

Guidelines for Clinical Neurophysiology Referral

Department / Service:	Neurophysiology
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Accountable Director:	Divisional Medical Director
Approved by:	Specialty Medicine Divisional Management Board
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This is the most current document and is to be used until a revised version is available	
Target Organisation(s)	Worcestershire Acute Hospitals NHS Trust
Target Departments	Neurophysiology
Target staff categories	Health Care Science Neurophysiology

Plan Overview:

Guidelines for the requesting investigations in Clinical Neurophysiology

Key amendments to this Document:

Date	Amendment	By:
23/08/17	Document Approved at Key Document Approval Group	KDAG
05/12/2017	Sentence added in at the request of the Coroner	
18/8/2019	Document updated Inclusion of QIP data for EEG referral Updated reference list Updated information on In- patient referral Addition of link to new request forms	KB

Introduction

The Department of Clinical Neurophysiology at Worcestershire Acute Hospitals covers a wide range of routine and specialist investigations. These investigations are usually performed by scientists and practitioners (Clinical Physiologists) and clinically interpreted by medical consultants or Clinical scientists/physiologists.

These guidelines have been produced to help clinicians make the best use of Clinical Neurophysiology.

By using recommendations as outlined in these guidelines it is anticipated that there will be a reduction in the number of inappropriate referrals therefore having a positive effect on waiting times. The primary objective of this guideline is to improve clinical practice for the best outcome of the patient. These guidelines have been updated in August 2019 to reflect a quality improvement plan looking at the appropriateness of neurophysiology referrals (ID 10311)

Users

This document is intended for use by all referring practitioners, in particular extended scope practitioners and newly qualified doctors. For all neurophysiology investigations an appropriate referral is required. This referral should be made using the Neurophysiology request form. This can be sent by post or via email wah-tr.NeurophysiologyElectronicReferrals@nhs.net

Link to referral form.

<http://www.worcsacute.nhs.uk/EasysiteWeb/getresource.axd?AssetID=93385&type=Full&servicetype=Attachment>

Rationale

It is deemed that a useful investigation may have a positive or negative result but it must either alter the clinical management of the patient, or add to the confidence of the clinician's diagnosis. Some of the causes of wastefulness in neurophysiology investigations are;

- Investigations where the result is unlikely to affect the patient management.
- Failing to provide appropriate clinical information with a question that the investigation should answer.
- Relying on investigations more than clinical assessment/examination (i.e. over investigating)
- Un-necessary repeating of investigations

Electroencephalography (EEG)

The electrical activity of the brain (EEG) can be recorded using scalp (surface) electrodes or in specialist circumstances depth electrodes (intercranial) electrodes. At Worcestershire Acute Hospitals Trust (WAHT) surface electrodes are used. For the purpose of these guidelines 'EEG' will refer to surface EEG.

Types of EEG currently available at WAHT are:

- Routine (with video)
- Sleep (deprived, sedated, natural)
- Ambulatory
- Video home Ambulatory
- Multiple sleep latency test (MSLT)

Routine

Outpatient Routine EEG recordings are taken from 20 minutes to several hours dependent on clinical circumstances. Therefore they are not deemed to be a 'quick' test even though they are relatively inexpensive and are not invasive. They will include hyperventilation and photic stimulation as standard activation procedures, unless contraindicated (EEG guideline WAHT 2015)

Inpatient EEGs – will be adapted to each individual case and may be shorter in length and activation techniques are usually omitted. It is therefore important to ensure only medically urgent/ acutely ill patients receive an inpatient EEG, that will have a direct impact on care, treatment and management at that time. All other patients should be seen as an outpatient where appropriate.

Sleep EEG

Sleep deprivation is evidenced to increase the sensitivity of abnormality in the EEG (Giorgi et al., 2014). There are a number of different approaches to obtaining a sleep recording. These are: sleep deprivation, partial sleep deprivation, sedated sleep or natural sleep. The clinical scientist/physiologist will help determine the best approach in triaging, however please include Melatonin prescription for all children under 3.

Ambulatory EEG

These will be performed on an outpatient basis usually after routine EEG's have already been performed. However, to aid in the diagnosis of juvenile myoclonic epilepsy an ambulatory EEG may be performed in the first instance. The seizure/episode frequency should be at least 3 times per week before an ambulatory will be performed.

Recommendations for standard EEG

An EEG should be performed only to support a diagnosis of epilepsy in adults in whom the clinical history suggests that the seizure is likely to be epileptic in origin. (NICE 2004, 2018). A single routine EEG can be used to determine seizure type and classify epilepsy syndromes when the clinical features are highly suggestive of epilepsy (NICE, 2018) this enables children, young people and adults to be given the correct prognosis. In children, young people and adults presenting with a first unprovoked seizure, unequivocal epileptiform activity shown on EEG can be used to assess the risk of seizure recurrence (NICE 2004, 2018).

A single routine EEG can be used to determine seizure type and classify epilepsy syndromes when the clinical features are highly suggestive of epilepsy (NICE, 2018). However the sensitivity of a routine EEG is around 50% (Smith, 2005), meaning that

the EEG may be normal in many people with epilepsy. The specificity of inter-ictal abnormalities in an EEG is 70-90% (Smith, 2005). A study into normal adults found that 0.5% had epileptiform discharges in their routine EEG and the chance of these healthy individuals subsequently developing epilepsy was 2-3% (Gregory et al., 1993). The chance of epileptiform discharges increases to 10-30% in cerebral pathologies such as tumor, head injury, cranial surgery, or congenital brain injury and 3% of patients with psychiatric disorders (Zifkin et al., 1968). Furthermore 20% of the general population have non-specific EEG abnormalities (Zifkin et al., 1968). Combining these factors means that it is easy to misuse and misinterpret EEG investigations (Fowle and Binnie, 2000).

Using EEG to assess cerebral function, or diagnose and evaluate neurological conditions apart from epilepsy has widely been evidenced with varied sensitivity and specificity. When used in conjunction with a clear clinical history EEG can be used to aid diagnosis in the following circumstances:

- Where seizures or non-convulsive status epilepticus (NCSE) may be a contributing to acute confusion
- To demonstrate functional disturbance when cerebral dysfunction is clinically evident but structural imaging is normal
- To detect focal or lateralised abnormalities which could suggest a structural basis for an encephalopathy
- To identify diagnostic EEG patterns in appropriate clinical settings, such as sporadic Creutzfeldt-Jakob disease (CJD), Herpes Encephalitis (HSV).

(Smith 2005)

Recommendations specific for children and young people

An electroencephalogram (EEG) should be performed only to support a diagnosis of epilepsy in children and young people. If an EEG is considered necessary, it should be performed after the second epileptic seizure but may, in certain circumstances, as evaluated by the specialist, be considered after a first epileptic seizure (NICE 2004, 2018).

In children and young people, a sleep EEG is best achieved through sleep deprivation or the use of melatonin. (NICE 2017)

When an EEG should not be used.

Do not perform an EEG in the case of *probable syncope* because of the possibility of a false positive result (NICE 2004, 2018).

NICE has produced a pathway on the management of transient loss of consciousness ('blackouts') in adults and young people and this should be used in these circumstances. (NICE, 2014)

Do not use an EEG *to exclude* a diagnosis of epilepsy when the clinical presentation supports a diagnosis of a non-epileptic event (NICE 2004, 2018).

Do not use an EEG in isolation to make a diagnosis of epilepsy. (NICE 2004, 2018)

Do not use an EEG to diagnose encephalitis (Smith 2005)

If diagnosis is still unclear after a standard EEG

If epilepsy is suspected, other specialist neurophysiological investigations are available, such as sleep EEGs or ambulatory EEGs.

Repeated standard EEGs may be helpful when the diagnosis of the epilepsy or the syndrome is unclear. However, if the diagnosis has been established, repeat EEGs are not likely to be helpful (NICE 2004, 2018).

Do not use repeated standard EEGs in preference to sleep or sleep-deprived EEGs. When a standard EEG has not contributed to diagnosis or classification of epilepsy, a sleep EEG may be performed (NICE 2004). In children and young people, this is best achieved through sleep deprivation or the use of melatonin (NICE 2012).

Do not use repeated standard EEGs if the diagnosis has been established (NICE 2018)

Long-term video or ambulatory EEG may be used in the assessment of children, young people and adults who present diagnostic difficulties after clinical assessment and standard EEG. (NICE, 2013). These are typically used to capture a clinical event and therefore a minimum of 3 typical attacks per week is required.

Video ambulatory EEG (home or inpatient) may also be used if daily episodes are occurring. Please discuss these with the department on a case by case basis.

Nerve conduction study (NCS) and Electromyography

Clinical Indications for NCS/EMG

Polyneuropathy of unknown cause (classification of axonal or demyelinating)

Mononeuropathy – carpal tunnel syndrome, ulnar neuropathies

Mononeuritis multiplex

Disorders of the neuromuscular junction – Myasthenia Gravis, LEMS

Disorders of the anterior horn cells – Motor Neuron Disease

Disorders of the muscles – Myositis, Myopathy

Specialist NCS/EMG

Clinical conditions where NCS/EMG are NOT indicated routinely (initially)

Radiculopathy when the diagnosis is secure based on clinical imaging findings.

Clinically isolated small fibre neuropathy

Chronic fatigue syndrome

Pain syndrome

Myalgia

Tarsal tunnel syndrome

Meralgia paraesthetica (Laguëny et al., 1991)

Inpatient Referrals (all investigations)

As a standard the department aims to see each inpatient, where clinically appropriate, within 24 hours of receipt of referral. When taking into consideration the content of this document, referrals will be accepted into the department. It may be necessary to suspend a referral until further information is available. Where possible all referrals should be discussed with a member of the Neurophysiology clinical team. There will be variation and adaptation to the outpatient process to allow inpatients to be seen in a timelier manner. There may be adaptations to the procedure of the investigation for differing clinical circumstances.

Electroencephlogram (EEG)

The majority of inpatients will be seen at the bedside for their EEG – therefore activation procedures are not routinely performed. The length of the EEG recording will be adapted depending on the clinical circumstances.

Nerve conduction Studies (NCS)

The majority of nerve conduction patients will need to be seen in the department due to the nature of the investigation and the need for electrical interference to be minimal for optimal results.

Electromyography (EMG)

These patients will have to be seen in the department due to the nature of the investigation and to limit electrical interference and gain optimal results. These investigations are currently performed by the Clinical Consultant within the department. At the time of writing this document this is a single handed consultant with no cover for EMG services. This limits the availability of these investigations. If this investigation is required at a time when the Consultant Neurophysiologist is on leave, the referring doctor may have to consider having the investigation elsewhere or transferring the patient if clinically necessary.

Evoked Potentials (EP's)

It is not usual practice to perform evoked potentials on inpatients. However, individual clinical cases can be discussed with the clinical team within the department.

Outpatient referrals (all investigations)

Please refer to the Neurophysiology outpatient Referral Process Document for guidelines of practically referring to the department.

Mapping codes of conduct associated with Healthcare Scientists in the advancing field of Neurophysiology:

Association of Neurophysiological Scientists (Professional Body)

Standard	Trust behaviour
To advance for the public benefit the science and practice of Clinical Neurophysiology and allied subjects by the promotion of improved standards of training and education and of research work therein and by making the results of such study and research available to practitioners and the general public	Listen learn lead
To promote advance and encourage study and practice of the various techniques involved in the physiological measurement of the central and peripheral nervous systems	Listen learn lead
To establish uphold and improve standards of education training competence and conduct of all practicing members	Listen learn lead
To ensure and promote the health and safety of the public within the field of Clinical Neurophysiology	Well led/no delays
To exercise professional supervision by ensuring that practitioners for admission for Full Membership are suitably qualified	Well led
The practitioner's responsibility is to contribute to the governance of team work through good working relationships, effective communication and responsibility for their own professional development. The practitioner needs to understand the nature of different individuals, their rights and responsibilities.	Well lead
The practitioner's responsibility is to meet the requirements of relevant health and safety legislation and to promote the health and safety of all those with whom they come into contact	Listen learn lead
The practitioner should be able to recognise culture, gender and differences in behaviour and relate this to a different interpretation of situations.	Listen learn lead
The practitioner should always be polite, listen and respect the views of the patient and respond to patients complaints according to professional and local guidelines	Listen learn lead
The privacy and dignity of patients must be upheld at all times	Listen learn lead
A practitioner must hold in confidence any information relating to a patient whether this be verbal, written or multimedia based	Well led do as we say we will do
It is the practitioner's responsibility to maintain effective communication with patients and carers in the explanation of any further arrangements which have or may be made. The practitioner must fulfil their role in ensuring that procedures and reports are prioritised appropriately according to local guidelines. It is the practitioner's responsibility to maintain effective communication with other health care professionals, both written and verbal. The practitioner must always maintain accurate and legible documentation of patients' records.	Well lead/ listen learn lead/ do as we say we will do
A practitioner must not abuse the trust of the patient and/or carer	Well led/listen learn lead
Practitioners should respect the rights of their professional colleagues but have a duty of care to report any untoward incidence that contravenes their code of practice.	Do as we say we will
The practitioner must only participate in safe practices in order to protect patients undergoing investigations in their care	Well led/listen learn lead/

Registration council for Clinical Physiologists (Voluntary Register)

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Standard
A Registrant shall exercise his or her professional skill and judgement to the best of his or her ability and/or discharge his or her duties with integrity and with full regard to the public interest
A Registrant shall not be party to any act or default likely to bring discredit on the register or any other scientist or technologist in a health care profession
A Registrant shall not be engaged in any activity inconsistent with the responsibilities attached to her own appointment or position within his or her health care profession
A Registrant shall at all times take care to ensure that his or her work and the results of such work does not constitute any avoidable danger of death or injury or ill health to any person
A Registrant shall take all reasonable steps to maintain and develop his or her professional competence by attention to new development relevant to his or her field of professional activity and shall encourage persons working under his or her supervision to do so
A Registrant shall not undertake responsibility as a Clinical Physiologist which he or she does not believe himself or herself competent to discharge
A Registrant shall accept personal responsibility for all work done by himself or herself or under his or her supervision or direction, and shall take all reasonable steps to ensure that persons working under his or her authority are competent to carry out the tasks assigned to them and they accept personal responsibility for work done under the authority delegated to them
A Registrant whose professional advice is not accepted shall take all reasonable steps to ensure that the person overruling or neglecting this advice is aware of any danger which the member believes may result from such overruling or neglect

Universal Ethical Code for Scientists

Standard	Trust value
Act with skill and care in all scientific work. Maintain up to date skills and assist their development in others	
Take steps to prevent corrupt practices and professional misconduct. Declare conflicts of interest.	
Be alert to the ways in which research derives from and affects the work of other people, and respect the rights and reputations of others.	
Ensure that your work is lawful and justified	
Minimise and justify any adverse effect your work may have on people, animals and the natural environment	
Seek to discuss the issues that science raises for society. Listen to the aspirations and concerns of others	
Do not knowingly mislead, or allow others to be misled, about scientific matters. Present and review scientific evidence, theory or interpretation honestly and accurately	

References

Academy for Health Care Science; STP equivalence programme v3.2 2015

Health and Care Professions Council 2012: Standards of Conduct Performance and ethics London HPC

Association of Neurophysiologists (ANS)

Standard Protocols for nerve conduction studies 2013; British Society for Clinical neurophysiologists 2012.

HSE Updated: Jun 15, 2016 Wayne E Anderson

Fowle AJ, Binnie CD. 2000. Uses and abuses of the EEG in epilepsy. *Epilepsia*. 41 (3): S10-8.

Gavvala JR, Schuele SU. 2016. New-Onset Seizure in Adults and Adolescents: A Review. *JAMA* 316(24):2657-2668.

Giorgi FS, Guida M, Caciagli L, Maestri M, Carnicelli L, Bonanni E, Bonuccelli U. What is the role for EEG after sleep deprivation in the diagnosis of epilepsy? Issues, controversies, and future directions. *Neuroscience and Biobehavioural Reviews*, 2014; 47; 533-48

Gregory RP, Oates T, Merry RT. 1993. Electroencephalogram epileptiform abnormalities in candidates for aircrew training. *Electroencephalography and Clinical Neurophysiology* 86(1):75-7

NICE 2013. Epilepsy in adults. Quality Standard [QS26]. National Institute for Health and Clinical Excellence website: <https://www.nice.org.uk/guidance/qs26> (accessed August 2019).

NICE 2013. Epilepsy in children and young people. Quality Standard [QS27]. National Institute for Health and Clinical Excellence website: <https://www.nice.org.uk/guidance/qs27> (accessed August 2019).

NICE 2014. Transient loss of consciousness ('blankouts') in over 16s. Quality Standard [QS71]. National Institute for Health and Clinical Excellence website: <https://www.nice.org.uk/guidance/qs71> (accessed August 2019).

NICE 2004, 2012 & 2018. Epilepsies: diagnosis and management. Clinical Guideline [CG137]. National Institute for Health and Clinical Excellence website: www.nice.org.uk/guidance/cg137 (accessed August 2019).

Smith SJM. EEG in neurological conditions other than epilepsy: when does it help, what does it add? *Journal of Neurology, Neurosurgery & Psychiatry* 2005 76(2): ii8–ii12.

Zifkin L, Ajmone Marsan C. 1968. Incidence and prognostic significance of 'epileptiform' activity in the EEG of non-epileptic subjects. *Brain*. 91:751–78

Lagueny A, Deliac MM, Deliac P, Durandeu A. Diagnostic and prognostic value of electrophysiologic tests in meralgia paresthetica. 1991. *Muscle Nerve* 14(1)51-6.

Contribution List

This key document has been circulated to the following individuals for consultation;

Designation
Kelly Bill – Clinical Service Manager Neurophysiology
Dr Alison Blake – Consultant Neurophysiologist
Neurophysiology clinical staff
Neurophysiology department updated version 2 18-8-2019

This key document has been circulated to the chair(s) of the following committee's / groups for comments;

Committee
Divisional management Committee – Speciality medicine
Divisional management committee – specialist medicine new request forms and flow chart approved 31/7/2019

Monitoring Tool

This should include realistic goals, timeframes and measurable outcomes.

How will monitoring be carried out?

Who will monitor compliance with the guideline?

Page/ Section of Key Document	Key control:	Checks to be carried out to confirm compliance with the policy:	How often the check will be carried out:	Responsible for carrying out the check:	Results of check reported to: <i>(Responsible for also ensuring actions are developed to address any areas of non-compliance)</i>	Frequency of reporting:
	WHAT?	HOW?	WHEN?	WHO?	WHERE?	WHEN?
	Appropriateness of referral	Triage of referral by clinical staff	Every day	Clinical Staff	All non –appropriate referrals will be highlighted to the referring physician – documented on the audit sheet	Report to head of department on a monthly basis
	Change in national and regional guidelines	Bi-annual checks are carried out to ensure compliance with current guidelines	Bi-annual	Head of department	Any change in clinical guidance will go through a review process of the policy.	Bi-annually and reported at review of policy date

Supporting Document 1 - Equality Impact Assessment Tool

To be completed by the key document author and attached to key document when submitted to the appropriate committee for consideration and approval.

		Yes/No	Comments
1.	Does the policy/guidance affect one group less or more favourably than another on the basis of:		
	• Race	No	
	• Ethnic origins (including gypsies and travellers)	No	
	• Nationality	No	
	• Gender	No	
	• Culture	No	
	• Religion or belief	No	
	• Sexual orientation including lesbian, gay and bisexual people	No	
	• Age	No	
2.	Is there any evidence that some groups are affected differently?	No	
3.	If you have identified potential discrimination, are any exceptions valid, legal and/or justifiable?	No	
4.	Is the impact of the policy/guidance likely to be negative?	No	
5.	If so can the impact be avoided?	n/a	
6.	What alternatives are there to achieving the policy/guidance without the impact?	n/a	
7.	Can we reduce the impact by taking different action?	n/a	

If you have identified a potential discriminatory impact of this key document, please refer it to Assistant Manager of Human Resources, together with any suggestions as to the action required to avoid/reduce this impact.

For advice in respect of answering the above questions, please contact Assistant Manager of Human Resources.

Supporting Document 2 – Financial Impact Assessment

To be completed by the key document author and attached to key document when submitted to the appropriate committee for consideration and approval.

	Title of document:	Yes/No
1.	Does the implementation of this document require any additional Capital resources	No
2.	Does the implementation of this document require additional revenue	No
3.	Does the implementation of this document require additional manpower	No
4.	Does the implementation of this document release any manpower costs through a change in practice	No
5.	Are there additional staff training costs associated with implementing this document which cannot be delivered through current training programmes or allocated training times for staff	No
	Other comments:	

If the response to any of the above is yes, please complete a business case which is signed by your Finance Manager and Directorate Manager for consideration by the Accountable Director before progressing to the relevant committee for approval