NTS Clinical Guideline

Title:	Neonatal Seizure Management		
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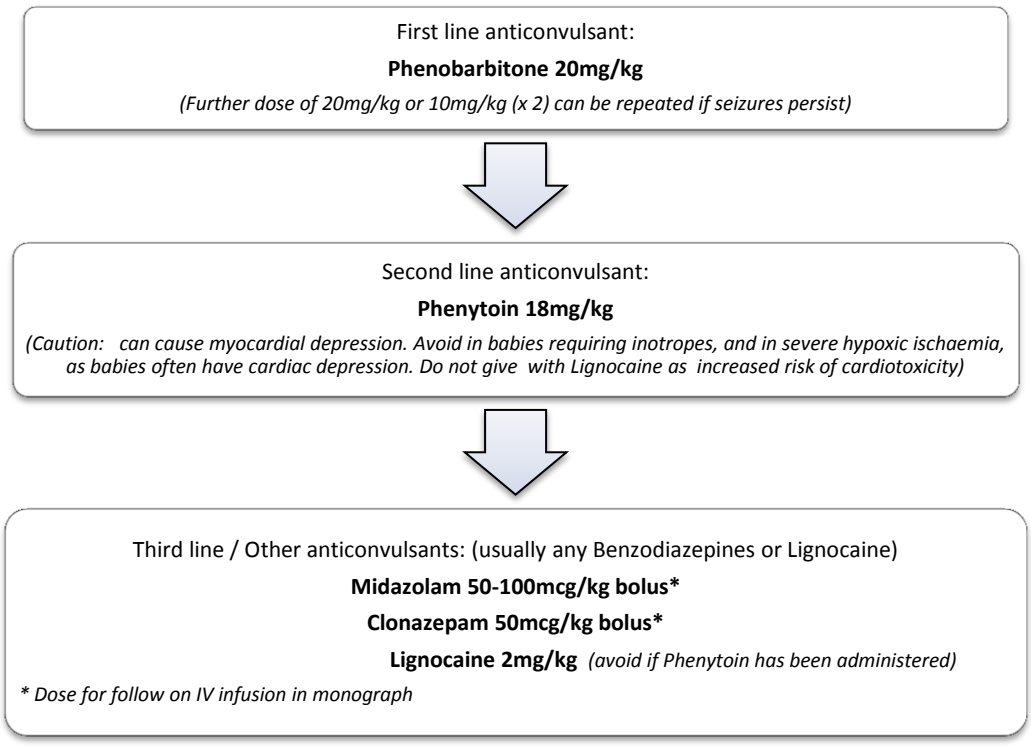
Quick Reference

Management

- General principles: A, B, C.
- Consider intubation and ventilation if:-
  - frequent seizures +/- apnoea
  - and/or use of anticonvulsants which may depress respiration, particularly when more than one has been used, or with higher/multiple doses.
- Identify and treat cause promptly; urgent investigations include electrolytes (including Calcium, Magnesium, Phosphate), Glucose, Blood gas, Lactate. Correct as required.
- Clarify what has been done of the following - CRP, FBC, blood culture, LP (if clinically stable), and cranial US.
- Antibiotics cover for meningitis, +/- aciclovir to cover HSV meningo-encephalitis.
- Anticonvulsants (see flow chart below). In the absence of aEEG / EEG, accepted practice to treat clinical seizures occurring 3 in 1 hour or a single seizure lasting more than 3 minutes[4].
- In intractable seizures, consider trial of Pyridoxine (50-100mg IV), Pyridoxal phosphate 30mg/kg/day), Folinic acid (4mg/kg/day); and re-evaluate for a metabolic cause.



Background

Seizures are the most common neurological emergency in neonates and they are associated with high mortality and morbidity. The immature brain seems more prone to seizures than the mature brain. The reported incidence of clinical seizures is 1-5/1000 in term, and up to 1-13% in VLBW neonates. The time of onset is usually between 12-48 hours, but can vary significantly, dependent on cause.

Clinical manifestation of seizures in neonates: *(see table below)*

Classic tonic-clonic seizures are rare in neonates. Seizures in newborns are often sub-clinical or subtle. Additionally, there is a well-recognised dissociation between electrographic and clinical seizures, where electrographic seizures can be clinically silent and vice versa. This dissociation is more pronounced after administration of Phenobarbitone[3,4], and can be seen with other anticonvulsants.

TYPE	CLINICAL MANIFESTATION	FREQUENCY AND EEG CORRELATION / ABNORMALITIES
Subtle (Often accompanied by autonomic changes)	• Orofacial manifestations (eye deviation, eye lid fluttering, staring, blinking, lip smacking, sucking, chewing) • Limb movements (cycling, boxing, swimming movements) • Desaturations / Apnoea +/- above	Approximately 50% of neonatal seizures. EEG: correlation variable.
Clonic	Unifocal or multifocal rhythmical jerking of limb(s), one side of face or body.	25-30% of neonatal seizures. EEG: correlation common; characteristic ipsilateral runs of sharp slow-wave complexes.
Myoclonic	Sudden brief, jerky movements; could be one muscle group or generalised; usually flexor muscles; irregular, arrhythmic, and high amplitude.	15-20% of neonatal seizures. EEG: can have no changes if focal or in sleep myoclonus; common if generalised.
Tonic	Stiffening, decerebrate posturing	5% of neonatal seizures. EEG: correlation variable.

Aetiology (in rough order of decreasing frequency):

- HIE
- Cerebral infarction (stroke)
- Intracranial haemorrhage (including IVH, subdural haematoma)
- Meningitis
- Maternal drug withdrawal
- Electrolyte disturbance – hypoglycaemia, hypocalcaemia, hypomagnesaemia, Hypo-/hypernatraemia
- Congenital brain malformation
- Benign non-familial neonatal seizures
- Benign familial neonatal seizures
- Inborn errors of metabolism (Pyridoxine dependent seizures, Non-ketotic hyperglycinaemia, biotinidase deficiency)

- Hypertension
- Kernicterus
- Epileptic encephalopathies
- Early myoclonic epilepsy (EME)

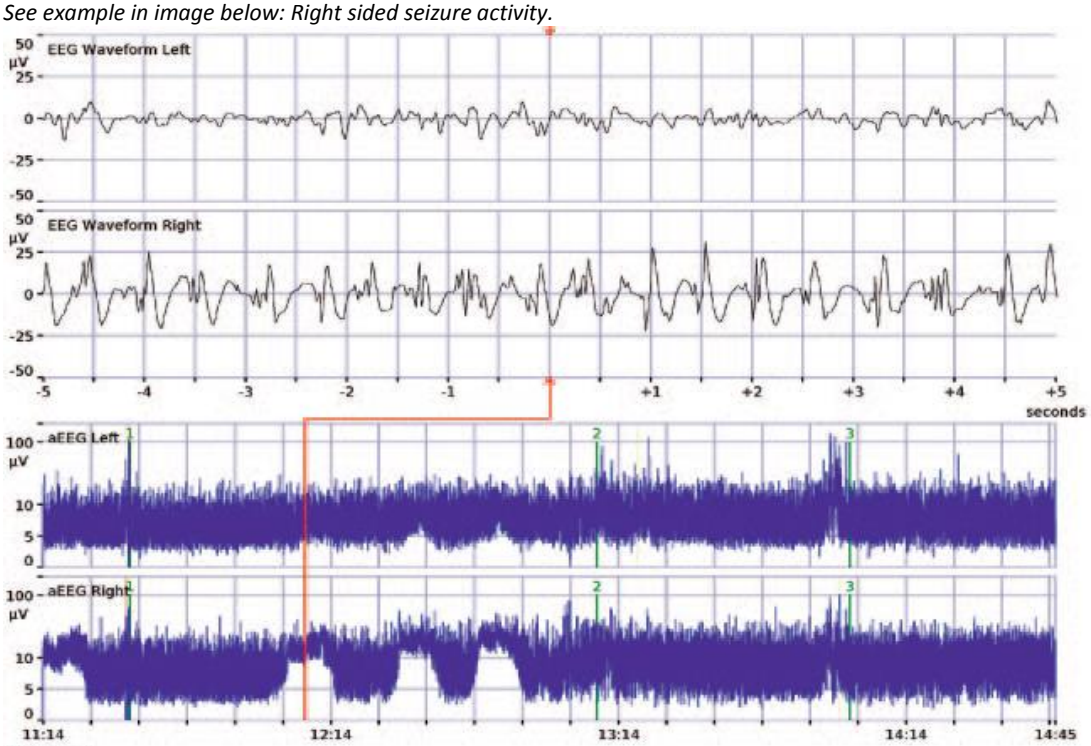
Assessment:

- Clinical: it is important to perform a neurological assessment, including examination of pupils and checking for lateralising signs, along with the general examination.
- Investigations: glucose, calcium, magnesium, phosphate, U&E, CRP, FBC, blood gas, lactate, blood culture, LP (once clinically stable), and cranial US are important 1st line investigations to perform prior transfer. Review aEEG/CFM changes if available. Other investigations to consider: CT/MRI brain, metabolic screen, virology + TORCH, screen for maternal drug abuse.

aEEG / CFM features of seizures:

- CFM: sudden abrupt rise in the minimum and maximum amplitude of the CFM trace, associated with narrowing of the CFM width. Raw EEG should be reviewed for confirmation.
- Raw EEG: monomorphic, repetitive, rhythmic sharp wave and spike discharges.

See example in image below: Right sided seizure activity.



References:

1. Glass HC (2014) Neonatal seizures: Advances in Mechanisms and Management, *Clin Perinatol.***41(1):**pp177-190
2. HellstrÖm-Westas L, Rosén I, de Vries LS, and Greisen G (2006) Amplitude-intergrated EEG Classification and interpretation in preterm and term infants *NeoReviews* **7(**2): pp76-87
3. Pressler RM, Chapter 6. Neonatal Seizures. Dept of Clinical Neurophysiology, GOSH, London.
4. Rennie JM (2012) *Rennie & Roberton's Textbook of Neonatology.* 5th Edition. London: Elselvier.
5. Shah NA and Wusthoff CJ (2015) How to use: amplitude-integrated EEG (aEEG), *Arch Dis Child Educ Pract Ed* **100:** pp75-81
6. Slaughter LA, Patel AD, and Slaughter JL (2013) Pharmacological treatment of Neonatal Seizures: A Systematic Review, *Journal of Child Neurology* 28(3) pp351-364.