

Table 8.2 Medications Used to Treat Seizures

Medication	Indications and mechanisms	Dosing	Side effects affecting rehab	Toxicities (monitoring required)
First-generation agents				
Benzodiazepines				
Lorazepam (Ativan)	Status epilepticus seizures, GABA.	Adults: 0.1 mg/kg IV at 2 mg/min. Children: 0.1 mg/kg (maximum dose of 8 mg) at 1-2 mg/min. May be taken IM.	Cog: +++ S: +++ A: ++ Motor: +++ D: ++ Com: ++ F: +++	Ataxia, sedation, headache, fatigue, nausea, dependence. Half-life is 14 h.
Diazepam (Valium)	Status epilepticus seizures, GABA.	Adults: 0.2 mg/kg IM at 5 mg/min. Children: 0.2-0.5 mg/kg (maximum dose of 10 mg) at 2 mg/min. Do not take IM (precipitates). Rectal: 0.5 mg/kg (maximum dose of 20 mg).	Cog: ++++ S: ++++ A: ++ Motor: +++ D: ++ Com: ++++ F: ++++	Ataxia, sedation, headache, fatigue, nausea, dependence, active metabolite. Long half-life of 43 h.
Hydantoins				
Phenytoin (Dilantin)	Status epilepticus, tonic-clonic, and partial complex seizures. Blocks sodium channels and decreases calcium uptake.	Adults: 18-20 mg/kg IV at 50 mg/min (IV form precipitates with admixture) or 300-400 mg by mouth/day. Children: 5-10 mg/kg/day. Dosed to therapeutic blood levels of 10-20 mg/dl.	Cog: ++ S: ++ A: 0 Motor: ++ D: +++ Com: +++ F: ++	Liver: ++ Hematologic: +++ Renal: ++ Rash (Stevens-Johnson): +++ Anticonvulsant hypersensitivity syndrome, phlebitis with IV administration, gingival hyperplasia, hirsutism, acne, coarsening of features, hepatic failure, lymphadenopathy, osteomalacia
Fosphenytoin (Cerebyx)	Status epilepticus, tonic-clonic, and partial complex seizures. Blocks sodium channels and decreases calcium uptake.	Adults: 15-20 mg/kg IV or IM at 100-150 mg/min. Dosed to therapeutic blood levels of 10-20 mg/dl. Less irritating to veins than phenytoin.	Cog: ++ S: ++ A: 0 Motor: +++ D: +++ Com: +++ F: ++	Sedation, headache, cerebellar signs (e.g., ataxia, dysarthria, nystagmus)
Barbiturates				
Phenobarbital	Partial simple and tonic-clonic seizures. Increases GABA and chloride channels.	Adults: 15-20 mg/kg IV at 50-100 mg/min. Oral: 180-300 mg/day. Children: 5-10 mg/kg/day. Dosed to therapeutic blood levels of 15-40 mg/dl. Active metabolite is primidone.	Cog: +++ S: +++ A: ++ Motor: +++ D: +++ Com: +++ F: +++	Liver: +++ Hematologic: +++ Renal: 0 Rash (Stevens-Johnson): +++ Anticonvulsant hypersensitivity syndrome, sedation, lethargy, decreased cognition, decreased attention, hyperactivity, depression, nystagmus, ataxia
Primidone (Mysoline)	Partial seizures. Increases GABA and	Adults and children >8 yr: Start at 100-125 mg at bedtime and	Cog: +++ S: +++	Sedation, lethargy, decreased cognition, decreased

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	chloride channels.	increase to twice/day after 3 days, then to 3 times/day after 3 days, then to 4 times/day after 3 days. Maximum dose of 500 mg 4 times/day. Dosed to therapeutic blood levels of 15-40 mg/dl.	A: ++ Motor: +++ D: +++ Com: +++ F: +++	attention, hyperactivity, depression, nystagmus, ataxia, skin rash
Miscellaneous agents				
Valproic acid (Depakote)	Partial, tonic-clonic, myoclonic, and absence seizures. Blocks sodium channels and increases calcium-dependent potassium conductance.	Adults: 15-60 mg/kg by mouth or IV/day. Infants: 20-50 mg/kg/day when used with other agents. Children: 10-20 mg/kg/day; up to 100 mg/kg/day has been used. Dosed to therapeutic levels of 50-100 mg/dl.	Cog: ++ S: ++ A: ++ Motor: ++ D: ++ Com: ++ F: ++	Liver: +++ Hematologic: +++ Renal: 0 Rash (Stevens-Johnson): +++ Anticonvulsant hypersensitivity syndrome, weight gain, hepatotoxicity, dyspepsia, pancreatitis (potentially life threatening), alopecia, tremor, thrombocytopenia, platelet dysfunction, rash, hair loss
Ethosuximide (Zarontin)	Partial complex seizures; agent of choice in absence seizures. Blocks calcium channels.	Adults: 15-40 mg/kg by mouth/day. Children: 10-20 mg/kg/day. Dosed to therapeutic blood levels of 40-100 mg/dl.	Cog: ++ S: ++ A: ++ Motor: ++ D: ++ Com: ++ F: ++	Liver: 0 Hematologic: +++ Renal: +++ Rash: + Leukopenia, headache, dizziness, dyskinesia, bradykinesia, blood dyscrasias (rare), rash (rare)
Iminostilbene				
Carbamazepine (Tegretol)	Partial complex and tonic-clonic seizures. Blocks sodium channels and decreases calcium uptake.	Adults: 800-1200 mg by mouth/day. Children: 10-20 mg/kg/day. Dosed to therapeutic levels of 8-12 mg/dl. Autoinduction of own metabolism occurs after 30 days; may need to adjust dose to maintain levels.	Cog: ++ S: ++ A: + Motor: ++ D: ++ Com: ++ F: +++	Liver: +++ Hematologic: +++ Renal: +++ Rash (Stevens-Johnson): +++ Anticonvulsant hypersensitivity syndrome, blurred vision, benign leukopenia, cardiac arrhythmias, congestive heart failure, syndrome of inappropriate antidiuretic hormone (rare), aplastic anemia (rare); genetic testing required before initiation in Asians (high risk of AHS)
Second-generation agents				
Felbamate (Felbatol)	Second-line agent for partial simple and partial complex seizures not treated with other agents. Blocks N-methyl-D-aspartate receptors and modulates GABA.	Adults: 20 mg/kg by mouth/day.	Cog: ++ S: + A: +++ Motor: ++ D: +++ Com: + F: ++	Liver: ++++ Hematologic: ++++ Renal: 0 Rash: ++ Anticonvulsant hypersensitivity syndrome, headache, fatigue, somnolence, dizziness, insomnia, nausea, vomiting, anorexia, dyspepsia, diarrhea

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Gabapentin (Neurontin)	Add-on therapy for partial complex and tonic-clonic seizures. Binds to glutamate synapses and increases GABA turnover.	Adults: 900-1800 mg by mouth/day. Children >12 yr: 20-40 mg/kg/day. Adjust for renal impairment.	Cog: ++ S: ++ A: + Motor: +++ D: 0 Com: ++ F: +++	Liver: 0 Hematologic: 0 Renal: +++ Rash: + Peripheral edema, tremor, dizziness, fatigue, ataxia, drowsiness, weight gain, behavioral changes
Lamotrigine (Lamictal)	Add-on therapy for partial, absence, tonic-clonic, and myoclonic seizures in children >2 yr. Blocks sodium channels and inhibits presynaptic release of glutamate and aspartate.	Adults: 5-15 mg/kg by mouth/day. Children >2 yr: 5-15 mg/kg/day.	Cog: ++ S: 0 A: ++ Motor: + D: 0 Com: ++ F: ++	Liver: + Hematologic: 0 Renal: + Rash (Stevens-Johnson): + Anticonvulsant hypersensitivity syndrome. Teratogenic; avoid in pregnancy (causes cleft palate).
Levetiracetam (Keppra)	Partial, atonic, tonic, clonic, tonic-clonic, myoclonic, and absence seizures. Decreases brain-derived neurotrophic factor and NPY and increases Y1 and Y5 receptors to reduced kindling.	Adults: 20-40 mg/kg by mouth/day. Children >4 yr: 20 mg/kg/day. Adjust for renal impairment.	Cog: +++ S: +++ A: 0 Motor: +++ D: + Com: ++ F: +++	Liver: 0 Hematologic: + Renal: +++ Rash: + Somnolence, tiredness, dizziness, upper-respiratory infections. Pyridoxine may decrease psychiatric side effects.
Oxcarbazepine (Trileptal)	Simple seizures; adjunctive therapy in children with partial seizures. Blocks sodium channels and decreases calcium uptake.	Adults: 600 mg by mouth twice/day. Children: 10-30 mg/kg/day.	Cog: ++ S: ++ A: 0 Motor: +++ D: +++ Com: ++ F: +++	Liver: + Hematologic: 0 Renal: 0 Rash: +++ Anticonvulsant hypersensitivity syndrome, hyponatremia, nausea, rash. Active metabolite of carbamazepine; fewer side effects than carbamazepine.
Tiagabine (Gabitril)	Partial seizures; add-on therapy for complex partial seizures in children >12 yr. Blocks GABA reuptake and enhances GABA activity.	Adults: Up to 56 mg by mouth/day in 2-4 divided doses. Children >12 yr: 1-2 mg/kg/day.	Cog: ++ S: ++ A: ++ Motor: +++ D: ++ Com: +++ F: +++	Liver: + Hematologic: 0 Renal: 0 Rash: ++ Confusion, difficulty speaking, mild sedation, paresthesias, irritability, weakness, dizziness, nervousness
Topiramate (Topamax)	Partial, tonic, myoclonic, and tonic-clonic seizures; add-on therapy for refractory complex	Adults: Start at 25 mg twice/day and then increase weekly by 50 mg/day in divided doses to 200 mg by mouth twice/day.	Cog: ++ S: ++ A: ++ Motor: +++ D: +	Liver: 0 Hematologic: 0 Renal: +++ Rash: ++ Language impairment,

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	seizures in children >2 yr. Blocks sodium channels.	Children >2 yr: 1-9 mg/kg/day. Adjust for renal impairment.	Com: +++ F: ++	behavioral changes, weight loss, altered taste, metabolic acidosis, kidney stones, hypohidrosis
Zonisamide (Zonegran)	Partial and myoclonic seizures; adjunct therapy for myoclonic seizures in children >16 yr. Mechanism is unknown.	Adults: 1.5-15 mg/kg by mouth/day. Maximum dose of 600 mg/day. Children >16 yr: 5-10 mg/kg/day. Long half-life; promotes adherence. Adjust for renal impairment.	Cog: ++ S: ++ A: ++ Motor: ++ D: ++ Com: +++ F: ++	Liver: +++ Hematologic: +++ Renal: +++ Rash (Stevens-Johnson): +++ Anticonvulsant hypersensitivity syndrome, behavioral changes, weight loss, kidney stones, rash, hypohidrosis
Recently approved agents and agents pending approval				
Eslicarbazepine (Stedesa)	Adjunctive treatment of partial onset seizures. Blocks sodium channels.	800 or 1200 mg once/day. Reduced dosage used in patients with renal impairment.	Cog: ++ S: +++ A: 0 Motor: +++ D: ++ Com: +++ F: +++	Dizziness, somnolence, headache, nausea, diplopia, abnormal coordination, vomiting. Can reduce the drug levels and effectiveness of oral contraceptives.
Vigabatrin (Sabril)	Alternative first-line therapy in treatment of infantile spasms associated with tuberous sclerosis; treatment of refractory complex partial seizures in adults. GABA.	100-150 mg/kg/day.	Cog: +++ S: +++ A: ++ Motor: +++ D: + Com: +++ F: +++	Drowsiness, behavioral problems, irritability, hypotonia, impaired cognitive development. Risk Evaluation and Mitigation Strategy program mandates ophthalmic examination every 3 mo and efficacy assessment every 2-4 wk.
Lacosamide (Vimpat)	Adjunctive therapy in partial onset seizures. Inhibits sodium channels; acts on CRMP-2.	Start at 50 mg twice/day and then increase weekly by 100 mg/day to 200-400 mg IV or by mouth/day. IV should be given over 30-60 min.	Cog: + S: 0 A: + Motor: ++ D: +++ Com: ++ F: +++	Dizziness, diplopia, ataxia, vomiting, nausea, vertigo, blurred vision, cardiac arrhythmia, syncope, suicidal or psychotic reactions, allergic reactions

Cog = cognition; S = sedation; A = agitation or mania; Motor = discoordination; D = dysphagia; Com = communication; F = falls; CRMP = collapsin response mediator protein; NPY = neuropeptide Y; GABA = gamma amino butyric acid; IM = intramuscular; IV = intravenous; AHS = anticonvulsant hypersensitivity syndrome.

The likelihood rating scale for encountering the side effects is as follows: 0 = Almost no probability of encountering side effects. + = Little likelihood of encountering side effects. +/+ = Low probability of encountering side effects; however, probability increases with increased dosage. ++ = Medium likelihood of encountering side effects. +++ = High likelihood of encountering side effects, particularly with high doses. ++++ = Highest likelihood of encountering side effects; best to avoid in at-risk patients.