NETS
Part of the Sydney Children's Hospitals Network

SEIZURE MANAGEMENT FOR CHILDREN > 1 MONTH OF AGE - NETS

PRACTICE GUIDELINE ©

DOCUMENT SUMMARY/KEY POINTS

- Supportive treatment and electrolyte and glucose correction should be addressed initially
- Drug therapy is considered after 5 minutes or when the child appears compromised

CHANGE SUMMARY

- Levetiracetam (Keppra) has been added as a second line medication as an alternative to phenytoin. Drug dosing has been updated in line with current evidence.
- Flowchart for status epilepticus management changed to SCHN algorithm to harmonise with the Paediatric Improvement Collaborative (PIC) and SCHN seizure guidelines.

READ ACKNOWLEDGEMENT

- All NETS clinical staff are to read and acknowledge they understand the contents of this guideline.

Approved by:	SCHN Policy Pathway & Guidelines Committee.	
Date Effective:	1st September 2022	**Review Period:** 3 years
Team Leader:	NETS Retrieval Consultant	**Area/Dept**: NETS

NSW GOVERNMENT

Rationale/Background

- It is usual practice to start anti-convulsive treatment when a seizure has lasted 5 or more minutes.
- Convulsive Status Epilepticus (CSE) is defined as continuous seizure activity, lasting greater than 5 minutes, or a 'cluster' of seizures where the child has multiple short, self-resolving seizures (<1min duration) over a 5-10 minute period, without regaining a normal level of consciousness or fully recovering between seizures. Optimum treatment is to terminate the seizure rapidly, effectively and safely[1].

Several observational studies have demonstrated the effectiveness of **levetiracetam (Keppra®)** as a second line agent after a benzodiazepine. There have been two recent randomised trials showing similar efficacy of levetiracetam when compared with phenytoin for status epilepticus in children[2,3]. Levetiracetam is easy to administer, can be given over 5 minutes, requires no ECG monitoring and carries little risk of extravasation injury. Levetiracetam has the added advantage of utility in children who have had allergic reactions to phenytoin

Team Management

- Use NETS Clinical Calculator to confirm medication doses
- **Immediate assessment and intervention: support Airway, Breathing and Circulation**.
- **Airway:**
  - Patency: If assessed as 'not clear' airway-opening manoeuvres should be immediately commenced. For example head tilt/chin lift or jaw thrusts.
  - Gentle suction of the oropharynx may aid secretion clearance
  - Oropharyngeal or nasopharyngeal airways may be used in conjunction with bag-valve-mask if required.
  - The recovery position should be adopted once airway patency and breathing are satisfactory to minimise the risk of potential aspiration should the child vomit.
- **Breathing:**
  - The effort, efficacy and effects of breathing and/or respiratory failure should be assessed quickly and recorded.
  - Give high flow oxygen via a facemask with a reservoir as soon as airway patency and breathing are demonstrated as satisfactory or until further airway management is initiated.
  - The hypoventilating child should be supported with breaths via a bag-valve-mask device +/- airway adjunct. Intubation and ventilation may be considered if the child's respiratory effort remains poor despite the use of adjuncts and bag-valve-mask.

- **Circulation:**
  - **Gain vascular access** and administer intravenous Midazolam 0.15mg/kg (max 10mg) or Diazepam 0.25mg/kg (max 10mg) if the seizure is still ongoing at 5 minutes. If there is no vascular access available, other routes of administration for midazolam include buccal, intranasal or intraosseous routes.
  - Take blood for blood glucose, sodium, potassium, calcium, magnesium and blood cultures. Hypoglycaemia (<3 mmol/L) should be treated immediately.
  - Antibiotics such as cefotaxime 50mg/kg IV/IO or ceftriaxone 50mg/kg IV/IM/IO (ceftriaxone is contraindicated in neonates receiving calcium containing fluids including parenteral nutrition even when given in separate lines) should be considered in the presence of a rash, stiff neck, or bulging fontanelle after blood cultures have been taken.
  - **Monitor and record the following:**
    - **Heart rate:** presence of inappropriate bradycardia can suggest raised intracranial pressure (ICP)
    - **Blood pressure:** hypertension can indicate a possible cause of the convulsion or a raised ICP
    - **Capillary refill time**
    - **Skin temperature and colour**
    - **Oxygen saturation**
- **Disability:**
  - **Monitor and record the following;**
    - **GCS or AVPU:** conscious level/mental status
    - **Pupillary size and reaction**
    - **Posture:** decorticate or decerebrate posturing in a previously well child may indicate raised ICP
    - **Assess fontanelle in infants less than 12 months or neck stiffness in children older than 12 months**
  - **History:** consider drug induced dystonia, psychogenic, pseudo-epileptic attack.
- **Exposure:**
  - Rash: is it purpuric?
  - Fever: suggests an infective cause or prolonged seizures
  - Poisoning: see education notes
  - Observe and document bruising or signs of injury

Continuing Team Management:

- If **no IV access**:, continue with **either** buccal Midazolam (0.3mg/kg) **or** IM Midazolam (0.15mg/kg) every 5 minutes or PR Diazepam (0.5mg/kg) every 10-15 minutes. After 2 doses of benzodiazepine the intraosseous route may be required to administer phenytoin, levetiracetam or phenobarbitone.
- **IV/IO access: after initial 2 doses of benzodiazepine give either:** Levetiracetam or phenytoin, or if less than 12 months of age give phenobarbitone.
- Intubation and ventilation should be considered if the child continues to have seizures after the above management is given and the seizure fails to terminate. Rapid sequence induction (RSI) with thiopentone or propofol is normally recommended however dose should be tailored to the patient and discussed beforehand with the consulting intensivist. Be wary of hypotension and be prepared to treat promptly with a fluid bolus and/or inotrope.
- IV midazolam infusion (1-6mcg/kg/min) should be continued for the transport as sedation and anticonvulsant.

Educational Notes

- Seizures are a common occurrence in children, with 5% reported to have had at least one by 15 years of age[1].
- Many children with known epilepsy, particularly if severe, will have an individualised acute seizure treatment plan. Information should be available from the usual treating clinician or service.
- In 50% of children seizures are isolated events provoked by high fever (febrile seizures or febrile convulsions) or minor head injuries. Most acute seizures will terminate spontaneously and require no treatment[1].
- Terminology;
  - **Tonic:** stiffening
  - **Tonic-clonic:** rhythmic stiffening and relaxing giving the appearance of jerking
- Decerebrate posturing should not be confused with the tonic phase of status epilepticus as it is a sign of raised intracranial pressure (ICP).
- Buccal Midazolam has been shown to be more effective than PR Diazepam4.
- Lorazepam is not widely available in NSW1 as requires application via special access scheme and refrigeration.
- If toxicity is suspected, the Poisons Information Centre should be contacted 131 126 via NETS co-ordination for advice on specific treatments.
- Avoid muscle relaxants where possible as can mask the signs of ongoing seizures which may result in permanent brain injury.

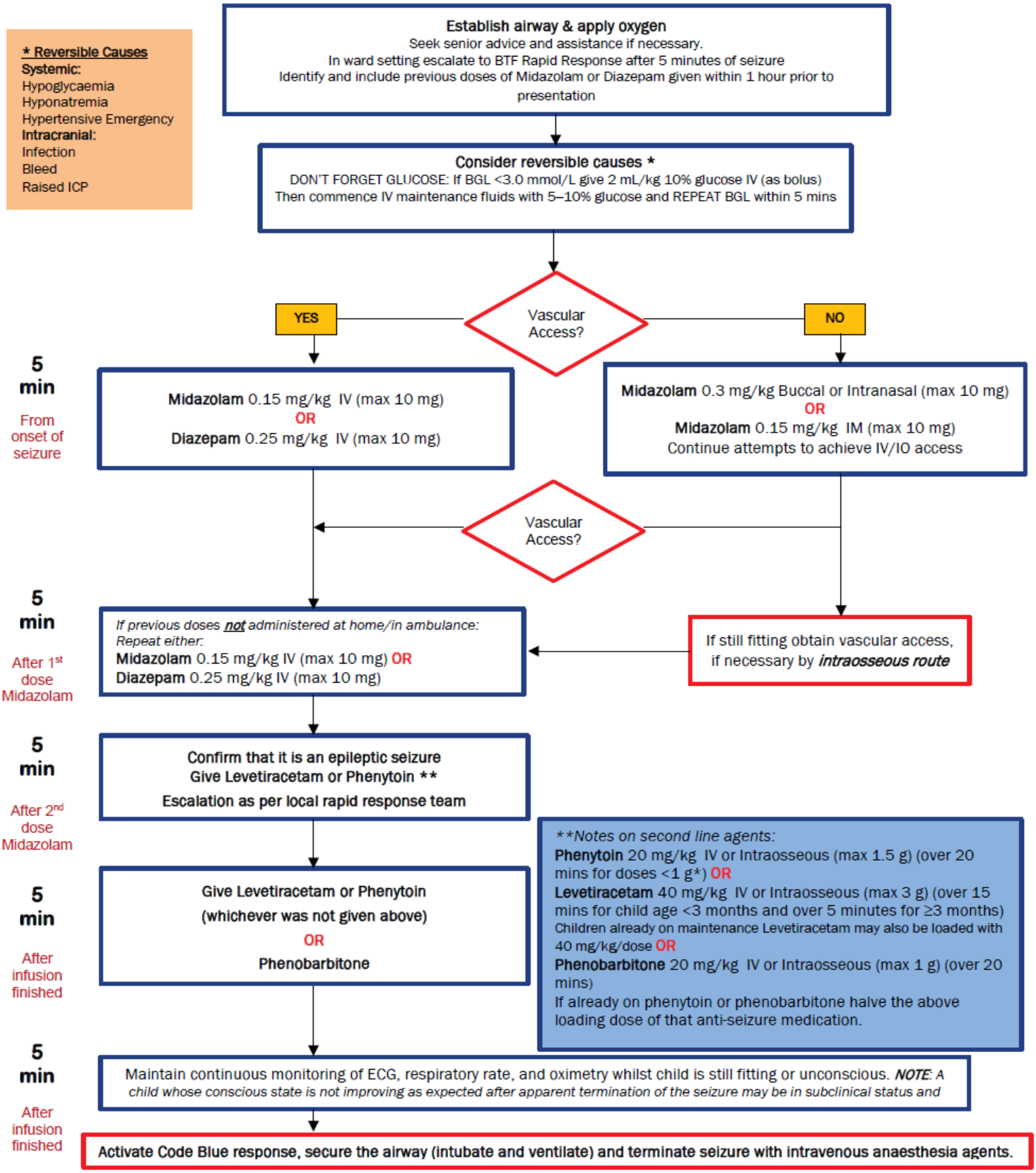
Medication used in acute seizures

See NETS Clinical Calculator for weight specific dosing

Medication	Route	Dose	Administration	Comments
Midazolam	IV Injection	0.15mg/kg (max 10mg)	Dilute to 1mg/ml with sodium chloride 0.9%	
	IO	0.15mg/kg (max 10mg)	Dilute to 1mg/ml with sodium chloride 0.9%	
	IM	0.15mg/kg (max 10mg)	Undiluted	
	Buccal/IN	0.3mg/kg (max 10mg)	Undiluted	IN recommended from 1 month of age. Use atomiser.
	IV Infusion	1-6mcg/kg/min	3mg/kg diluted to 50mL in 5% glucose or 0.9% saline	1ml/hr=1mcg/kg/min
Diazepam	IV/IO	0.25mg/kg (max 10mg)	Undiluted, slowly over 3 minutes into a large vein.	
	PR	0.5mg/kg (max ≤12 years 10mg, >12 years: 20 mg)		
Phenytoin	IV/IO	20mg/kg (max 1.5g)	Dilute to 3-10mg/mL in 0.9% NaCl, infuse over 30 minutes	AVOID glucose in the line.
Phenobarbitone	IV/IO	20mg/kg **(max 1g)**	Dilute to ≤20mg/mL in 0.9% NaCl or 5% glucose, infuse over 10 minutes	Loading dose only.
Levetiracetam (Keppra)	IV/IO	20-40mg/kg (max 3g)	Dilute to 15mg/mL in 0.9% NaCl and give over 5-15minutes.	Initial dose 40mg/kg.

Pyridoxine	IV	50-100mg (note NOT per kg)	Consider in infants up to 6 months with refractory seizures and discuss with paediatric neurologist. Inject slowly undiluted or dilute to a convenient volume, over at least 5 minutes	Risk of apnoea and cardiovascular collapse. Continuous monitoring or respiratory rate, heart rate and BP is recommended.

Algorithm for Status Epilepticus



References and Resources

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