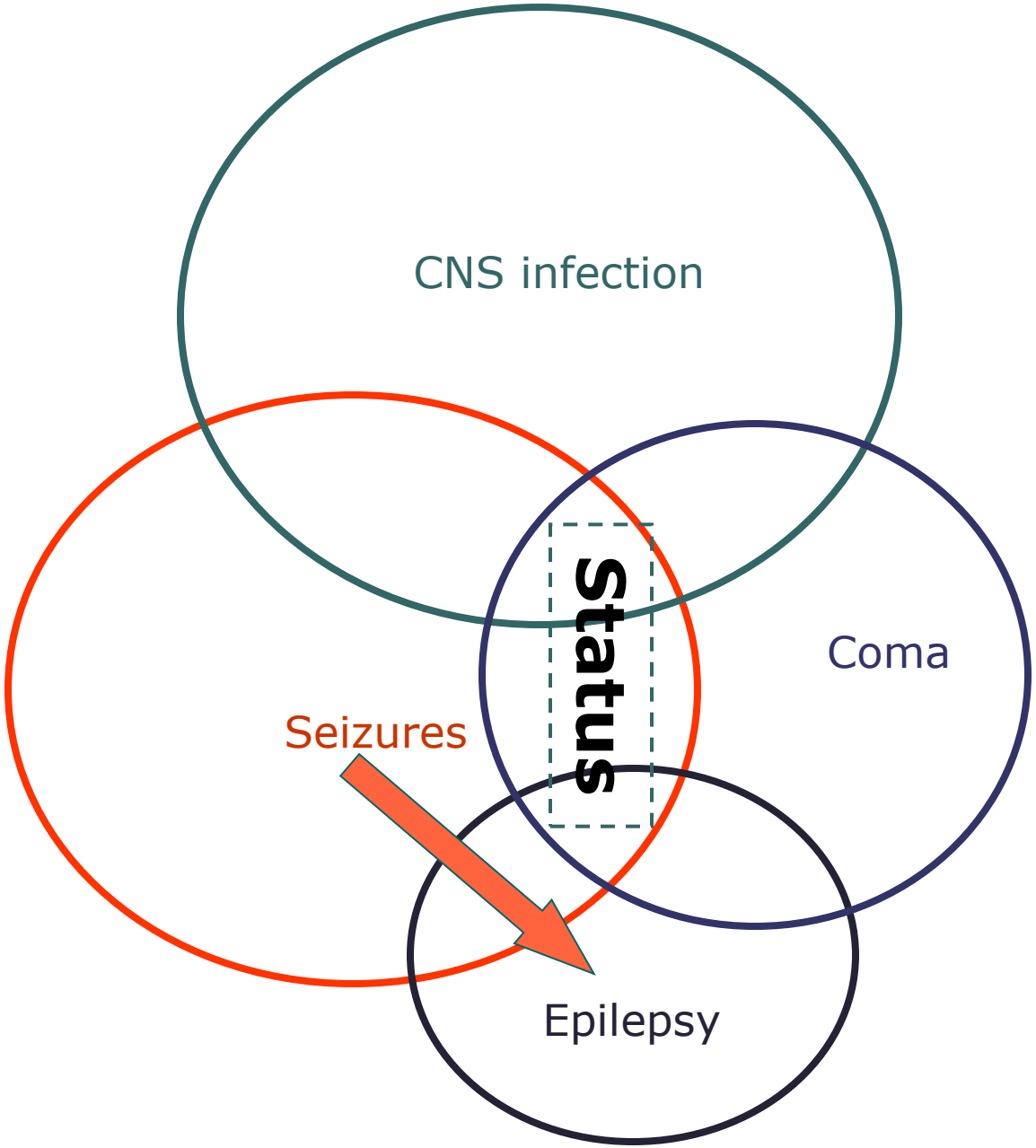
CNS Topics

I Smuts


CNS infection
Status
Coma
Seizures
Epilepsy

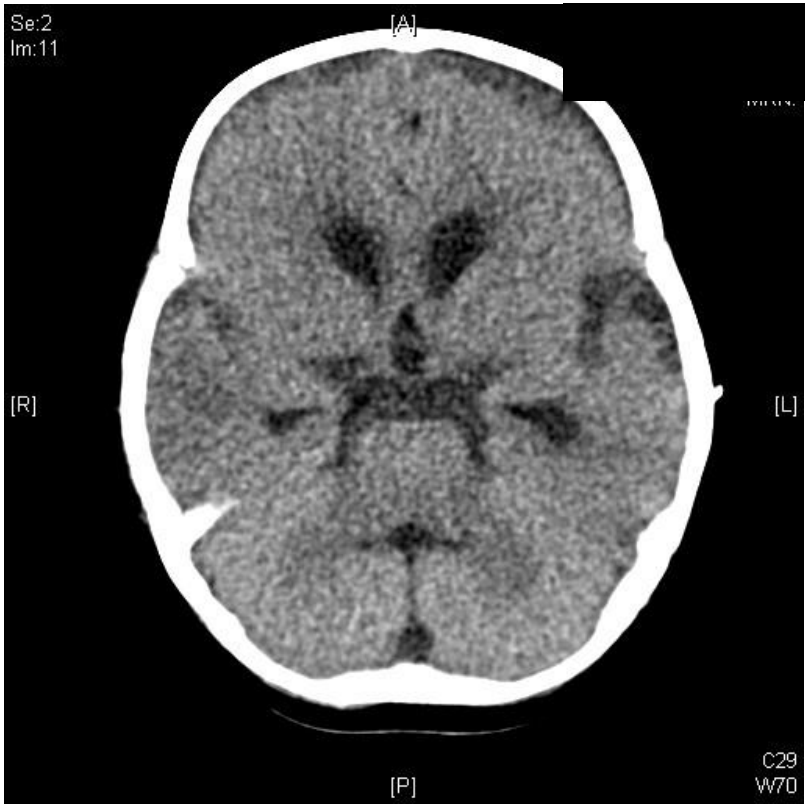
Infections

Bacterial meningitis Aetiology

- **Neonates:**
  - Group B *Strep*
  - *E. coli*
  - *Klebsiella*
  - *Enterobacter*
  - *Listeria monocytogenes*
  - *Salmonella*
  - *Staphylococcus*
- **Infants and older:**
  - *Strep. pneumoniae*
  - *N.meningitidis*
  - *H. Influenza type B*

Complications

- Brain oedema
- SIADH
- Convulsions
- Subdural effusions
- Brain abscess
- Hydrocephalus
- Deafness and blindness
- Learning problems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Clinical manifestations

- Neonates
  - Septicaemia
  - Poor temperature control
  - Respiratory distress
  - Intolerant of feeds
  - Convulsions
  - Bulging fontanel
- Older babies and children
  - Irritable
  - Fever
  - Headache
  - Photophobia
  - Convulsions
  - Meningeal irritation
  - Skin rashes
  - ↓ LOC
  - Signs of ↑ ICP
  - Focal neurological signs
  - Systemic involvement

Diagnosis

- Consider it
- Fever + convulsions → Do LP if in doubt
- LP:
  - Measure the pressure
  - Cell count
  - Gram stain
  - Capsular antigen
  - Culture
  - Biochemistry

When not to do an LP…

- ↓LOC (Glascow <13)
- Focal deficit (e.g. unequal pupils)
- Too sick – haemodynamically unstable or respiratory compromise
- Septicaemia with petechia or purpura
- Low platelets
- Local infection

BUT

Do CULTURES and START TREATMENT

CT before LP?

Indications:

- Immuno compromised
- Known CNS lesion
- Seizures
- Abn LOC
- Focal deficit
- Papilloedema – clinical suspicion ↑ICP

LP contra-indicated if following seen:

- Midline shift
- Loss of cisterns
- Mass in post fossa
- Relative CI: ↑ICP

Management

- Antibiotics – 3rd generation cephalosporin
- ?Steroids – Dexamethasone

- Supportive treatment
  - Fluid balance
  - Electrolytes + GLUCOSE
  - BP
  - Saturation
  - ICP

- Chemoprophylaxis for household contacts

Coovadia and Wittenberg 6th edition:587-589

Aseptic meningitis

- Partially treated meningitis
- TBM
- Viral meningitis
- Leukaemia
- Uncommon infections
  - Syphilis
  - Mycoplasma
  - Toxoplasmosis

TBM

- Clinical
  - Slow onset
  - ICP
  - 75% has lung involvement
  - 93% has a + PPD
  - 3 Stages:
    1. Non-specific – malaise, meningeal irritation, conscious
    2. Confusion and/ or focal signs
    3. LOC affected and / or focal neurological signs
- Treatment
  - 4 drugs + steroids

Brain abscess

- High mortality of 10%
- Associated conditions
  - Formation of pus in paranasal sinuses
  - Cyanotic heart lesions
  - Head injuries
  - Complications of meningitis

Coma

Introduction

Coma = reduction in

AROUSABILITY

and

AWARENESS

Terminology

- Normal consciousness
- Sleep
- Stupor
- Delirium
- Lethargy
- Coma
- Persistent vegetative state
- Brain death

Normal

Brain death

Definitions

- Normal Consciousness
- Sleep
  - Normal physiologic state of nonawareness **but** arousable
- Stupor
  - State of deep sleep, when the mental and physical activity are at minimum
  - Difficult to arouse
  - **Organic pathological process**

Definitions

- Delirium
  - Mental state abnormal
  - Random physical activity
  - Abnormal reaction to stimuli
  - Disorientated
  - Can be associated with
    - Infection
    - Liver dysfunction
    - Toxins
    - Postictal state

Definitions

- Lethargy
  - Drowsy
- Obtundation
  - Varying degrees of decreased alertness
  - Loss of interest and responsiveness to stimuli
  - Communication abilities slow and less clear

Definitions

- Coma
  - **Unarousable** for at least 1 hour
  - Total unawareness with closed eyes
  - Lack of wakefulness or movement
  - Noxious stimuli may lead to inappropriate responses

Aetiology

- History:
  - Sudden onset
    - Stroke
    - Bleeds
    - Seizures
    - Toxins
  - Subacute
    - Brain tumours
    - Hydrocephalus
    - Metabolic disorders

NO FOCAL SIGNS		FOCAL SIGNS
Normal CSF	***Abnormal CSF***	
Hypertension	Meningitis	Tumour
Intoxication	Subarachnoidal haemorrhage	Stroke
Epilepsy		Abscess
Metabolic abn		
Infection		

Clinical Approach

- Acute onset coma is a

  neurological emergency

- Systematic approach
  1. Resuscitation … then

     Figure it out
  2. History
  3. Examination
  4. Diagnostic tests
  5. Treatment

Step 1	ABC GLUCOSE level
Step 2	History (rapid) - Ingestion: induce vomiting / charcoal / antidote
Step 3	Examination and directed Rx: 1. Vitals – BP! 2. ↑ICP: Mannitol, head up 3. Meningeal irritation : LP, antibiotics 4. Skull – trauma: Look in ears and retinas! 5. Seizure activity: tongue laceration, incontinence 6. Neuro exam: GCS, breathing pattern, posture, eyes, focal (Cranial nerves, tone, reflexes), brainstem reflexes

Glasgow coma scale

- Eye opening + verbal + motor response
- Normal GCS:
  - 0-6 months: 9 6-12 months: 11
  - 1-2 years : 12 2-5 years: 13
- Severity
  - Severe <8

Step 4	Look for treatable cause 1. Glucose, FBC, U&E, LFT, ammonia, blood gas, Toxic screen, AED levels 2. Febrile: Blood culture, LP, urine 3. EEG 4. Neuro imaging: CT best for acute situations – bleeds, brain oedema, acute hydrocephalus; MRI best for stroke
Step 5	Treatment and ongoing evaluation 1. Homeostasis: BP, electrolytes, glucose 2. ICP: Head up, mannitol, restrict fluids, normocarbia 3. Specific cause: meningits – AB, SOC – neurosurgery, ingestion – remove toxin and antidote, status – anticonvulsants …..

Status Epilepticus

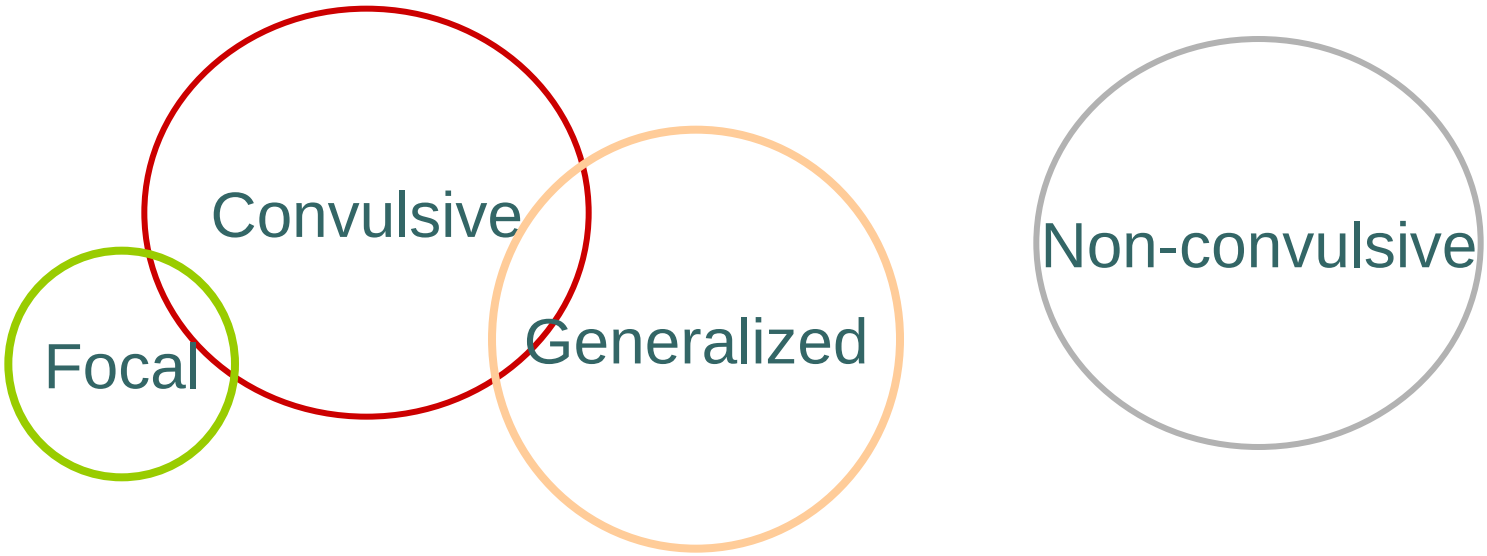
Status epilepsy = true emergency

- Convulsive status epilepticus in children is
  - life-threatening
  - may have neurological complications

- Outcome determined by
  - CAUSE
  - DURATION

So when is it status?

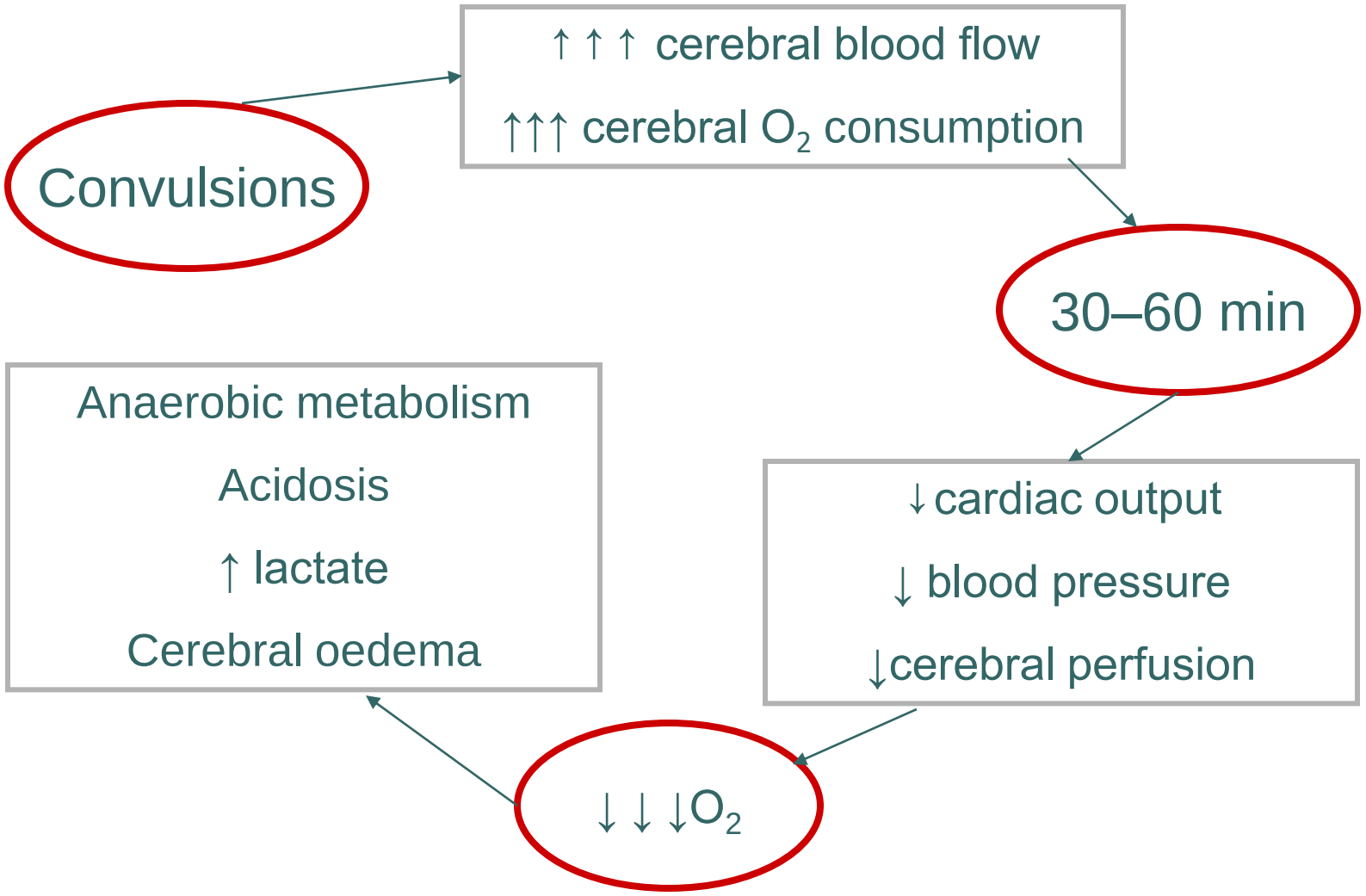
- Seizures for 30 minutes or remains unconscious between seizures
- Types:



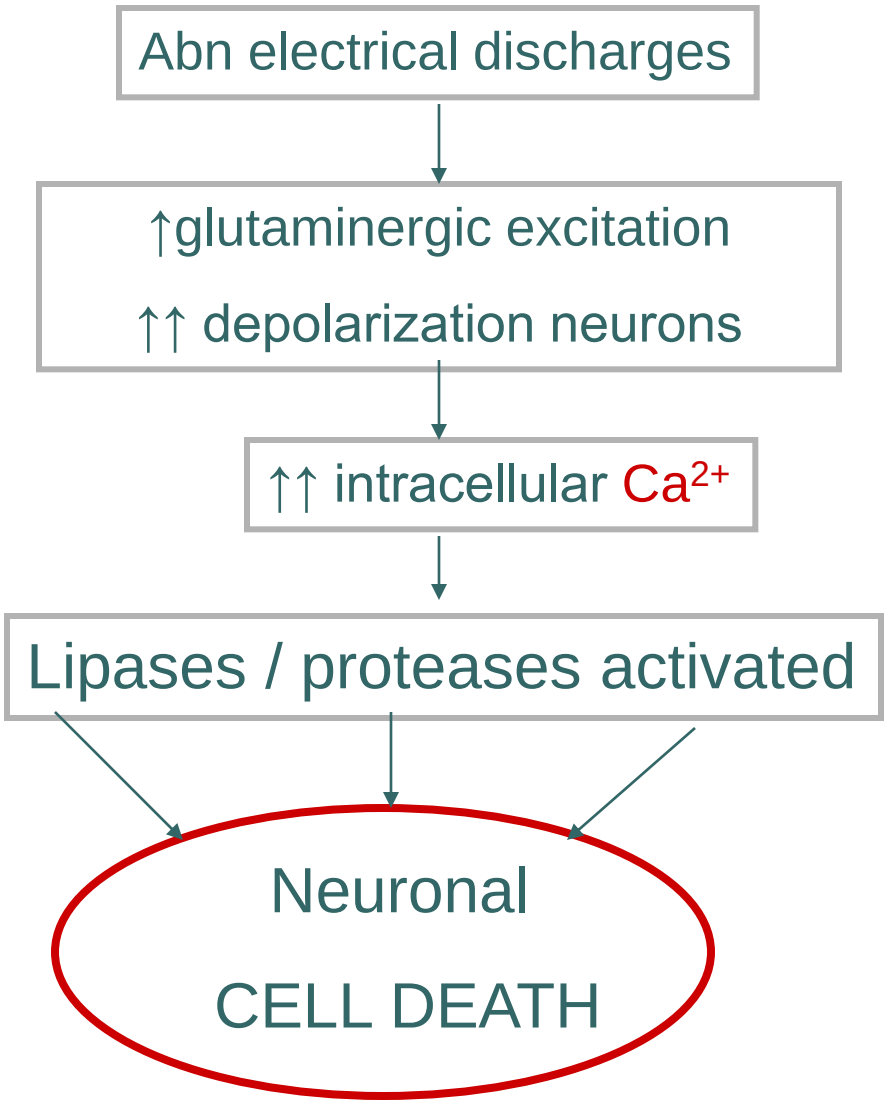
Why is it so urgent?

- Longer duration - worse outcome
- Brain damage after 30 min
- ↑ risk refractory to treatment
- ↑ mortality X 10 if > 1 hour

Mechanisms - Systemic



Mechanisms - cellular



Management

1) Maintain vital functions
2) Stop convulsions (drugs)
3) Cause?
4) Prevent more convulsions

First things first

- DON`T wait 30 min before treating!
- Start on flow chart if fitting for 10 min
- Follow the steps resolutely
- IV route preferred

Treatment protocol

1. Airway / Oxygen
2. IV line; draw blood; give bolus glucose
3. Benzodiazepines
4. Load with AED
5. Continuous IV AED

	Preferred	Alternative
Step 1 Repeat X1	Ativan 0.1 mg/kg IVI (12-15h effect)	Valium 0,3 – 0,5 mg/kg IV / PR Dormicum 0,2 mg nasal
Step 2	Epanutin 20 mg/kg •20-30 min slow infusion •Can give extra 5-10 mg/kg	Epilim 20 mg/kg •Over 5 min •NOT < 2yrs (give Phenobarb 20 mg/kg) •Over 10 min •Extra 10 mg/kg
Step 3 ICU Intubate EEG	Thiopentone infusion Keep on infusion min 48h seizure free	Midazolam Propofol

NEONATE / < 1 yr	Preferred	Alternative
Step 1	Phenobarb 20 mg / kg	Lorazepam 0,1 mg / kg
Step 2	Phenytoin 20 mg/kg	DO NOT USE VALPROATE
Step 3 ICU	Thiopentone	Midazolam infusion

Messages

- Treat immediately
- Proper doses / Proper route (=IV)
- Don`t fiddle around - go to the next step
- Exclude meningitis