

Epilepsy Treatment Principles

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Management includes three areas:

1. **PHARMACOLOGIC:**
 - 1) treatment of underlying conditions
 - 2) suppression of recurrent seizures.
2. **PSYCHOSOCIAL:**
 - 1) employability, insurability
 - 2) avoidance of precipitating factors. see p. E1 >>
3. **LEGAL:**
 - 1) **reporting by physician** (required in some states)
 - 2) **lifestyle restrictions** (vary from state to state):
 - restrict life as little as possible!*
 - recommendations must be documented very well in chart!*
 - **driving motorized vehicles** (patient should be advised to contact state agency that regulates driving privileges);
 - most states permit *automobile driving* if:
 - a) seizures have not recurred (on or off medications) for 6 months ÷ 2 yr (even after first seizure)
 - b) seizures occur only during sleep for last 3 years.
 - for *commercial driving* across state lines, patient must be 5-year seizure-free.
 - driving is not permitted during drug tapering (treatment termination).
 - *aircraft pilots* are typically no longer permitted to fly.
 - **water precautions** - do not swim alone, do not bath infants alone, wear life jacket in boat. N.B. patient can drown with as little as inch of water during flaccid postictal phase! – use showers instead of baths!
 - **heights** - encourage use of helmets.
 - **fire** (esp. burns related to cooking) – use microwave instead of cooking!
 - **power tools** - supervision during use +safety devices (e.g. automatic shutoff switches).

DURING SEIZURE

N.B. seizure **lasting ≥ 5-10 minutes** must be treat as status epilepticus. see p. E7 >>

1. **Intravenous anticonvulsants are not required** for uncomplicated seizure!!!
2. **Protect from self-harm** (pillows, padded side rails, etc).
3. Loosen **tight clothing and jewelry around neck**.
4. Gently hyperextend neck and thrust jaw to enhance breathing.
5. Roll patient into **left lateral decubitus position** to prevent aspiration.
 - this may cause more harm than good:
 - 1) greater risk for self-injury (such as dislocated shoulder).
 - 2) patients are not breathing during generalized tonic-clinic seizure - no high risk for aspiration until event ends.
 - roll patient onto side **immediately after motor activity ceases** (patients usually take deep breath immediately following seizure).
6. **Mouth should not be opened forcibly** (by object or finger)*, **protecting tongue should not be attempted** - teeth may be dislodged and aspirated + risk of significant injury to oropharynx; wait to suction oropharynx until end of seizure.
 - * **bite block** could protect tongue and allow suctioning access.

DECISION TO HOSPITALIZE AND START TREATMENT

Factors against treatment:

- 1) risk of **adverse effects**
- 2) unknown effects of long-term AED treatment on **brain development, learning, behavior** - may be insidious and not apparent for many years!
- 3) anticonvulsant therapy **does not affect long-term prognosis** (AED significantly reduces risk of recurrence, but does not guarantee remission).

Factors for treatment:

- 1) **risk factors for seizure recurrence** (patients with ≥ 1 of these risk factors probably should be treated):
 - a) **focal onset**
 - b) **abnormal EEG, abnormal MRI, abnormal neurologic examination** (incl. postictal Todd's predisposing **neurologic injury** sufficient to cause seizures.
 - c) paralysis)
 - d) **family history** of epilepsy
 - e) **age < 16 years**
 - f) seizures **presenting as status epilepticus**
 - g) **seizure while sleeping** (twice risk of recurrence compared with seizures while awake).
 - h) history of **neurologic deficit from birth**

risk of recurrence after first seizure:
 normal EEG + normal MRI + no evidence of focal onset → risk 15% → do not treat.
 abnormal EEG + abnormal MRI + focal onset → risk 80% → start treatment.

chance of second seizure:
 normal MRI and EEG = 1 in 3
 either test abnormal = 1 in 2
 both tests abnormal = 2 in 3

- 2) **consequence to patient** of recurrent seizures.

First seizure – transport to ED and admit for several hours of **observation** (most patients recover rapidly after isolated seizure).

- **screen for acute medical / neurologic illness** (i.e. determine if seizure was PROVOKED / UNPROVOKED): complete history, vital signs, general and neurologic examinations, basic chemistry studies, toxicology screen.
- **EEG & neuroimaging** need not be done emergently (can be done on outpatient basis – see p. E1 >>) unless high *likelihood of acute cerebral lesion* or patient *remains obtunded* for > 30 min.

PROLONGED POSTICTAL CONFUSION suggests either *ongoing seizure activity* (status epilepticus) or *underlying encephalopathic condition* (toxic, metabolic, infectious, or structural).

- **hospitalization** is not necessary if all criteria can be fulfilled:
 - 1) no suspicion of *underlying illness*
 - 2) *responsible adult* can observe patient closely at home
 - 3) *follow-up is available* (make appointments for MRI, EEG, and follow-up care with neurologist while patient is still in ED!)
- if criteria are not fulfilled, perform **neuroimaging** (at least CT) in ED; if with fever → add **lumbar puncture**.

UNPROVOKED / IDIOPATHIC seizure

many persons who experience *first unprovoked seizure* never have second, so do not need treatment!; after *second unprovoked seizure* (reliable marker of epilepsy) risk for further recurrence is > 80% → start AED therapy.

- hospitalization and treatment are unnecessary* for *first unprovoked (afebrile) seizure* with uneventful recovery and possible good follow-up;
 - *but always consider *risk factors for seizure recurrence* (see above) and *consequence to patient of seizure recurrence* – if necessary, start AED even after first seizure!
 - e.g. patient with single, idiopathic seizure whose job depends on driving may prefer taking AED rather than risking seizure recurrence and potential loss of driving privileges.
- if patient is going to have recurrence, most occur **within 3 months**.

PROVOKED / SYMPTOMATIC seizure

If *provoking factor cannot be promptly corrected* → start AED therapy.

N.B. diagnosis of epilepsy refers to recurrent seizures and cannot be made on basis of single episode, even if anticonvulsant treatment is administered!

INITIATING DRUG THERAPY

- always start with **MONOTHERAPY**.
- initial target dose should produce serum concentration in low-to-mid therapeutic range.
 - N.B. **PHENYTOIN** requires large loading doses!
 - if therapeutic blood levels need to be achieved rapidly – use drugs for which loading doses are practical (**PHENYTOIN**, **VALPROATE**, **PHENOBARBITAL**).
- patients should expect that minor side effects (mild sedation, slight changes in cognition, imbalance, etc) will typically resolve within few days.
- *slowly increase (titrate) dosage* until seizures are controlled* or toxic signs occur.
 - *AED efficacy can only be evaluated in **STEADY STATE** (not earlier!) *see below*

"start low, go slow"

- consider Medic-Alert bracelet or necklace.

DRUG SELECTION

- drug selection is based on specific **SEIZURE TYPE** (or specific **EPILEPSY SYNDROME**).
- several drugs may be equally effective, and *agent toxicity* is often major consideration in drug selection.
- start with **monotherapy**.

Seizure Type	First-line Agents	Adjunctive Agents
Tonic-clonic	VALPROATE* CARBAMAZEPINE PHENYTOIN	PHENOBARBITAL PRIMIDONE LAMOTRIGINE TOPIRAMATE
Absence	ETHOSUXIMIDE VALPROATE*	LAMOTRIGINE TOPIRAMATE BENZODIAZEPINES ACETAZOLAMIDE PHENOBARBITAL
Myoclonic	VALPROATE BENZODIAZEPINES	LAMOTRIGINE TOPIRAMATE FELBAMATE ZONISAMIDE ACETAZOLAMIDE KETOGENIC DIET
Tonic/atonic	VALPROATE BENZODIAZEPINES	LAMOTRIGINE TOPIRAMATE FELBAMATE
Focal (partial) onset	CARBAMAZEPINE PHENYTOIN VALPROATE LAMOTRIGINE**	GABAPENTIN OXCARBAZEPINE TOPIRAMATE PHENOBARBITAL / PRIMIDONE PREGABALIN ZONISAMIDE TIAGABINE LEVETIRACETAM

*VALPROATE is drug of choice for generalized seizures when *several seizure types coexist*.
 LAMOTRIGINE is reasonable alternative with fewer side effects.
 ** LAMOTRIGINE is first-choice in elderly

	PARTIAL seizures	GENERALIZED seizures		
		Tonic-Clonic	Absence	Myoclonic
Classic AEDs				
PHENYTOIN	1	1	aggravates	aggravates
CARBAMAZEPINE	1	1	aggravates	aggravates
VALPROATE	1-2	1	1	1
PHENOBARBITAL	3	2	–	±
PRIMIDONE	3	3	–	±
ETHOSUXIMIDE	–	–	1	±
CLONAZEPAM*	4	4	2	2
New AEDs (still not generally indicated as first choice for monotherapy)				
FELBAMATE	Effective	Effective	Effective	Effective
GABAPENTIN	Effective	±	aggravates	–
OXCARBAZEPINE	Effective	±	–	–
LAMOTRIGINE	Effective	Effective	Effective	Effective
TOPIRAMATE	Effective	Effective	±	Effective
TIAGABINE	Effective	±	aggravates	–
VIGABATRIN	Effective	±	–	–
ZONISAMIDE	Effective			Effective
LEVETIRACETAM	Effective			
PREGABALIN	Effective		?	

* tolerance development is problem

THERAPEUTIC DRUG MONITORING, ADJUSTING DOSAGE

- to minimize [drug] fluctuations, dosing interval should not exceed $T_{1/2}$ (advisable, $< T_{1/2} / 2$; ideally, $< T_{1/2} / 3$).
- steady state** - equilibrium between drug intake and clearance;
N.B. steady state is reached after time interval equal to $5 \times T_{1/2}$.

Therapeutic blood level - range within which most patients experience *improvement in seizure control* and *few or no adverse reactions*.

- blood levels are obtained during **steady-state** (i.e. no sooner than $5 \times T_{1/2}$ after dosage adjustment).
- therapeutic blood level should serve as general guide only;

patient's *individual clinical response* should prevail over *laboratory reading*

- some become seizure-free with subtherapeutic concentrations;
- some benefit from "toxic" levels without adverse effects.

N.B. "subtherapeutic" drug level should be altered only if seizures remain uncontrolled!!!

- no standard recommendations exist for timing of laboratory monitoring.

INDICATIONS:

- baseline:** after seizures are controlled, determine drug *levels needed to achieve seizure-free effectiveness*.
- toxicity:** determine maximal AED dose that patient can *tolerate without toxic effects*.
- lack of efficacy vs. noncompliance:** before anticonvulsant is deemed failure, knowing whether patient has *achieved adequate drug level* is imperative; 30% patients miss at least 1 dose of medication every month (H: pill reminder boxes for all patients with epilepsy)

if problem is **TOXICITY**, *peak serum level* is desirable;
if problem is **EFFICACY/COMPLIANCE** - use *trough serum level* (just before next dose)

N.B. supratherapeutic levels of some anticonvulsants (e.g. **PHENYTOIN**, **CARBAMAZEPINE**) can *cause* seizures! - be cautious about giving full loading anticonvulsant dose to patients on chronic therapy before checking serum level!

4) **suspected pharmacokinetic change:**

- hepatic autoinduction*;
- concurrent medications* with **P-450 induction / inhibition** potential or **highly bound to serum proteins***;
- altered metabolism* (neonates ÷ young children, elderly, hepatic failure);
- altered protein binding** (uremia, hypoalbuminemia, pregnancy); esp. important for highly protein-bound drugs (**PHENYTOIN**, **VALPROATE**).

*measure of *free drug fraction* (vs. usual [total drug]) is advisable!

N.B. only free (protein-unbound) fraction penetrates BBB and produces desirable / undesirable effects

COMPLIANCE

Most common cause of *breakthrough seizures* is **noncompliance!**

- only 70% patients take anticonvulsant medications as prescribed.
- persistently low [drug] in face of increasing dosage generally imply poor compliance.
- caution with **PHENYTOIN** - 20% patients have poor absorption or rapid metabolism.
- risk factors for noncompliance:**
 - adolescents and elderly persons
 - infrequent seizures
 - dosage several times per day
 - persisting toxic effects
 - psychiatric symptoms (esp. depression)

BREAKTHROUGH SEIZURE

Known epileptic patient who has had single, typical seizure and whose mental status has returned to baseline need not be transported to ED (vs. **first seizure** → transport to ED).

N.B. **noncompliance** is most frequent cause!

- patients must be encouraged to *take medications as prescribed* and to *arrange follow-up* with their own physician as soon as possible.
- if patient stopped taking medication because he was drinking alcohol, advise to *continue taking AED even if drinking* (while warning against respiratory depressive effects when combined with alcohol!).

If patient has run out of medication and has no refills on his prescription, he should be told to go to ED (or urgent care clinic) if someone can provide transportation;

- if not, patient is transported to ED by ambulance.
- in ED, only testing required is **serum anticonvulsant level**.

If [AED] is below patient's usual levels* → loading dose of AED:

$$D = Vd \times \Delta C$$

D – drug dose (mg/kg) required to achieve particular serum concentration (µg/mL)

Vd – volume of distribution (L/kg)

ΔC = desired concentration* - actual concentration

*if specific patient's optimal levels are unknown, reasonable target levels are at upper end of usual therapeutic ranges.

AED	Vd (L/kg)	AED	Vd (L/kg)
CBZ	0,8	PHB	0,6
PHT	0,8	VPA	0,2

- **intravenous loading** can be performed with PHB, PHT, VPA; **oral loading** is limited by toxic adverse effects (including nausea and vomiting), but required calculated dose can be spread out over day or more if necessary.

MONITORING OF ADVERSE EFFECTS

1. **CBC** – baseline + periodic assessment during **CARBAMAZEPINE, ETHOSUXIMIDE, VALPROATE** therapy.
2. **Liver transaminases** – baseline + periodic assessment during **CARBAMAZEPINE, VALPROATE, PHENYTOIN, PRIMIDONE / PHENOBARBITAL** therapy.

Most adverse drug effects are mild and **DOSE-RELATED**.

- typically appear when drug is first given or when dosage is increased.
- usually, but not always, correlate with blood concentrations.
- reversible on lowering dosage or discontinuing drug.
- many are common to virtually all antiepileptic drugs - sedation, mental dulling, impaired memory and concentration, mood changes, dizziness, GI upset.

N.B. all AED depress CNS even in therapeutic concentrations!

IDIOSYNCRATIC adverse effects are **rare**, but **most serious** (life-threatening) reactions to AEDs; similar for all AEDs:

1. Rash – most frequent idiosyncratic reaction
2. Exfoliative dermatitis, erythema multiforme, Stevens-Johnson syndrome
3. Agranulocytosis, aplastic anemia, thrombocytopenia
4. Pseudolymphoma syndrome
5. Hepatic failure
6. Pancreatitis
7. Connective tissue disorders

N.B. no laboratory test can identify individuals specifically at risk!



Hypersensitivity to phenytoin - symmetrical, bright-red, exanthematous eruption, confluent in some sites; associated lymphadenopathy.

Antiepileptic drugs ≈ 2-fold increase risk of **suicidal behavior / ideation** (0.43%) compared to placebo (0.22%).

PREGNANCY CONCERNS

Epilepsy is most common neurological disorder encountered by obstetricians!

De novo seizures – consider **ECLAMPSIA!** see p. 2646 >>

Do not discourage woman from becoming pregnant! (> 90% women taking AED have healthy babies).

AEDs are **teratogenic** + may precipitate* **failure of oral contraceptives!**

vs.

Frequent convulsions** can lead to **miscarriage** or **malformations!**

*P-450 inducing drugs (e.g. carbamazepine, phenytoin)

**hypoxia, reduced placental blood flow

It is currently recommended that pregnant women be maintained on effective drug therapy!

No "best" antiepileptic drug - drug of choice is one that is most appropriate to seizure type and that produces optimal control with fewest side effects; preferable **MONOTHERAPY** at lowest effective dose (esp. during 1st trimester).

- switching medications is not recommended (risk of losing seizure control).
- consider drug withdrawal in patients with prolonged seizure-free periods and seizures not impairing consciousness.

LAMOTRIGINE - one of preferred treatments during pregnancy (low incidence of congenital malformations!!!)

1. Epileptic women (regardless of treatment!) have **1.5-3 times higher rates of PREGNANCY COMPLICATIONS** (intrapartum bleeding, abruptio placentae, premature labor, stillborn births, pre-eclampsia, eclampsia).
2. 25-50% epileptic women experience **increased seizures during pregnancy** - mostly due to [AED]↓ associated with physiologic changes:
 - 1) volume of distribution↑
 - 2) hepatic microsomal activity↑ + protein binding↓ → clearance↑

N.B. **AED dosage requirements increase during pregnancy!**

AED levels (total & free) should be followed frequently during pregnancy, at least once per trimester (esp. after 1st trimester) – baseline, at 18-19 and at 34-36 weeks, postpartum monthly (for 3 months).

3. **Major fetal malformations** increase from 2% (in general population) → 4-6% (single AED during pregnancy) → 10% (≥ 2 concurrent AEDs during pregnancy).

N.B. **all AEDs can produce similar anomalies!**

- formerly particular profiles were attributed to specific drugs (e.g. FETAL HYDANTOIN SYNDROME, FETAL VALPROATE SYNDROME).
- **most common syndrome:**
 - 1) microcephaly, facial dysmorphism, cleft lip, cleft palate
 - 2) cardiac defects
 - 3) digital hypoplasia, nail dysplasia
 - 4) growth retardation, developmental delay.
- **VALPROATE (!!!)** and **CARBAMAZEPINE** increase **neural tube defects**;
H: preconceptive **folic acid, 1-4 mg/day** + **prenatal diagnosis** (serum **α-fetoprotein** at 15-18 week, **ultrasonography** and **amniocentesis** at 15-19 weeks).
- **most critical period is first 5 weeks of gestation.**

Because considerable proportion of pregnancies are unplanned and are discovered after 4th week of gestation, all epileptic women who have child-bearing potential should be treated with FOLIC ACID 1-2 mg/d.

- 4. **Minor anomalies** are also increased independent of treatment status (although AED therapy increases risk further to slight degree).
- 5. All AED (esp. enzyme-inducers) promote **hemorrhagic diathesis in newborns**; routine **vitamin K 1 mg i/m** for babies is occasionally inadequate.
H: additional **oral vitamin K, 10 mg/day** for mother during last month of pregnancy (or 20 mg/d during last 2 weeks or 10 mg IV 4 hours before birth).

BREAST FEEDING

- AED are **excreted into breast milk**.
- ratio of [DRUG] in breast milk / [DRUG] in serum:
 - 80% - for **ETHOSUXIMIDE**
 - 40-60% - for **PHENOBARBITAL**
 - 40% - for **CARBAMAZEPINE**
 - 15% - for **PHENYTOIN**
 - 5% - for **VALPROATE**.
- given overall benefits of breast feeding + lack of evidence for long-term harm to infant by being exposed to AED, epileptic mothers should not be discouraged from breast feeding.
- **monitor drug effects on infant** (lethargy, poor feeding, etc).

NEONATES, INFANTS

- require **similar loading doses** per kilogram of body weight as adults.
- **metabolize drugs faster** than adults.
- rapid increase in total volume of distribution.

ELDERLY

- high incidence of epilepsy.
- physiologic changes (creatinine clearance↓, albumin level↓, hepatic drug metabolism↓), concomitant disease and concomitant medications → **AED adverse effects** (esp. CNS).
H: **lower doses & slower titration**.
- use AED with fewer interactions (e.g. **GABAPENTIN, LAMOTRIGINE**).

EXACERBATIONS

- a) **noncompliance** (draw blood level).
- b) **alcohol** drinking.
- c) **intercurrent infection** (H: temporary increase dosage if seizures occur during intercurrent infection).
- d) **change in lifestyle** (emotional stress, menses, sleep deprivation).

CHANGING DRUG

If seizures continue despite **adequate trial of monotherapy + documented compliance**, then **switch to another AED**:

- maintain patient on first drug (dose may be reduced to that was well tolerated) while second drug is added;
- dose of second drug is adjusted to decrease seizure frequency without causing toxicity;
- only once this is achieved, first drug can be gradually withdrawn (usually over weeks unless there is significant toxicity);
- dose of second drug is further optimized.

POLYTHERAPY

- if no monotherapies work → **try POLYTHERAPY**.
- combination therapy with relatively nonsedating drugs (e.g. CBZ and VPA) is preferable to high-dose monotherapy with sedating drug (e.g. PHB, PRM).
- **factors predicting that polytherapy will be necessary**:
 - 1) partial epilepsy related to underlying structural lesion (vs. idiopathic epilepsy)
 - 2) multiple seizure types
 - 3) developmental delay.
- use drugs with different **mechanisms of action** and **side effect profiles**.
- in most cases **start with two of three first-line drugs** (i.e. **CARBAMAZEPINE, PHENYTOIN, VALPROATE**);
 - if unsuccessful, then add third **newer drug** (e.g. **LAMOTRIGINE, GABAPENTIN**);
 - if effective, least effective of first two drugs should be gradually withdrawn.
- if seizures continue despite adequate trials of several AEDs → refer to **epilepsy center** + consider ACTH / prednisone, ketogenic diet, epilepsy surgery.

ANTIPILEPTIC DRUG INTERACTIONS (effect on serum concentration of AED along top row by addition of AEDs in first column):

Drug	PHB	PRM	PHT	CBZ	VPA	ETX	KLO	LTG	FLB	TPM	OXC	ZNS	VGB
PHB	■	■	variable	↓	↓	↓	↓	↓	0		↓	↓	
PRM	■	■	variable	↓	↓	↓	↓	↓	0		↓	↓	
PHT	0	↓	■	↓	↓	↓	↓	↓		↓	↓	↓	
CBZ	0	↓	variable	■	↓	↓	↓	↓	↓	↓	↓	↓	
VPA	↑	↑	variable	0*	■	variable	↑	↑	↑	↓		↓	
ETX	0	0	variable	0	0	■	0	0	0				
KLO	0	0	0	0	0	0	■	0	0				
LTG	0	0	0	0	0	0	0	■	0				
FLB	0	↑	↑	↓*	↑	0	0	0	■				
TPM	0	0	variable	0	↓					■			
OXC			↑								■		
ZNS												■	
VGB			↓										■

*increases [CBZ-10,11-epoxide]

GBP, LEV, PREGABALIN have no drug interactions!!! – useful as add-on therapy.
GBP clearance is exclusively renal (not metabolized); **LEV** metabolism is minimal.
 PHB, PRM, PHT, CBZ are **P-450 inducers**.
 VPA, FLB are **P-450 inhibitors**.

TERMINATING DRUG THERAPY, PROGNOSIS

IDIOPATHIC epilepsy – patients may be treated chronically (often for life).

- seizures can be **controlled completely** (at least 12 months seizure-free) in \approx 50% epileptics, and **meaningful improvement** is achieved in 50% remaining patients.
- 10 years after diagnosis, probability of being in remission is:
 - 75% - if epilepsy was diagnosed at age < 10 years
 - 68% - if epilepsy was diagnosed at age 10-19 years
 - 63% - if epilepsy was diagnosed at age 20-59 years.

N.B. no available medical treatment can permanently eliminate ("cure") epilepsy!

SECONDARY seizures – antiepileptic drugs are given until primary cause is corrected.

- despite removal of **structural CNS lesion**, there is risk that seizure focus will **remain** in surrounding tissue or develop **de novo** (as result of gliosis and other processes induced by surgery, radiation, or other therapies) - most patients are therefore maintained on AED for at least 1 year.

Discontinuing AED therapy is reasonable if been **seizure free for at least 2 years**.

N.B. decision to terminate treatment is made on CLINICAL GROUNDS!

Therapy should never be terminated abruptly - seizures may result.

H: **withdrawal over 3-6 months** (**BENZODIAZEPINES** and **BARBITURATES** need to be discontinued even more slowly);

- return to previous dose if brief seizure occurs.

Examples of dose decrements every 4 weeks: **CBZ** – 100 mg (3 mg/kg), **PHT** – 50 mg (1.5 mg/kg), **VPA** – 200 mg (6 mg/kg), **ETX** – 250 mg (4 mg/kg), **PRM** – 125 mg (4 mg/kg).

Conditions for low risk of relapse (permanent drug-free remission):

- 1) onset before age 12 yrs. (i.e. **younger patients** have better prognosis!), excluding neonatal seizures.
 - 2) **idiopathic generalized tonic-clonic seizures** (vs. partial seizures, atypical absences, tonic/tonic seizures).
 - 3) no difficulty establishing seizure control.
 - 4) **monotherapy**
 - 5) long seizure-free interval (4 years rather than 2)
 - 6) few seizures before remission
 - 7) **normal sleep-deprived EEG** (esp. absent epileptiform discharges or focal abnormalities)
N.B. normal / abnormal EEG is only guide (not criterion) for treatment termination!
 - 8) **normal neurologic examination** (incl. intelligence)
 - 9) SPECIFIC EPILEPSY SYNDROME:
 - all **benign epilepsy syndromes of childhood** - excellent prognosis.
 - juvenile myoclonic epilepsy** - high rate (80-90%) of relapse – patients must not be withdrawn from AED therapy!
- most recurrences occur in **first 3-6 months** (50% in first 3 months) after discontinuing therapy - patients should be advised to avoid potentially dangerous situations (driving, unsupervised swimming) during this period.
 - relapse is rare **after 2 years!**

BIBLIOGRAPHY for ch. "Epilepsy and Seizures" → follow this [LINK](#)