



IN THE NAME OF GOD



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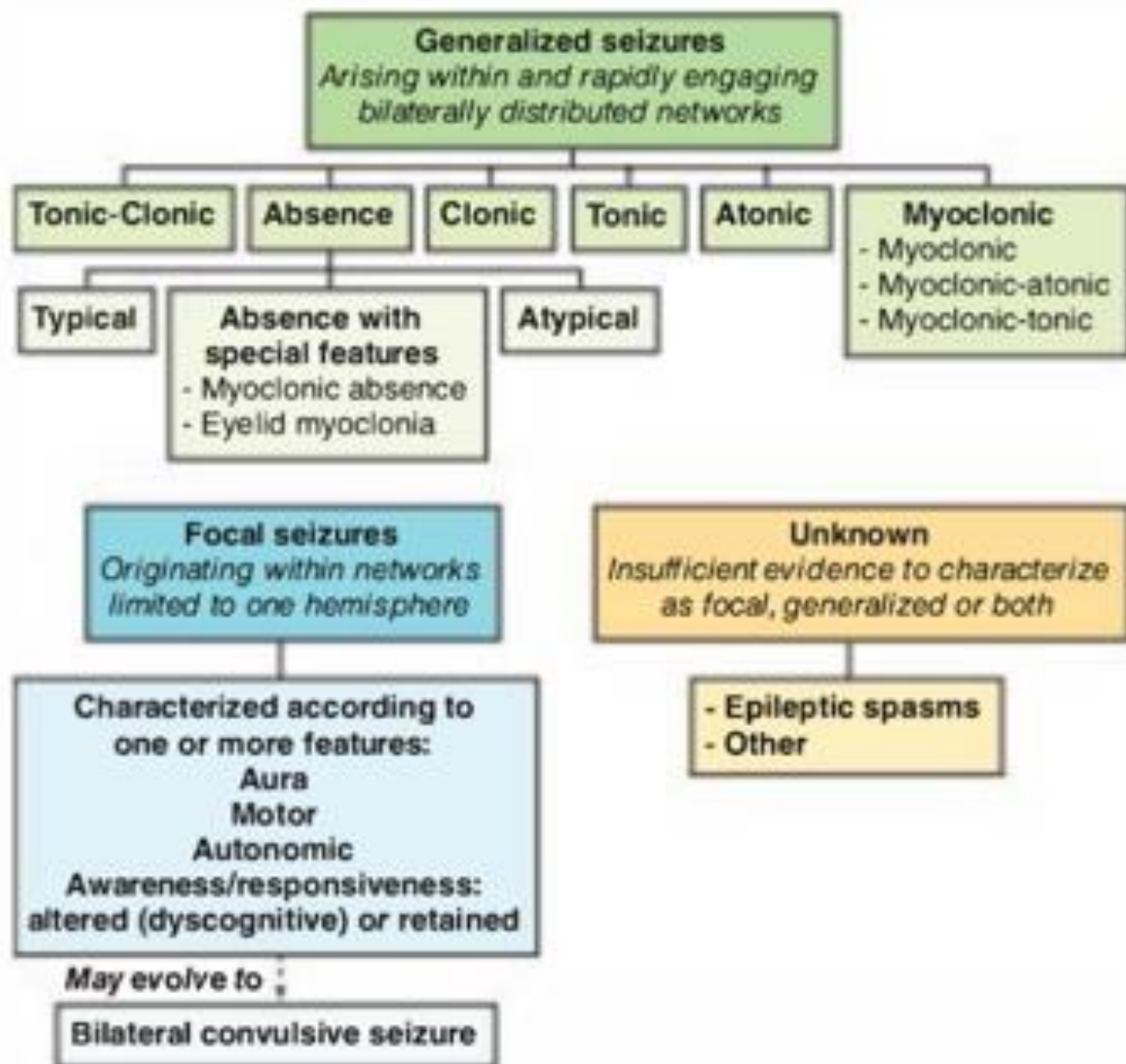
# Epilepsy

## INTERNATIONAL CLASSIFICATION OF EPILEPTIC SEIZURES

- I. Generalized seizures (bilaterally symmetrical and without focal onset)
  - A. Tonic, clonic, or tonic-clonic (grand mal)
  - B. Absence (petit mal)
    - 1. typical
    - 2. atypical
    - 3. special features
      - a. eyelid myoclonia
      - b. myoclonic absence
  - C. Clonic
  - D. Tonic
  - E. Atonic
  - F. Myoclonic including atonic and tonic types
- II. Focal (formerly "partial"); characterized by main feature(s). See Table 16-2
  - A. Simple (*without* loss of consciousness or alteration in psychic function)
    - 1. Aura; somatosensory or special sensory (visual, auditory, olfactory, gustatory, vertiginous)
    - 2. Motor
    - 3. Autonomic
    - 4. Awareness retained (formerly ("simple") or impaired (formerly "complex"))
- III. Unclassifiable; cannot be characterized as focal, generalized or both, including epileptic spasms

## COMMON FOCAL SEIZURE PATTERNS

| CLINICAL TYPE                                                                  | LOCALIZATION                                                              |
|--------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| <i>Somatic motor</i>                                                           |                                                                           |
| Jacksonian (focal motor)                                                       | Prerolandic gyrus                                                         |
| Masticatory, salivation, speech arrest                                         | Amygdaloid nuclei, opercular                                              |
| Simple contraversive                                                           | Frontal                                                                   |
| Head and eye turning associated with arm movement or atetoid-dystonic postures | Supplementary motor cortex                                                |
| <i>Somatic and special sensory (auras)</i>                                     |                                                                           |
| Somatosensory                                                                  | Contralateral postrolandic                                                |
| Unformed images, lights, patterns                                              | Occipital                                                                 |
| Auditory                                                                       | Heschl gyri                                                               |
| Vertiginous                                                                    | Superior temporal                                                         |
| Olfactory                                                                      | Mesial temporal                                                           |
| Gustatory                                                                      | Insula                                                                    |
| Visceral: autonomic                                                            | Insular-orbital-frontal cortex                                            |
| <i>Focal seizure with altered consciousness</i>                                |                                                                           |
| Formed hallucinations                                                          | Temporal neocortex or amygdaloid-hippocampal complex                      |
| Illusions                                                                      | —                                                                         |
| Dyscognitive experiences (déjà vu, dreamy states, depersonalization)           | —                                                                         |
| Affective states (fear, depression, or elation)                                | Temporal                                                                  |
| Automatism (ictal and postictal)                                               | Temporal and frontal                                                      |
| Staring                                                                        | Frontal cortex, amygdaloid-hippocampal complex, reticular-cortical system |



## CAUSES OF RECURRENT SEIZURES IN DIFFERENT AGE GROUPS

| AGE OF ONSET                       | PROBABLE CAUSE <sup>a</sup>                                                                                                                                                                                                            |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Neonatal                           | Congenital maldevelopment, birth injury, anoxia, metabolic disorders (hypocalcemia, hypoglycemia, vitamin B6 deficiency, biotinidase deficiency, phenylketonuria, and others)                                                          |
| Infancy (1–6 months)               | As above; infantile spasms (West syndrome)                                                                                                                                                                                             |
| Early childhood (6 months–3 years) | Infantile spasms, febrile convulsions, birth injury and anoxia, infections, trauma, metabolic disorders, cortical dysgenesis, accidental drug poisoning                                                                                |
| Childhood (3–10 years)             | Perinatal anoxia, injury at birth or later, infections, thrombosis of cerebral arteries or veins, metabolic disorders, cortical malformations, Lennox-Gastaut syndrome, "idiopathic," probably inherited, epilepsy (Rolandic epilepsy) |
| Adolescence (10–18 years)          | Idiopathic epilepsy, including genetically transmitted types, juvenile myoclonic epilepsy, trauma, drugs                                                                                                                               |
| Early adulthood (18–25 years)      | Idiopathic epilepsy, trauma, neoplasm, withdrawal from alcohol or other sedative drugs                                                                                                                                                 |
| Middle age (35–60 years)           | Trauma, neoplasm, vascular disease, alcohol or other drug withdrawal                                                                                                                                                                   |
| Late life (older than 60 years)    | Vascular disease (usually postinfarction), tumor, abscess, degenerative disease, trauma                                                                                                                                                |

# COMMON ANTIEPILEPTIC DRUGS

| GENERIC NAME                                                                                                                                                                       | TRADE NAME | USUAL DOSAGE        |                        | PRINCIPAL THERAPEUTIC INDICATIONS                              | SERUM HALF-LIFE, H | EFFECTIVE BLOOD LEVEL, <sup>a</sup> μG/ML |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------|------------------------|----------------------------------------------------------------|--------------------|-------------------------------------------|
|                                                                                                                                                                                    |            | CHILDREN, MG/KG     | ADULTS, MG/D           |                                                                |                    |                                           |
| <b>Major antiepileptic used as monotherapy</b>                                                                                                                                     |            |                     |                        |                                                                |                    |                                           |
| Valproic acid                                                                                                                                                                      | Depakote   | 30–60               | 1,000–3,000            | Generalized tonic-clonic, partial, absence, myoclonic          | 6–15               | 50–100                                    |
| Phenytoin                                                                                                                                                                          | Dilantin   | 4–7                 | 300–400                | Generalized tonic-clonic, partial, absence, myoclonic          | 12–36              | 10–20                                     |
| Carbamazepine                                                                                                                                                                      | Tegretol   | 20–30               | 600–1,200 <sup>b</sup> | Generalized tonic-clonic, partial                              | 14–25              | 4–12                                      |
| Oxcarbazepine                                                                                                                                                                      | Trileptal  | 10–40               | 900–2,400              | Partial                                                        | 1–5                | —                                         |
| Phenobarbital                                                                                                                                                                      | Luminal    | 3–5 (8 for infants) | 90–200                 | Generalized tonic-clonic, partial                              | 40–120             | 15–40                                     |
| Lamotrigine                                                                                                                                                                        | Lamictal   | 0.5                 | 300–500                | Generalized, partial                                           | 15–60              | 2–7                                       |
| Levetiracetam                                                                                                                                                                      | Keppra     | 20–60               | 500–3,000 <sup>b</sup> | Partial, myoclonic                                             | 6–8                | —                                         |
| <b>Adjuvant and special-use anticonvulsants</b>                                                                                                                                    |            |                     |                        |                                                                |                    |                                           |
| Topiramate                                                                                                                                                                         | Topamax    | —                   | 400                    | Generalized tonic-clonic, atypical absence, myoclonic, partial | 20–30              | —                                         |
| Lacosamide                                                                                                                                                                         | Vimpat     |                     |                        |                                                                |                    |                                           |
| Zonisamide                                                                                                                                                                         | Zonegren   |                     |                        |                                                                |                    |                                           |
| Primidone                                                                                                                                                                          | Mysoline   | 10–25               | 750–1,500 <sup>b</sup> | Generalized tonic-clonic, partial                              | 6–18               | 5–12                                      |
| Ethosuximide                                                                                                                                                                       | Zarontin   | 20–40               | 750–1,500              | Absence                                                        | 20–60              | 50–100                                    |
| Methsuximide                                                                                                                                                                       | Celontin   | 10–20               | 500–1,000              | Absence                                                        | 28–50              | 40–100                                    |
| ACTH                                                                                                                                                                               | —          | 40–60 Units daily   | —                      | Infantile spasms                                               | —                  | —                                         |
| Clonazepam                                                                                                                                                                         | Klonopin   | 0.01–0.2            | 2–10                   | Absence, myoclonus                                             | 18–50              | 0.01–0.07                                 |
| <b>Anticonvulsants for status epilepticus</b> (initial loading or continuous infusion doses shown) <sup>c</sup> —phenytoin and phenobarbital used in doses higher than shown above |            |                     |                        |                                                                |                    |                                           |
| Diazepam                                                                                                                                                                           | Valium     | 0.15–2              | 2–20                   | Status epilepticus                                             | —                  | —                                         |
| Lorazepam                                                                                                                                                                          | Ativan     | 0.03–0.22           | 2–20                   | Status epilepticus                                             | —                  | —                                         |
| Midazolam                                                                                                                                                                          | Versed     | —                   | 0.1–0.4 mg/kg/h        | Status epilepticus                                             | —                  | —                                         |
| Propofol                                                                                                                                                                           | Diprivan   | 2.5–3.5             | 2–8 mg/kg/h            | Status epilepticus                                             | —                  | —                                         |
| Fosphenytoin                                                                                                                                                                       | Cerebyx    | 30–50 mg            | 1,000–1,500            | Status epilepticus                                             | —                  | 10–20                                     |

## CHOICES OF ANTIEPILEPTIC DRUGS BY TYPE OF ADULT SEIZURE DISORDER

| SEIZURE TYPE                                  | INITIAL CHOICE           | SECOND LINE                                                       |
|-----------------------------------------------|--------------------------|-------------------------------------------------------------------|
| Generalized tonic-clonic                      | Valproate, phenytoin     | Lamotrigine, levetiracetam, carbamazepine, oxcarbazepine          |
| Myoclonic                                     | Valproate                | Topiramate, levetiracetam, zonisamide                             |
| Focal (with or without secondary generalized) | Carbamazepine, phenytoin | Valproate, lamotrigine, oxcarbazepine, levetiracetam, lacosamide, |
| Absence                                       | Valproate                | Ethosuximide                                                      |
| Status epilepticus                            | Diazepines               | Phenytoin, fosphenytoin, propofol, levetiracetam                  |

# Status Epilepticus

**Recurrent generalized convulsions at a frequency that precludes regaining of consciousness in the interval between seizures (convulsive status) constitutes the most serious problem in epilepsy .**

**With an overall mortality of 20 to 30 percent .**

**But probably lower in recent years .**

**Rising temperature, acidosis, hypotension, and renal failure from myoglobinuria is a sequence of life-threatening events that may be encountered in cases of convulsive status epilepticus .**

**Prolonged convulsive status (for longer than 30 min) also carries a risk of serious neurologic sequelae ("epileptic encephalopathy").**

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**With regard to acute medical complications, from time to time a case of neurogenic pulmonary edema is encountered during or just after the convulsions, and some patients may become extremely hypertensive, making it difficult to distinguish the syndrome from hypertensive encephalopathy .**

**The etiologies of status epilepticus vary among age groups but all the fundamental causes of seizures are able to produce the syndrome .**

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**The most recalcitrant cases we have encountered in adults have been associated with viral or paraneoplastic encephalitis, old traumatic injury, and epilepsy with severe mental retardation. Stroke and brain tumor have, in contrast, been infrequent causes .**

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## Acute

|                         |     |     |
|-------------------------|-----|-----|
| Stroke                  | 22% | 33% |
| Metabolic abnormalities | 15% | 30% |
| Hypoxia                 | 13% | 53% |
| Systemic infection      | 7%  | 10% |
| Anoxia                  | 5%  | 71% |
| Trauma                  | 3%  | 25% |
| Drug overdose           | 3%  | 25% |
| CNS infection           | 3%  | 0%  |
| CNS haemorrhage         | 1%  | 0%  |

## Chronic

|                                                 |     |     |
|-------------------------------------------------|-----|-----|
| Low concentration of anti-epileptic drugs       | 34% | 4%  |
| Remote symptomatic (eg, tumour, stroke, trauma) | 25% | 14% |
| Alcohol misuse                                  | 13% | 20% |
| Tumour                                          | 7%  | 30% |
| Idiopathic                                      | 3%  | 25% |

Some patients had more than one aetiology.

# **APPROACH TO THE TREATMENT OF STATUS EPILEPTICUS IN ADULTS**

## **Initial assessment**

**Ensure adequate ventilation, oxygenation, blood pressure  
Intubate if necessary, based on low oxygen saturation and  
labored breathing Insert intravenous line Administer glucose and  
thiamine in appropriate circumstances Send toxic screen Assess  
quickly for cranial and cervical injury if onset of seizures is  
unwitnessed .**

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# **Immediate suppression of convulsions**

**Lorazepam or diazepam, 2 to 4 mg/min IV to a total dose of 10 to 15 mg with blood pressure monitoring when higher rates or doses are used .**

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# **Initiation or reloading with anticonvulsants**

**Phenytoin 15-20 mg/kg IV at 25-50 mg /min in normal saline or fosphenytoin at 50 to 75 mg/min .**

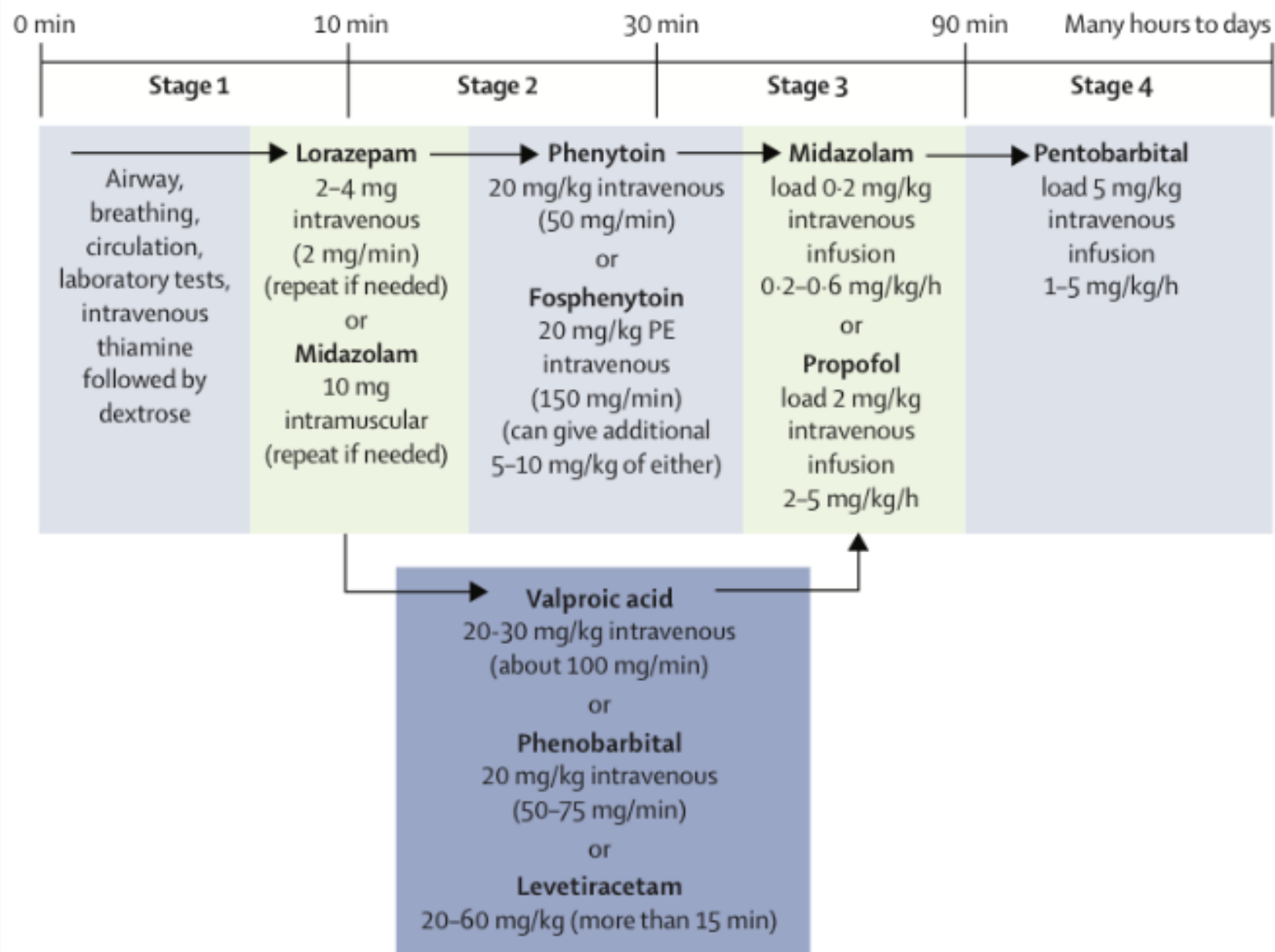
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# **General anesthetic doses of medication or persistent status epilepticus**

**Midazolam 0.2 mg/kg loading dose followed by infusion at 0.1 to 0.4 mg/kg/h or propofol 2 mg/kg/h .**

## **Further treatment if convulsions or electrographic seizures persist after several hours**

**May add valproate or phenobarbital 10 mg/min to total dose of 20 mg/kg as additional anticonvulsants intravenously, or carbamazepine or levetiracetam by nasogastric tube if there is gastric and bowel activity Consider neuromuscular paralysis with EEG monitoring if convulsions persist Pentobarbital 10 mg/kg/h Inhalational anesthetics (isoflurane) .**





Thanks For Your  
Attention