid, others). Level is decreased by enzyme-inducing drugs (e.g., phenytoin, carbamazepine, phenobarbital, others)	Drug Levels Therapeutic: Recommended target 1-4 mcg/ml, but dose adjustment should be based on efficacy and tolerability. No clear relationship between level and efficacy or toxicity. 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/not recommended
Phenobarbital LUMINAL® Sodium Tabs: 15, 30, 60, 100 mg 20 mg/5 ml; IM; IV Nonformulary Cost $	Indications: Generalized Seizures (Alternative-Convulsive) Status Epilepticus Dosing: Generalized Seizures: Initial 60 mg orally two to three times daily, up to 50-100 mg two to three times daily Status Epilepticus: Loading dose: IV: 10-20 mg/kg (maximum rate ≤60 mg/minute in patients ≥60 kg), may repeat dose at 20-minute intervals as needed to maximum total dose: 30 mg/kg Maintenance dose: Oral / IV: 1-3 mg/kg/day in divided doses or 50-100 mg two to three times a day Half-Life: 53-140 hours DOT / NAT	CNS excitation or depression, respiratory depression. Bradycardia, hypotension, syncope, agitation, anxiety, ataxia, confusion, dizziness, drowsiness, hallucinations, "hangover" effect, headache, hyperkinesia, impaired judgment, insomnia, lethargy, nervousness, nightmares, somnolence. Exfoliative dermatitis, rash, Stevens-Johnson syndrome. Nausea, vomiting, constipation, agranulocytosis, thrombocytopenia, megaloblastic anemia Drug interactions: Azoles, protease inhibitors. Level is increased by valproic acid, phenytoin, clarithromycin, other drugs. Potentiates effects of alcohol or other sedatives. May decrease levels of phenytoin, oxcarbamazepine, lamictal, coumadin, other drugs, Avoid use in geriatric patients	Drug levels Therapeutic: 20-40 mcg/ml Toxic: > 40 mcg/ml. Time to peak, serum: Oral: 1-6 hours, duration 6-10 hrs. Monitor levels primarily for adherence. Dosage of drug based on seizure control and side effects. Contraindications Hypersensitivity to barbiturates or any component of the formulation; marked hepatic impairment; dyspnea or airway obstruction; porphyria. Renal Impairment Adjust dose-Clcr <10 ml/min Hepatic Impairment Reduce dose Pregnancy (D) Positive evidence of risk to fetus Lactation Use with caution per American Academy of Pediatrics

OTHER ANTIEPILEPTIC DRUGS: NONFORMULARY (LISTED ALPHABETICALLY BY GENERIC NAME)

MEDICATION	DOSAGE FORMS	SIDE EFFECTS	CONTRAINDICATIONS / COMMENTS
Pregabalin LYRICA® Caps: 25 mg, 50 mg, 75 mg, 100 mg, 150 mg, 200 mg , 225 mg, 300 mg Nonformulary 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 Full Effect: First week of therapy Administered with or without food. Half-Life: 6 hours	Cardiovascular: peripheral edema CNS: dizziness, somnolence, ataxia, headache, tremor, blurred vision, diplopia GI: 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. Maximum daily dose 600 mg/day. Contraindications Hypersensitivity to pregabalin or any component of the formulation Renal Impairment Adjust dose for Clcr <60 ml/min Hepatic Impairment No adjustment Pregnancy There are no adequate clinical trials in pregnant women Lactation Not recommended
Primidone MYSOLINE® Tabs: 50 mg, 250 mg Nonformulary	Indications Partial and generalized seizures (Alternative) Initial: Days 1-3: 100-125 mg/day at bedtime (oral) Titration Days 4-6: 100-125 mg twice daily Days 7-9: 100-125 mg 3 times daily Usual dose: 750-1500 mg/day in divided doses three to four times a day with maximum dosage of 2 g/day Half-Life 3-12 hours, phenobarbital is active metabolite– half life 53-140 hours	Ataxia, drowsiness, emotional disturbances, fatigue, hyperirritability, suicidal ideation, morbilliform skin eruptions. Anorexia, nausea, vomiting. Impotence, agranulocytosis, granulocytopenia, megaloblastic anemia (idiosyncratic), red cell aplasia/ hypoplasia. Diplopia, nystagmus Drug interactions: Level is increased by valproic acid and phenytoin.	Drug Levels Therapeutic: 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 phenobarbital; porphyria Renal Impairment 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® Tablets: 25 mg, 50 mg, 100 mg, 200 mg Capsule, sprinkles: 15 mg, 25 mg Nonformulary 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 maintenance dose: 100-200 mg twice daily. Doses >1600 mg/day have not been studied. Half-Life: 18-30 hrs 60 hours in renal failure	Somnolence, dizziness, weight loss, fatigue, nervousness, ataxia, psychomotor slowing, speech problems, memory difficulties, behavior problems, confusion, difficulty concentrating, depression, nystagmus, metabolic acidoses, hyperthermia (severe). Stevens-Johnson syndrome, toxic epidermal necrolysis, 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, recommended maximum dose 200 mg twice daily.(400 mg/day) Time to peak: 1-4 hours Withdrawal: reduce dose 50-100 mg/day over two to eight weeks for seizure treatment. Contraindications Hypersensitivity to topiramate or any component of the formulation Renal Impairment Reduce dose with Clcr <70 ml/min Hepatic Impairment Use with caution Pregnancy (C) Topiramate was found to be teratogenic in animal studies. Topiramate was found to cross the placenta. Lactation Enters breast milk, use caution

ACUTE SEIZURE DRUGS:

MEDICATION	DOSAGE FORMS	SIDE EFFECTS	CONTRAINDICATIONS / COMMENTS
Fosphenytoin CEREBYX® Injection, solution, as sodium: 75 mg/ml (2 ml, 10 ml) [equivalent to phenytoin sodium 50 mg/ml] Formulary Cost $	Indications Status epilepticus Initial Dose Status epilepticus: IV: Loading dose: 15-20 mg PE*/kg IV administered at 100-150 mg PE/minute Nonemergent loading and maintenance dosing IV or IM: Loading dose: 10-20 mg PE/kg IV or IM (maximum IV rate: 150 mg PE/minute) Titration Initial daily maintenance dose: 4-6 mg PE kg/day IV or IM *Fosphenytoin doses expressed as phenytoin equivalents (PE)	Important adverse effects caused by the IV use of fosphenytoin or phenytoin are cardiovascular collapse and/or central nervous system depression. (Do not exceed administration rate of 150 mg phenytoin equivalent/minute when administering fosphenytoin) Nystagmus, dizziness, pruritus, paresthesia, headache, somnolence, and ataxia. Blood dyscrasias, pancytopenia. Severe reactions, including toxic epidermal necrolysis and Stevens-Johnson syndromes *(rare: Asian patients with the variant HLA-B*1502).*	Drug Levels Monitoring of levels not indicated, dose is titrated to clinical response. Contraindications Hypersensitivity to phenytoin, other hydantoins, or any component of the formulation; patients with sinus bradycardia, sinoatrial block, second and third degree AV block, or Adams-Stokes syndrome. HLA-B*1502-positive Caution Renal Impairment Use caution Hepatic Impairment Use caution Pregnancy (D) Positive evidence of risk to fetus. Lactation Not recommended
Lorazepam ATIVAN® Lorazepam: 2 mg tablets Ativan®: 0.5, 1, 2 mg tablets 2 mg/ml solution (IM/IV) Nonformulary Cost $	Indications: Status epilepticus Status epilepticus: IV: 4 mg/dose slow IV (maximum rate: 2 mg/minute); may repeat in 10-15 minutes; usual maximum dose: 8 mg Note: Use with caution in debilitated/ elderly patients DOT / NAT	CNS: Akathisia, amnesia, ataxia, confusion, depression, disorientation, dizziness, headache, visual disturbances, weakness. Respiratory depression, nausea. hypotension Interactions: Potentiates other CNS depressants including alcohol. Increase levels of phenytoin, fosphenytoin	Drug Levels Monitoring of levels not indicated, dose is titrated to clinical response. 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) Renal Impairment Possible risk of propylene glycol toxicity with IV use. Hepatic Impairment Use cautiously. Avoid use in hepatic failure. Pregnancy (D) Positive evidence of risk to fetus. Lactation Not recommended
Diazepam VALIUM® Oral (tablets): 2, 5, 10 mg tablets IV: 5, 10 mg/ml soln. (IM, IV) Rectal Gel: 2.5, 5, 7.5, 10, 12.5, 15, 17.5, and 20 mg/dose Nonformulary Cost $	Indications: Status epilepticus Dose Status epilepticus: IV— 5-10 mg every 5-10 minutes given over ≤5 mg/minute (maximum dose: 30 mg) Rectal gel — Premonitory / out-of-hospital treatment: 10 mg once; may repeat once if necessary. Do not use for more than five episodes per month or more than one episode every five days. Note: Use with caution in debilitated/ elderly patients DOT / NAT	CNS depression, drowsiness, fatigue, ataxia, amnesia, psychiatric and paradoxical reactions such as aggressive behavior, hallucinations, etc. Hypotension, vasodilatation, ataxia, confusion, depression, drowsiness, fatigue, headache, slurred speech, respiratory depression. Interactions: Potentiates other CNS depressants including alcohol. Increase levels of phenytoin, fosphenytoin. Cimetidine, ketoconazole, omeprazole, fluvoxamine, fluoxetine increase effects of diazepam.	Drug Levels Monitoring of levels not indicated, dose is titrated to clinical response. Contraindications Hypersensitivity to diazepam or any component of the formulation (cross-sensitivity with other benzodiazepines may exist); myasthenia gravis; severe respiratory insufficiency; severe hepatic insufficiency; sleep apnea syndrome; acute narrow-angle glaucoma. Renal Impairment Caution advised Hepatic Impairment Caution advised Pregnancy (D) Positive evidence of risk to fetus Lactation Possibly unsafe

Adapted from: Lexi-Comp—Drug information 2011 (UpToDate) and Epocrates Essentials, March 2011.

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