

1. Aims

This document is aimed at medical and nursing staff on PICU looking after patients with acute seizures who are referred or admitted to the Paediatric Intensive Care Unit. It should be used for management of prolonged (or repetitive) generalised or focal, clonic or tonic-clonic seizures. The treatment of any other type of seizure should be discussed with a consultant paediatric neurologist.

2. Introduction

Convulsive status epilepticus is a life threatening condition with serious risk of neurological sequelae.

3. Definitions

Convulsive status epilepticus (SE) is traditionally defined as a clonic or tonic-clonic seizure lasting more than 30 minutes, or repeated seizures occurring over a 30 minute period without recovery of consciousness between each convulsion. Many clinicians now regard a convulsive seizure lasting more than 10 minutes as SE. Extensor posturing is a sign of brain herniation until proven otherwise.

Refractory SE is that which persists for longer than 60 minutes despite appropriate treatment with benzodiazepines, phenytoin and phenobarbitone.

4. Aetiology of status epilepticus in children

25% are complex febrile convulsions (which is usually a retrospective diagnosis)

25% are remote symptomatic (children with prior neurological abnormality)

25% are idiopathic epilepsy

25% are acute symptomatic requiring specific treatment

- Traumatic brain injury, including non accidental injury
- CNS infection: meningitis, encephalitis, cerebral abscess, empyema
- Encephalopathy: metabolic disease, poisoning, electrolyte disturbance
- Space occupying lesion (tumour, haematoma or blocked shunt)
- Sudden withdrawal of anti-epileptic drugs in child with epilepsy

5. Initial management

- Follow initial treatment algorithm (**appendix 1**)
- Do basic investigations (**section 6**)
- Consider whether there may be an acute symptomatic aetiology which requires further investigation (**section 7**) and urgent treatment
- If still fitting at 40 minutes then call anaesthetist to intubate and ventilate
- Discuss with consultant paediatrician and PICU

6. Basic Investigations

- Blood sugar
- Blood pressure if not already done (to exclude hypertensive encephalopathy as primary cause)
- FBC, CRP, U&Es, calcium, magnesium, blood culture
- Check anti-epileptic drug levels if on treatment for epilepsy

7. Further investigations

Urgent CT brain may be needed to exclude space occupying lesions such as tumour, bleed or abscess. Ask for CT with contrast if meningitis or abscess are suspected. Remember that a normal CT scan does not rule out the possibility of raised intracranial pressure.

Arrange an urgent CT scan if any of the following are present:

- Any child with SE when aetiology is unknown
- Focal neurological signs including focal seizure
- Asymmetric or unreactive pupils
- Clinical suspicion of raised intracranial pressure
- Reduced conscious level 1 hour post seizure
- History of trauma
- Suspicion of non accidental head injury

Lumbar puncture is not necessary during acute stage and will not change immediate management. Send for MC&S, protein, glucose, meningococcal PCR and herpes PCR. Don't forget to do blood glucose at the same time.

Indications for LP

- age <12 months
- suspicion of meningitis or encephalitis; consider LP in all children presenting with first episode of febrile convulsive status epilepticus

Relative contraindications to LP *

- Glasgow Coma Score <13
- Other signs of raised intracranial pressure (altered pupillary responses, absent Doll's eye reflexes, decerebrate or decorticate posturing, abnormal respiratory pattern, papilloedema, hypertension, bradycardia)
- Within 30 minutes of a convulsive seizure
- Focal seizures or new focal neurological signs
- Tonic seizures (**beware extensor posturing** - this is a sign of brain herniation until proven otherwise)
- Clinical evidence of systemic meningococcal disease or shock
- Local infection over the LP site
- Coagulopathy, low platelet count or anticoagulant treatment

* If a relative contraindication is present, LP should not be undertaken without discussion with a PICU consultant.

6. Further investigations (continued)

EEG should be requested if there is:

- Unexplained SE in any child
- Refractory SE
- Focal seizures
- Possible non convulsive status or sub clinical status epilepticus

Other investigations to consider:

- a. Mycoplasma serology (acute and convalescent)
- b. Viral serology
- c. Urine toxicology
- d. Metabolic investigations (consider if history of consanguinity, or previous family history of metabolic disease or unexplained death. If high suspicion then discuss at an early stage with a metabolic consultant or a paediatric neurologist).
 - Blood gas
 - Biotinidase level
 - Serum ammonia and lactate
 - Urine amino acids and organic acids, serum amino acids

7. Management of refractory status epilepticus (SE persisting for 60 minutes despite appropriate treatment with benzodiazepines, phenytoin and phenobarbitone)

- Discuss with consultant paediatric intensivist and neurologist
- Consider continuous cerebral function monitoring
- IV phenobarbitone 20mg/kg loading dose. Infuse over 30 minutes
- IV midazolam. Start with a bolus of 100microgram/kg plus an infusion at 2microgram/kg/min. Reassess every 15 minutes. If no response then give a further bolus, before increasing by 2 microgram/kg/min. Repeat until response seen, up to a maximum of 20 microgram /kg/min.
- IV thiopentone 4mg/kg bolus. Infusion dose 2-4mg/kg/hr to induce burst suppression. May require higher dose. Must be done with cerebral function monitoring and under consultant supervision. Patient may require inotropic support.
- For unexplained refractory SE in neonates and infants start pyridoxine 30mg/kg/day
- Consider folinic acid 5-15mg BD in neonates
- Consider biotin 10mg OD in neonates after discussion with a metabolic consultant or paediatric neurologist

8. Antibiotics and antivirals

Cefotaxime for any child in whom CNS infection cannot be excluded, all seizures >30 min, complex febrile seizures.

Have a low threshold for giving Aciclovir (for herpes simplex encephalitis) and Erythromycin (mycoplasma encephalitis). Aciclovir should be given to any child with a first or unexplained febrile SE until herpes simplex encephalitis is excluded.

Aciclovir and erythromycin should both be added if:

- History of prodromal illness that may suggest encephalitis: fever, altered consciousness, behavioural changes, or history of recent herpes infection
- Focal neurological signs including focal seizures
- Any neonate (<28 days of age) presenting with seizure or reduced conscious level of unknown cause

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Appendix 1: Initial treatment algorithm

Appendix 2: Flow chart

Appendix 3: Drug doses (BNF for children)

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