Short Title:	Prolonged convulsive epileptic seizures
Full Title:	Guideline for the management of prolonged convulsive epileptic seizures in children and young people
Date of production:	November 2002
Last revision:	July 2008
Explicit definition of patient group to which it applies:	This guideline applies to all children and young people under the age of 19 years.
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This guideline has been registered with the Trust. However, clinical guidelines are 'guidelines' only. The interpretation and application of clinical guidelines will remain the responsibility of the individual clinician. If in doubt contact a senior colleague or expert. Caution is advised when using guidelines after the review date.

Management of prolonged convulsive epileptic seizures

- This is a default guideline for children presenting with ongoing prolonged (>5 minutes) convulsive seizures with loss of consciousness, **EXCEPT** seizures occurring in the neonatal period (see separate protocol).

- If individual patients have had a previous adverse experience e.g. with Benzodiazepines, or for other reasons have their own "tailor made" individual emergency plan, this should be used in preference to the generic default guideline.

Neurosurgical patients may be more sensitive to Benzodiazepines or conversely may be more resistant to anticonvulsant treatment

Definitions

- *Status epilepticus* should be diagnosed if a seizure has persisted for more than 30 minutes, or if there is no awakening between shorter repetitive seizures for the same period of time.

- *Prolonged convulsive epileptic seizure* should be diagnosed if a convulsive seizure with loss of consciousness / responsiveness has persisted for more than 5 minutes, or if there is no awakening between shorter repetitive seizures for the same period of time. Focal motor seizures with preserved consciousness / responsiveness are generally less noxious and should be tolerated for a longer period before giving emergency treatment.

- Commence emergency treatment if convulsive epileptic seizure has persisted more than 5 minutes.

- Consider carefully whether the convulsion is still ongoing or settled, and whether it may be syncopal, psychogenic non-epileptic, tonic-vibratory spasms due to raised intracranial pressure (decerebrate and / or decorticate), a movement disorder e.g. a drug related occulo-gyric crisis or other non-epileptic seizure, especially if emergency treatment fails.

Child older than 1 month having a prolonged generalised convulsive seizure CEWT

Immediately

t = 0

First Aid / ABC
Note the time the seizure started
Is there an individual emergency plan?

All children:
- If seizure continuing, proceed to next step
- No more than 2 appropriate doses of benzodiazepine in total.
- Prepare drugs in advance so that they can be given on time
- Blood sugar

As indicated:
- U&E, Ca, Mg, FBC, LFTs, toxicology screen, anticonvulsant drug levels, blood cultures, other…
- Manage underlying cause (see afebrile, febrile seizure & reduced conscious level guidelines)

5 minutes

Call '999' for ambulance if not in hospital
Call for senior help if in hospital
Blood Glucose, Oxygen, Blood Pressure and IV access as soon as possible

t=5 min

1st 'Status Drug'

Give in Community or Ambulance or Hospital

Buccal Midazolam	0.5 mg/kg (max 10 mg)	See blue instructions box
OR		
Use if IV access or Buccal Midazolam is not available — **Rectal Diazepam**	0.5 mg/kg (max 20 mg)	Rounded to nearest 2.5mg
OR		
For example, in hospital setting if can be given without delay — **IV Lorazepam**	0.1 mg/kg (max 4 mg)	Dilute with equal volume 0.9% saline or WFI. Administer over 1-2mins.

10 minutes

Prepare phenytoin in advance

t=15 min

2nd 'Status Drug'

Give in Ambulance or Hospital

IV Lorazepam	0.1 mg/kg (max 4 mg)	Dilute with equal volume 0.9% saline or WFI. Administer over 1-2mins.
OR		
Use if IV access not available — **Buccal Midazolam**	0.5 mg/kg (max 10 mg)	See blue instructions box

10 minutes

Alert Anaesthetist. Discuss with PICU

t=25 min

3rd 'Status Drugs'

Give in Hospital

If on regular oral phenytoin give Phenobarbital instead of phenytoin* — **IV or IO Phenytoin*	20 mg/kg (max 1000 mg) infusion	Close BP and ECG monitoring. (Not more than 1 mg/kg/min; Max rate 50 mg/min; Not exceeding concentration 10 mg/ml). Infuse over 20 min. Use in-line filter. E.g. If < 500 mg dilute in 50 ml 0.9% saline. E.g. If 500–1000 mg dilute in 100 ml 0.9% saline.
AND	(NB: do not delay giving the Phenytoin)	
Rectal Paraldehyde	0.4 ml/kg (max 12 ml)	Mix paraldehyde with an equal volume of olive oil or sunflower oil. Ready mixed solutions are also available.
**If on regular oral phenytoin give Phenobarbital instead of phenytoin* — IV or IO Phenobarbital	20 mg/kg (max 1000 mg) infusion	Dilute 10 times with WFI and infuse over 20 min

20 minutes

Anesthetist Rapid Sequence Induction, intubation, ventilation & then transfer PICU for further management

t=45 min

4th 'Status Drug'

Give in Hospital

IV Thiopentone	4 mg/kg

Definition

Children with a prolonged generalised convulsive seizure will be
- unresponsive
- with 4 limb involvement (some asymmetry allowed)
- > 5 min duration
- febrile or afebrile
- may or may not have an epilepsy
- may or may not have an underlying cause for the seizure

Also consider non-epileptic attacks, rigors, decerebrate posturing with raised ICP etc as these may appear similar but require different management.

Buccal Midazolam

Hypnovel® = 10 mg in 2 ml
Epistatus® = 10 mg in 1 ml

Administer via oral syringe between outside of teeth and inside of cheek. (For Hypnovel®, draw up using a filter straw).

Outcome

If child stops seizing then arrange admission and further management. Febrile convulsion, Afebrile convulsion, Reduced conscious level & epilepsy guidelines may be appropriate.

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WFI = water for injections; IO = intraosseus; IV = intravenous; PICU = Paediatric Intensive Care Unit

Version 1 Review Date July 2011

History

Obtain information regarding this event, 1st hand witness account if possible; including what happened just before, the evolution of the episode, duration and what it looked like. Consider possibility of NAI, ask about fever and measures taken to control it, recent infection or vaccination, family history of epilepsy. Record current drug treatments, regular and emergency treatments already given, (compliance, timing, dosage, possible over-dosage), history of head injury, history suggestive of raised intra-cranial pressure. Check past history for previous episodes and their management, and other illnesses e.g. diabetes, neurosurgery.

Physical Examination

1) Assess cardio-respiratory status (ABC)
2) Assess the seizure semiology, including whether the patient appears conscious or responsive during the seizure, and which parts of the body are posturing or moving, stiff or jerking or making complex movements
3) Look for evidence of a cause for the seizure

- Trauma
- Pupil size, reaction and symmetry
- Sepsis
- Fundi (papilloedema, haemorrhage)
- Dehydration
- Fontanelle
- Blood pressure
- Head circumference
- Muscle tone and reflexes
- Skin signs of neurological diseases

- Examine for signs of raised ICP, focal deficits, doll's eye movements

Investigations

In all patients

- blood glucose at bed-side

Then only if specifically indicated consider

- plasma glucose (laboratory), electrolytes, Ca, Mg, FBC, LFT's, blood cultures, anti-epileptic drug (AED) levels*, toxicology screen. (See afebrile seizure, febrile seizure or reduced conscious level guideline).

* AED levels taken at about the time of prolonged convulsive epileptic seizures are useful in that if the plasma or serum concentration is high (at or above the top of the target range), that AED may need to be changed. If the plasma or serum concentration is mid range or low then it may be worth exploring reasons (e.g. poor adherence, or gastroenteritis) and / or increasing the dose.

If there are signs of raised ICP or focal neurological signs, further management and imaging should be discussed with Paediatric Neurologist / Senior Paediatrician, Neurosurgeon and Neuroradiologist

Complications

- Post ictal drowsiness and confusion, sleep or GCS <12 usually resolves by 1 hour
- Facial / scalp / tongue lacerations
- Secondary hypoglycaemia
- Fractured vertebrae
- Todd's paresis
- Cerebral oedema
- Cerebral hypoxia
    - reversible
    - Irreversible
        - residual hemiparesis
        - temporal lobe damage

Children with refractory convulsive status epilepticus will require admission to PICU for ventilation and further management.

If the child is still convulsing or suffers respiratory depression requiring intervention, e.g. airway support, then PICU is indicated

- Inform anaesthetist / intensivist at stage 3 (i.e. if Phenytoin or Phenobarbital is needed) or if there is significant respiratory compromise (requiring intervention).

- If going to PICU, contact the Clinical Neurophysiology Department or the on-call Clinical Neurophysiology Technician (if out of hours) to plan EEG & CFAM, *after* any emergency brain imaging, even if convulsive movements have settled (see PICU status guideline). Further advice from the Paediatric Neurology team may be helpful at this stage.

- Consider emergency brain imaging with CT or MRI before transfer to PICU if safe to do so, or at least before EEG / CFAM electrodes are applied.

Management Aims

1. Support vital functions (ABC).

2. Control seizures to assist support of ABC.

3. Assess vital function / resuscitate: ABC. Give oxygen by mask. Position patient head to allow optimal airway. Consider intubation if respiratory assistance is needed.

4. Establish IV access. Draw venous blood sample for laboratory investigations. (see afebrile seizure or reduced conscious level guideline)

5. Fluid Therapy
    - Fluids may be restricted to 2/3 maintenance due to the risk of SIADH. This is unless the child is clinically dehydrated or has a fever when fluid requirements are increased. If hypoglycaemic, administer glucose 5 ml/kg of 10% glucose. Avoid hypotonic fluids. Introduce feeds early.

6. Drug Therapy – see below

If pre-hospital benzodiazepines have already been administered then give only one more dose of Lorazepam IV before proceeding to Phenytoin or Phenobarbital

Buccal Midazolam

0.5 mg/kg. Buccal Fossa. Maximum dose 10mg (available as *Hypnovel* 10 mg in 2 ml ampoules; **or** *Epistatus* 10 mg/ml oral solution).

Rectal Diazepam

0.5 mg/kg PR. Maximum dose 20 mg (available in 2.5 mg, 5 mg and 10 mg rectal tubes) use in the absence of venous access if it is not possible to administer Buccal Midazolam.

Lorazepam

0.1 mg/kg IV. Maximum dose 4 mg. Dilute with equal volume 0.9% saline or water for injections. Administer total dose over 1-2 minutes.

Paraldehyde

0.4 ml/kg PR. Maximum dose 12 ml. It is given mixed with an equal volume of olive or sunflower oil (Normal Saline is an alternative; 1 part paraldehyde: 9 parts saline). May be given as an earlier (e.g. step 1) alternative status drug in selected children e.g. previous benzodiazepine reaction.

Phenytoin

IV loading dose of 20 mg/kg IV. Maximum dose 1000 mg if not previously on Phenytoin. It must be given into a 0.9% saline IV line with close BP and ECG control and at a maximum rate of 1 mg/kg/min initially (e.g. over 20 minutes). Doses up to 500 mgs should be diluted in 50 ml 0.9% saline. Doses 500 mg – 1 g should be diluted in 100 ml 0.9% saline, (if the child's fluid restriction prevents this, then Phenytoin should be diluted to 10 mg/ml or less concentrated). It must not be given IM. It can be given IO.

Phenobarbital

IV Loading dose 20 mg/kg, dilute x 10 with water for injections and infuse over 20 minutes. It can be given IO.

Midazolam

IVI on PICU (ampoule 10 mgs in 2 mls) 500 mcg/kg bolus followed by 2 mcg/kg/min IV infusion and accelerating doses of Midazolam according to PICU guideline (up to 32 mcg/kg/min) with EEG and / or CFM monitoring. Titrate down when seizures controlled.

Lidocaine (previously Lignocaine)

IVI on PICU (500 ml containers of 0.2% Lignocaine in 5% glucose, 2 mgs lidocaine/ml solution): 4 mg/kg/hour (2 mls/kg/hour) for the first hour and then 1 – 4 mg/kg/hour (0.5 – 2 mls/kg/hour) for 24 hours.

References

This algorithm for the management of status epilepticus is based on:

- A national evidence-based guideline, Status Epilepticus Working Party,(Appleton R, Choonara I, Martland T, Phillips B, Scott R, Whitehouse W).
- The treatment of convulsive status epilepticus in children. Archives of Disease in Childhood,2000:83:415-419]
- McIntyre J, Robertson S, Norris E, Appleton R, Whitehouse WP, Phillips B, Martland T, Berry K, Collier J, Smith S, Choonara I. Safety and efficacy of buccal midazolam versus rectal diazepam for emergency treatment of seizures in children: a randomised controlled trial. Lancet 2005;366:204-210]
- APLS guideline [Advanced Life Support Group. Advanced Paediatric Life Support: the practical approach. 4th edition, 2005, Blackwell Publishing, Oxford].
- North Central London Epilepsy Network for Children & Young People Guidelines, April 2005.
- Nottinghamshire Health Community Guideline for the use of Buccal Midazolam (Epistatus®) in children and adults, November 2008.

The following were consulted and agreed with this local guideline:

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Nottingham Childrens Hospital Clinical Guideline Group July 2007

Document Derivation i.e. References:

1. 'NICE 20' 2004
2. 'SIGN 81' 2005
3. Safety and efficacy of buccal midazolam versus rectal diazepam for emergency treatment of seizures in children: a randomised controlled trial – The Lancet July 2005.
4. An analysis of first and second line agents for the treatment of convulsive status epilepticus in childhood (NLSTEPSS Collaborative Group) – Developmental Medicine & Child Neurology January 2005.
5. APLS 4th edition 2005