Clinical Guidance

Paediatric Critical Care:
Status Epilepticus (SE)

Summary
This guideline is for the use of staff to use when caring for a child following a prolonged seizure or recurrent seizures without return to baseline between seizures. It looks at treatment, management options and investigations. There is slight variation to APLS guidance in recognition that phenobarbitone or phenytoin can normally be given while the team is preparing for RSI.

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This clinical guideline has been produced by the South Thames Retrieval Service (STRS) at Evelina London for nurses, doctors and ambulance staff to refer to in the emergency care of critically ill children. This guideline represents the views of STRS and was produced after careful consideration of available evidence in conjunction with clinical expertise and experience. The guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient.	

Change History		
Date	Change details, since approval	Approved by
01/2023	Levetiracetam dose changed to 40mg/kg and preferred to phenytoin. Timings changed to reflect UK APLS guideline. Consideration of EEG. References updated.	ELCGC March 2023

Paediatric Critical Care

Status Epilepticus (SE)

Definition: prolonged seizure (>30 minutes) or recurrent seizures without return to baseline between seizures
All seizures lasting > 5 minutes at risk of progressing to SE. Delay in initiating therapy increases risk of refractory seizures.

Majority of seizures are terminated by end of protocol, if not this is REFRACTORY STATUS EPILEPTICUS

Causes

- Febrile convulsions and known epilepsy are most common
- Consider also:

  CNS infection, hyponatraemia, hypoglycaemia, head injury (acute or previous), cerebral vascular event (infarct or bleed), space occupying lesion, blocked VP shunt, hypoxia, ischaemia, poisoning, inborn error of metabolism

Urgent investigations

- Finger prick blood glucose
- FBC, sodium, calcium, magnesium, urea, creatinine, CRP
- Ammonia if neonate/ suspect inborn error of metabolism
- Consider urine drugs of abuse screen (esp. teenagers)
- Blood pressure (exclude malignant hypertension)
- CT if focal signs/ new focal seizure, trauma, possible VP shunt complication or space occupying lesion

Management principles

- Maintain **A**irway, **B**reathing and **C**irculation
- Treat seizures as soon as possible per algorithm below
- Find and treat underlying cause
- Minimize systemic complications e.g. hypoxia, hyperthermia, hypotension, hypoglycaemia

Potential problems

- Hypoventilation post benzodiazepines – majority can be extubated as soon as awake
- Failure to recognise ongoing seizures
- Failure to identify and treat cause (e.g low Na, low glucose)

Times are from start of seizure-follow algorithm until seizure is terminated
Consider pre-hospital treatment administered: maximum 2 doses benzodiazepines

Assess & support Airway / Breathing / CVS

0-5 min

Assess and support **A**irway and **B**reathing-ensure adequate ventilation
Apply high flow oxygen, attach monitoring
Finger-prick glucose, obtain IV access

Intravenous access: **YES**	Intravenous access: **NO**
Step 1 5min: IV Lorazepam 0.1mg/kg (max 4mg)	Buccal Midazolam 0.3mg/kg (max 10mg) or age-banded dose **OR** Rectal Diazepam 0.5mg/kg (max 20mg)
Step 2 10 mins: IV Lorazepam 0.1mg/kg (max 4mg)	Repeat step 1 or PR Paraldehyde 0.8mL/kg 50:50 mix (max 20mL)

Call for senior support. Prepare drugs for steps 3/4. Consider IO if no IV

Step 3 15min: IV/IO Levetiracetam 40mg/kg (max 3g)
(can be given even if patient on regular Levetiracetam)

On call anaesthetist should be present and prepare for RSI

Step 4 20min: Is patient on phenytoin?

NO	**YES**
IV/IO Phenytoin 20mg/kg • Give over 20 minutes • Extravasation risk	IV/IO Phenobarbitone 20mg/kg • Give over 5 minutes

Notify PICU/ STRS

Step 5 40 min: Rapid sequence induction of anaesthesia: intubate and ventilate
IV Propofol 2-4mg/kg (unless metabolic) or IV Thiopental 3-5mg/kg
Short acting muscle relaxant (not infusion)

Step 6 60 min: Reassess and consider:

- Ongoing seizures – difficult to identify if muscle relaxed (pupils, heart rate, blood pressure) → refractory SE*
- CT if focal signs, focal/atypical seizure, trauma, possible raised ICP
- Check sodium, magnesium, calcium and ammonia results
- Specific therapies as appropriate: antibiotics, aciclovir, neurosurgery, etc
- **If intubated for hypoventilation, assess for extubation**
- **Lumbar puncture should not be performed in child with reduced GCS**

Important issues

- **Glucose:** aim for 4-8 mmol/L
- **Hyponatraemia (Na <135)**
  if Na <135 mmol/L and still seizing OR Na <130 mmol/L give bolus 3 mL/kg 2.7% sodium chloride
- **Aim for temp** <37ºC
- **Meningitis**
  Ceftriaxone 80 mg/kg IV
- **Encephalitis**: add aciclovir + macrolide
- **Raised ICP** on CT or clinical signs – Neuroprotect guide

STRS management

- Confirm seizures stopped
- Does child need CT before transfer (?neurosurgical problem)
- Do not routinely change to nasal ETT as likely short vent time
- Avoid propofol for sedation if suspected inborn error of metabolism (e. g. LCAD)
- Attention to fever, low sodium, glucose

PICU management

In PICU, stop all sedation and allow patient to wake up and extubate if:

- Seizures easily controlled
- No immediate requirement for further imaging
- No signs of raised ICP

Patient must wake up with no focal neurology to perform LP

Discuss with consultant if:

- Refractory SE
- Delay in waking appropriately
- Known difficult seizure disorder
- Known metabolic disease
- Focal seizures or head trauma

***REFRACTORY SE: inform STRS to retrieve / PICU consultant if in ELCH**

- Load with which ever agent has NOT been used above: Levetiracetam/Phenytoin/Phenobarbitone
- Aim to terminate seizures within 30 minutes with Midazolam infusion
- Bolus 0.1mg/kg & start infusion at 2 micrograms/kg/minute (wait 10 minutes)
- Increase rate to **5, 10, 15, 20** micrograms/kg/minute every **5 min** until seizure stopped
- DO NOT bolus on increments as escalation rapid
- Monitor for hypotension and avoid muscle relaxation (masks seizures)
- Ongoing seizures discuss urgently with PICU consultant and Neurology consultant
- Consider PR paraldehyde 0.8mL/kg 50:50 mix if not given above and available
- Consider EEG if refractory seizures or doubt on whether movements are seizures

Ref: GSTT formulary online. Reiter Ped Neurol 2010: 43 (2) 117-21. ECLIPSE (2125-2134),ConSEPT (2135-2145) both Lancet May 2019. ESETT Lancet Apr 2020. Bacon ADC Educ 2023 108:43-48