Ashford and St. Peter's Hospitals
NHS Foundation Trust

Encephalitis Guideline

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Guideline History		
Date	**Comments**	**Approved By**
21.02.2024	Guideline first accepted	Guideline Committee

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Contents

Page

1. Guideline

a. Introduction

b.

2. Supporting References

3. Supporting Trust Guidelines

4. Guideline Governance

a. Scope

b. Purpose

c. Duties and Responsibilities

d. Approval and Ratification

e. Dissemination and Implementation

f. Review and Revision Arrangements

g. Equality Impact Assessment

h. Document Checklist

5. Appendices

1. Causes of encephalitis

Encephalitis Guideline

Introduction

Encephalitis is inflammation of the brain parenchyma. It is a paediatric emergency. Encephalitis should be considered in any child with an alerted mental state. Features of the altered mental state can be subtle and may depend on the area of the brain affected. They can include unusual behaviour, confusion, personality change and emotional lability. Prompt recognition of the encephalopathic state and appropriate and timely investigations will help to identify treatable causes and thus help to minimise neurological sequelae.

A typical DGH may see around 5 children/year with a diagnosis of encephalitis (1).

It is important to distinguish between meningitis and encephalitis as the common causative agents will differ, although initial empirical treatment will often cover both.

The aim of this guideline is to define the clinical features of encephalitis and to guide initial investigations and management.

Presentation:

Table 1. Presenting features of encephalitis.

Features of infective encephalitis are:	**Plus 2 of the following for a "possible diagnosis" or > 3 of the following for a "probable diagnosis":**
Altered mental status (i.e. decreased or altered level of consciousness, lethargy, or personality change) lasting >24hrs with no alternative cause identified	Documented fever > 38 °C within 72hrs (before or after) presentation
	Generalized or partial seizure not fully attributable to pre-existing seizure disorder
	New onset focal neurologic findings
	CSF WBC count > 5 cells/microL
	Abnormality of brain parenchyma on neuroimaging suggestive of encephalitis that is new or appears to have acute onset
	Abnormality that is consistent with encephalitis and not attributable to another cause.

Algorithm 1. Initial management of a child with suspected viral encephalitis

Clinical features of encephalitis as per Table 1.

See History and examination key points on the next page.

Assess and manage ABCDE + glucose

IV access and investigations to include:

1. Bloods (see Table 2)
2. LP (unless contraindicated as per Table 3)
3. Urine
4. NPA
5. Stool

Give IV aciclovir and antibiotics (see Table 4)

Consider urgent brain imaging (preferably MRI) and aim to do it within 24 hours

Ensure appropriate monitoring. Do they need HDU/ PICU?

Assessment of a child with suspected encephalitis

1. Initial steps are an ABCDE approach in any child with reduced consciousness. Establish airway protection, respiratory adequacy and circulatory sufficiency before moving on.

2. History: Get a history including of the following:

   • The timing and nature of the deterioration

   • Recent febrile illnesses and symptoms of headache, vomiting and/or diarrhoea

   • Alternating periods of consciousness

   • History of seizures

   • Past medical history and birth history

   • Child's pre-existing neurological status and development

   • History of travel

   • History of contact with animals or insects

   • Drug/toxin ingestion, including prescribed drugs/chemotherapeutic agents

   • History of trauma- ask specifically about any minor, seemingly insignificant head or neck trauma (carotid artery dissection can be a cause of stroke in children)

   • Family history of neurological, metabolic, vascular or haematological disease and history of early childhood or infant deaths.

   • Social history: consider possibility of non-accidental injury and housing situation (risk of lead poisoning).

3. Examination
   - Observations: Respiratory Rate, O2 saturation (continuous) Heart rate/ECG (continuous), Blood Pressure, Temperature
   - GCS
   - Physical appearance/state
   - Bedside blood glucose (with blood gas)
   - Neurological examination
   - Examine for skin lesions and respiratory signs (although HSV encephalitis is usually due to reactivation so no skin lesions are seen and mycoplasma encephalitis can occur in the absence of respiratory symptoms
   - Involve PICU if GCS <8, raised ICP or shock evident.

Table 2. Investigations for suspected encephalitis (those in bold are 1st line)

Bloods	• **Capillary glucose within 15 minutes of presentation + lab glucose if <2.6 (then also send hypoglycaemia screen and correct the blood glucose)** • **FBC &film, clotting, U&Es, LFTs, ammonia** • **Blood gas** • **Blood culture,** serology for EBV, CMV, mycoplasma • Plasma and serum save if possible • **Glucose again with LP**
CSF (including 12 drops in virology bottle)	• Opening pressure (but don't let it delay LP or treatment) • **Gram stain and culture, glucose, protein, lactate** • **Neuromultiplex virology**
Urine	• **Dipstick** • **Microscopy and Culture** • Amino and organic acids/ toxicology
NPA	PCR for respiratory viruses, enteroviruses and adenoviruses
Stool	Enterovirus RNA PCR
Radiology (within 24 hours if stable)	MRI is 1st line- CT if unavailable. Sedation is contraindicated, consider GA if necessary
EEG	May be useful to differentiate encephalitis from non-convulsive status epilepticus and is a sensitive indicator of cerebral dysfunction, and is of particular value in children with HSV encephalitis, where the typical pattern of periodic lateralising epileptiform discharges are seen arising from the temporal lobes.

Table 3. Reasons to consider deferring or not performing a lumbar puncture during initial acute management include (2):

Signs of raised intracranial pressure such as: - Pupillary dilatation (unilateral or bilateral) - Pupillary reaction to light impaired or lost - Bradycardia (HR<60) - Hypertension (mean BP above 95th centile for age) - Abnormal breathing pattern - Abnormal posture	GCS less than or equal to 8 or deteriorating
	Focal neurological signs
	Convulsion >10 minutes and GCS 12 or less
	Shock
	Systemic meningococcal disease
	CT or MRI scan suggesting blockage or impairment of CSF pathways
	Coagulation abnormalities

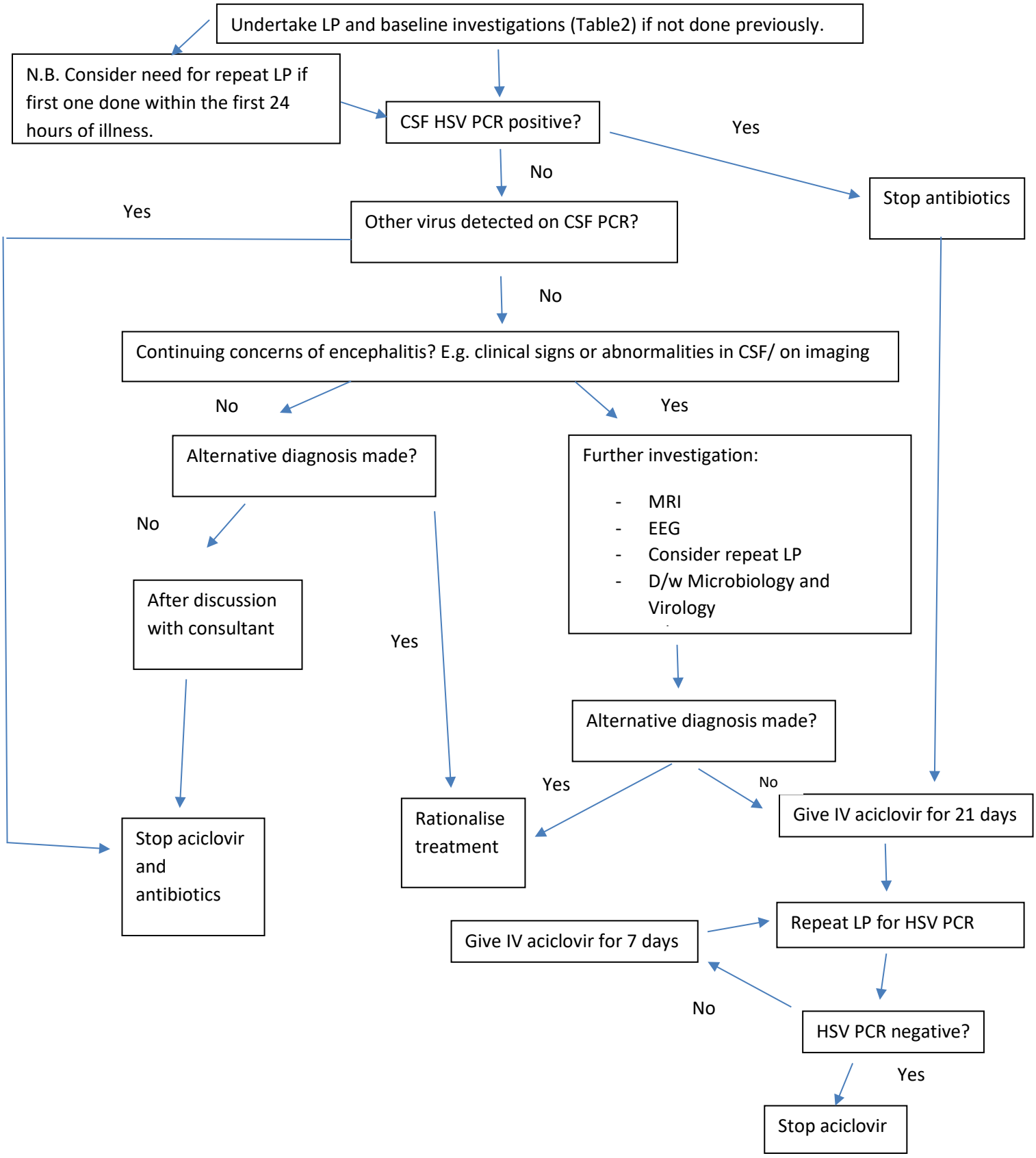
Table 4. Empirical treatment for suspected encephalitis

Age	**Treatment**
< 1 month of age	Cefotaxime IV Amoxicillin IV (stop once listeria excluded by negative cultures at 48 hours) Aciclovir IV
>1 month of age	Ceftriaxone IV Aciclovir IV

Total duration:

- Review with culture results
- Likely/ proven HSV -> 21 days
- For mycoplasma encephalitis then discuss with Microbiology and consider Clarithromycin

Algorithm 2. Ongoing Management of Suspected Encephalitis



Monitoring the child admitted with encephalitis:

Observations should be performed every 30 minutes for the first 2 hours, then hourly whilst required. After 8 hours if the child is stable then can move to 4 hourly observations.
These should include PEW scoring and neuro observations.
Always consider if this child requires observation on HDU or PICU rather than the ward.
Aim to keep systolic blood pressure in the high normal range to maintain cerebral perfusion.

Treatment

Treatment should be guided according to likely aetiology (see Appendix 1 for more on this) and rationalised accordingly once the aetiology has been found as per Algorithm 2.

If the initial LP is performed in the 1st 24 hours of the illness, consider repeating an LP with viral PCR 24-48 hours later and performing urgent neuroimaging (MRI) before considering stopping aciclovir as CSF can be normal and HSV PCR negative early in the course of HSV encephalitis.

If the HSV PCR is positive then consider siting a long line early in the course as this requires a 21-day course of aciclovir.

If symptoms persist or there are abnormalities on neuroimaging, despite CSF HSV PCR being negative, consider discussing the case with paediatric neurology or paediatric infectious diseases team at St George's Hospital (SGH). You should also inform these teams if HSV encephalitis is confirmed.

When NOT to start aciclovir in children with neurological symptoms/signs:

- Child with simple febrile convulsions
- Seizures without documented fever or history of fever (unless immunocompromised)
- Other obvious cause for symptoms, e.g., blocked VP shunt, child with epilepsy (who has an increase in seizures with a febrile illness)
- Acute head injury, drug overdose
- CSF and clinical picture are highly suggestive of bacterial meningitis

2. Supporting References

Useful information for parents:

Encephalitis in children - A guide | The Encephalitis Society

References:

1) Koskiniemi M, Korppi M, Mustonen k, et al. Epidemiology of encephalitis in children. A prospective multicentre study. Eur J Paediatr 1997; 156:541-5

2) Sheffield Children's Hospital Encephalopathy Guideline. www.sheffieldchildrens.nhs.uk

3) Clinical Practice Guidelines: Meningitis and encephalitis (rch.org.au)

4) Management of viral encephalitis guidelines | The Encephalitis Society https://www.encephalitis.info/

5) Kneen et al. Management of suspected viral encephalitis in children - Association of British Neurologists and British Paediatric Allergy, Immunology and Infection Group national guidelines. J Infect. 2012 May;64(5):449-77. doi: 10.1016/j.jinf.2011.11.013. Epub 2011 Nov 18.

6) Wessex Regional Paediatric Neurology Guideline: Management of Suspected Encephalitis (piernetwork.org)

3. Supporting relevant trust guidelines

- Meningitis guideline

2. Guideline Governance

a. Scope

This guideline is relevant to all staff caring for all children from 0-18 years old across the emergency department, inpatient ward and outpatient department.

b. Purpose

i. This guidelines aims to facilitate a common approach to the management of children. At times deviation from the guideline may be necessary, this should be documented and is the responsibility of the attending consultant.

ii. This guideline is subject to regular review to ensure ongoing evidence based practice.

c. Duties and Responsibilities

All healthcare professionals responsible for the care of all children 0-18years should be aware of practice according to this guideline.

d. Approval and Ratification

This guideline will be approved and ratified by the Paediatric Guidelines Group.

e. Dissemination and Implementation

i. This guideline will be uploaded to the trust intranet 'Paediatric Guidelines' page and thus available for common use.
ii. This guideline will be shared as part of ongoing education within the Paediatric Department for both medical and nursing staff.
iii. All members of staff are invited to attend and give comments on the guideline as part of the ratification process.

f. Review and Revision Arrangements

a. This policy will be reviewed on a 3 yearly basis by the appropriate persons.
b. If new information comes to light prior to the review date, an earlier review will be prompted.
c. Amendments to the document shall be clearly marked on the document control sheet and the updated version uploaded to the intranet. Minor amendments will be ratified through the Paediatric Guidelines Group. A minor amendment would consist of no major change in process, and includes but is not limited to, amendments to documents within the appendices.

g. Equality Impact Assessment

Background • Who was involved in the Equality Impact Assessment
Author and the supervising consultants.
Methodology • A brief account of how the likely effects of the policy was assessed (to include race and ethnic origin, disability, gender, culture, religion or belief, sexual orientation, age) • The data sources and any other information used • The consultation that was carried out (who, why and how?)
All groups of staff and patients were taken into consideration and there is no bias towards or against any particular group.
Key Findings • Describe the results of the assessment • Identify if there is adverse or a potentially adverse impacts for any equalities groups
There is no evidence of discrimination.
Conclusion • Provide a summary of the overall conclusions
There is no evidence of discrimination.
Recommendations • State recommended changes to the proposed policy as a result of the impact assessment • Where it has not been possible to amend the policy, provide the detail of any actions that have been identified • Describe the plans for reviewing the assessment
This guideline is appropriate for use.

h. Document Checklist

To be completed (electronically) and attached to any document which guides practice when submitted to the appropriate committee for approval or ratification.

Title of the document: Encephalitis guideline

Policy (document) Author: Duana Cook

Executive Director: N/A

		Yes/No/ Unsure/NA	Comments
1.	**Title**		
	Is the title clear and unambiguous?	**Y**	
	Is it clear whether the document is a guideline, policy, protocol or standard?	**Y**	
2.	**Scope/Purpose**		
	Is the target population clear and unambiguous?	**Y**	
	Is the purpose of the document clear?	**Y**	
	Are the intended outcomes described?	**Y**	
	Are the statements clear and unambiguous?	**Y**	
3.	**Development Process**		
	Is there evidence of engagement with stakeholders and users?	**N**	
	Who was engaged in a review of the document (list committees/ individuals)?		**Reviewed at Guidelines Committee**
	Has the policy template been followed (i.e. is the format correct)?	**Y**	
4.	**Evidence Base**		
	Is the type of evidence to support the document identified explicitly?	**Y**	

		Yes/No/ Unsure/NA	Comments
	Are local/organisational supporting documents referenced?	**Y**	
5.	**Approval**		
	Does the document identify which committee/group will approve/ratify it?	**Y**	
	If appropriate, have the joint human resources/staff side committee (or equivalent) approved the document?	**N/A**	
6.	**Dissemination and Implementation**		
	Is there an outline/plan to identify how this will be done?	**Y**	
	Does the plan include the necessary training/support to ensure compliance?	**Y**	
7.	**Process for Monitoring Compliance**		
	Are there measurable standards or KPIs to support monitoring compliance of the document?	**N**	
8.	**Review Date**		
	Is the review date identified and is this acceptable?	**Y**	
9.	**Overall Responsibility for the Document**		
	Is it clear who will be responsible for coordinating the dissemination, implementation and review of the documentation?	**Y**	
10.	**Equality Impact Assessment (EIA)**		
	Has a suitable EIA been completed?	Y	

Committee Approval (Paediatric Guidelines Group)			
If the committee is happy to approve this document, please complete the section below, date it and return it to the Policy (document) Owner			
Name of Chair	**Dr Claire Mitchell**	**Date**	**21/02/2024**
Ratification by Management Executive (if appropriate)			
If the Management Executive is happy to ratify this document, please complete the date of ratification below and advise the Policy (document) Owner			
Date: n/a			

Appendix 1.

Causes of Encephalitis:

Encephalitis is varied in aetiology, but can be generally divided in to infective or non-infective. Viral encephalitides are the most common, and usually present acutely, although sub-acute and chronic presentations may be typical of certain pathogens, particularly in the immunocompromised.

The most common viral pathogens in the UK include enteroviruses, HSV, EBV, adenovirus and measles.

Less common causes include:

Viral

- VZV, adenovirus, CMV, HHV6, parvovirus, mumps, rubella, para-influenza

Bacterial

- Lyme disease, mycoplasma, listeria, bartonella, streptococcus, mycobacterium

Parasites

- Malaria, toxoplasma

Non-infective acute encephalitis

- Acute disseminated encephalomyelitis (ADEM)
- Immune mediated encephalitis (anti-NMDA, voltage gated K+ channel, anti-GAD)
- Hashimoto's encephalopathy
- Neoplastic encephalomyelitis

Non- inflammatory encephalopathies:

- Trauma including non-accidental injury
- Seizure related including non-convulsive status epilepticus and epileptic encephalopathy
- Toxins
- Metabolic disorders
- Hypertensive encephalopathy e.g. secondary to renal or cardiac disease or raised ICP
- Malignancy
- Vascular conditions e.g. stroke/ venous sinus thrombosis
- Hypoxia/ ischaemia including Following prolonged resuscitation/cardiorespiratory arrest

Indicators of aetiology based on presentation:

Clinical Presentation	**Possible Aetiological Agent**
Seizures	HSV, Immune mediated encephalitis
Cranial nerve abnormality	HSV, EBV, Listeria, TB, Lyme disease
Cerebellar ataxia	VZV, EBV, Mumps
Dementia	HIV, measles, Syphilis
Poliomyelitis-like flaccid paralysis	Polioenteroviruses
Retinitis	CMV, Cat-scratch, Syphilis
Rash	VZV, HHV-6, Rubella, Lyme disease, Enteroviruses, Mycoplasma, HIV
Respiratory tract findings	Influenza, adenovirus, mycoplasma, TB NB. ADEM is often preceded by a respiratory illness or vaccination.
Parotitis	Mumps
Lymphadenopathy	HIV, EBV, CMV, Measles, Rubella, Cat-scratch
Hepatitis	Q fever