Document Control

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Seizures in Neonates Guideline			
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CONTENTS

1. Purpose

The purpose of this guideline is to recommend best practice for the recognition, assessment and treatment of neonatal epilepsy.

2. Introduction

Seizures occur in 1-2 per 1000 live births and in 5 to 13 % of very low birth weight infants. The commonest cause is hypoxic ischaemic encephalopathy. Other causes include intracranial bleeds, infection, infarction, malformations and metabolic disorders.

The majority of neonatal seizures occur on the first day, and 70% of all cases eventually recognised have been diagnosed by the fourth day.

3. Scope

This guideline relates to the following staff groups who may be involved in caring and treating infants with neonatal epilepsy

- Paediatric medical team
- Registered neonatal and paediatric nurses
- Midwives

4. Responsibilities

Role of Senior Neonatal Staff

4.1. The Senior Neonatal Staff are responsible for:

- Ensuring that neonatal staff are familiar with the contents of the guideline
- Acting in accordance with the guideline

Role of the Paediatric medical team

4.2. The Paediatric medical team are responsible for:

- Acting in accordance with the guideline

5. Causes of Neonatal seizures

In contrast to seizures in infancy and childhood, most neonatal seizures are acute and symptomatic with suspected specific causes.

Causes of neonatal seizures.	Frequency
Hypoxic-ischaemic encephalopathy	30-53%
Intracranial haemorrhage	7-17%
Cerebral infarction	6-17%
Cerebral malformations	3-17%
Meningitis/septicaemia	2-14%
Metabolic • Hypoglycaemia • Hypocalcaemia, hypomagnesaemia • Hypo-/hypernatraemia • Inborn errors of metabolism (such as pyridoxine dependency, folinic acid-responsive seizures, glucose transporter defect, non-ketotic hyperglycinaemia, propionic aciduria) • Kernicterus	 0.1-5% 4-22% 3-4% 1%
Maternal drug withdrawal	4%
Idiopathic	2%
Benign idiopathic neonatal seizures	1%
Neonatal epileptic syndromes	
Congenital infections	

6. Recognition of Seizures

The clinical manifestations of neonatal seizures are varied. There are four main types.

Type & frequency	Clinical signs	12 lead EEG findings
Subtle (50%)	Eyelid fluttering, eye deviation, staring, blinking, cycling, boxing, mouthing, chewing, lip smacking, smiling, apnoea.	Variable correlation. Most likely if ocular signs present.
Tonic (5%)	Stiffening & posturing of limbs/trunk. Deviation of	Variable correlation.

	head or eyes.	
Clonic (25-30%)	Repetitive jerking. Unifocal or multifocal.	Correlation high, especially if unifocal.
Myoclonic (15-20%)	Jerking in the flexor muscle groups.	Strong association unless benign sleep myoclonus.

Jitteriness is frequently confused with seizure activity. It may be a sign of cerebral irritation.

7. Treatment of Neonatal seizures

Treatment of neonatal seizures	
Step	**Assessment**
1	Resuscitation and stabilisation of infant
2	All seizures are described, documented and reported to the paediatric medical team.
3	Paediatric medical team obtain a full perinatal history and perform a full examination.
4	Hypoglycaemia should be recognised and treated promptly. Meningitis should be considered and investigated.
5	**Essential investigations are:** • Blood glucose • Calcium and magnesium • Sodium, potassium, urea and creatinine • Blood gas • Full blood count and packed cell volume **Also consider:** • Blood culture • Lumbar puncture • Cranial ultrasound • Metabolic screen • Urine for toxicology • Virology specimens
6	**Cerebral Function Monitoring** • Commence cerebral function analysing monitoring (CFAM). • Arrange electroencephalogram (EEG) • CT or MRI will depend on the individual case.
Step	**Treatment**
1	Treat any underlying cause e.g. hypoglycaemia or infection
2	Nurse infant in an environment that minimises all sensory stimulation.
3	Any abnormal movements should be documented with a description, time of onset and duration on the seizure chart. The Paediatric Seizure Event Chart may be used. **Discuss with on duty Consultant.**
4	Consider an anticonvulsant if there are: • Prolonged or frequent seizures – seizures lasting over 3 minutes or > 3 per hour. • Associated cardio-respiratory compromise. Be prepared to give respiratory support when initiating anticonvulsant therapy.

Step	Anticonvulsants
1	**Phenobarbital** (Treatment of choice). • Given as an initial loading dose of 20mg/kg by a slow infusion over 30 minutes. • Phenobarbital commenced at 2.5-5 mg/kg once or twice daily either by slow IV injection.
2	**Phenytoin** • Loading dose of 20 mg/kg by a slow infusion over 30 minutes (with blood pressure and ECG monitoring) (Can cause cardiac arrhythmias particularly in infants with cardiac compromise secondary to a hypoxic event). • Then 2.5-5mg/kg twice daily.
3	**Midazolam** • Initially by intravenous injection 150-200 micrograms/kg followed by continuous intravenous infusion of 60 micrograms/kg/hr (increased by 60 micrograms/kg/hr every 15 minutes until seizures controlled); max 300micrograms/kg/hr
4	**Pyridoxine (Pyridoxine-dependent seizures /intractable fits with no apparent cause)** • Initial test dose 50-100mg every 10 mins by intravenous injection, may be repeated;(max 500mg) if responsive followed by an oral maintenance dose of 50-100mg once daily, adjusted as necessary.
5	**Neonatal seizures unresponsive to first line agents for infants of > 36/40 gestation** **Levetiracetam (Keppra)** • Loading dose: 40 mg/kg iv infused over 15 minutes • Without loading dose: start at 10 mg/kg/dose 12 hourly iv or oral increasing by 10 mg/kg/day over 3 days to 30 mg/kg twice daily • Maintenance: 10 mg/kg/day in one or 2 divided doses, increase daily by 10 mg/kg over 3 days to 30 mg/kg/day (max 60mg/kg/day) Dose frequency should be reviewed in patients with renal impairment
6	**Maintenance treatment** • Drug levels must be monitored in all maintenance therapy. • Duration of treatment depends upon the underlying cause and likelihood of further seizures. In most cases anticonvulsants will be stopped prior to discharge.

8. Monitoring Compliance with and the Effectiveness of the Guideline

Standards/ Key Performance Indicators

Key Performance indicators on which to base care in the Special Care Unit are:

8.1. ATAIN programme
8.2. Nice Neonatal Quality Standards
8.3. NHS Toolkit for High Quality Neonatal Services
8.4. National Neonatal Audit Programme
8.5. NHS Standard Contract for Neonatal Critical Care

8.6. BLISS Neonatal Audit
8.7. Key Recommendations for Neonatal Seizures (WHO 2011)

9. Process for Implementation and Monitoring Compliance and Effectiveness

- Staff are informed of revised documentation. There is an expectation that staff are responsible to keep updated on any improvements to practice and deliver care accordingly.
- Data is collected by use of Badger data base
- All term neonates that have HIE, seizures , poor central tone and are comatose are reported internally via Datix and in addition to NHS Resolution if they occur within the first 7 days of life. This is monitored and investigated as a potential maternity incident.
- Non-adherence to the guideline is reported by use of the Datix system. Incidents are monitored and reviewed by the neonatal governance team and action plans made if required.
- Further discussion and reviews occur at Directorate meetings, Paediatric Governance meetings and Ward meetings. Learning and action plans are cascaded at these meetings and improvements implemented. Key findings and learning points will be disseminated to relevant staff.

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