

HIGHER MEDICAL TRAINING

CURRICULUM

FOR

CLINICAL NEUROPHYSIOLOGY

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CURRICULUM IN CLINICAL NEUROPHYSIOLOGY

INTRODUCTION

Clinical Neurophysiology is a diagnostic specialty which encompasses the use of electroencephalography (EEG), electromyography (EMG), nerve conduction studies (NCS), and evoked potentials (EP) to assess function in the nervous system. The Training Programme in Clinical Neurophysiology will equip trainees with the necessary knowledge and skill to become Consultants providing the highest service to patients who require neurophysiological investigations. Implicit in the educational process is the need to develop positive attitudes towards lifelong learning, such that the practising Consultant can adapt to technological advances and clinical developments.

The Trainee will be taught how to apply neurophysiological investigations in clinical practice, and the interaction of these investigations with procedures used by other disciplines, such as neuroradiology, neuroimmunology and neuropathology, to evaluate nervous system structure and function. Competence in Clinical Neurophysiology is underpinned by understanding of a wide range of relevant clinical conditions, as well as basic science, technology, electronics and data processing. Many medical and surgical specialities utilise Clinical Neurophysiology, and background knowledge/experience of neurology, paediatrics, neurosurgery, orthopaedics and ophthalmology is particularly desirable. Acquisition of good communication and reporting skills is essential.

The ability to work in a multidisciplinary team with physiological measurement technicians, clinical scientists, medical engineers and other ancillary staff, and to provide leadership where appropriate, is fundamental to the Clinical Neurophysiologist. Additionally, the Trainee will need to develop teaching skills which encompass this broad range of health care professionals, as well as undergraduates and postgraduates in medicine.

ENTRY REQUIREMENTS

Applicants for speciality training programmes must complete a minimum of 2 years general professional training (GPT) in approved posts and in accordance with JCHMT requirements for acute medical experience.

A post-graduate qualification is essential. In the majority of cases, this will be MRCP (UK or I) or overseas qualifications recognised by the RCP as equivalent to MRCP. In recognition of the broad clinical base which Clinical Neurophysiology serves, the SAC has agreed that candidates may also offer MRCPaed or FRCS, but GPT requirements in general medicine must still be satisfied.

GENERAL DESCRIPTION OF TRAINING PROGRAMME

Accreditation in Clinical Neurophysiology

The Training Programme comprises 4 years:

- 12 months training in Neurology
This may be completed as a single attachment of 12 months, or in blocks to a total of 12 months through the 4 year training programme, depending on local opportunities or preference.
- 24 months training in Clinical Neurophysiology (all age groups)
- 12 months for research or specialised training
Trainees wishing to spend a longer period in research will be encouraged to do so, but the time credit will be limited to 12 months. Credit for clinical work undertaken during research will be granted at the discretion of the SAC.

Dual accreditation in Clinical Neurophysiology and Neurology

Trainees seeking dual accreditation will need to complete a total of 6.5 years, comprising 4.5 years in Neurology (which may include 1 year of research) and 2 years in Clinical Neurophysiology. There is a very small number of training posts specifically for dual accreditation; otherwise, the Trainee will need to organise his/her own programme within separate approved training posts.

Assessment

The standard RITA format of annual review and penultimate year assessment is utilised. A broad range of assessment tools is used (see Appendix B) to evaluate knowledge base and practical skills and determine competence. Trainees will need to demonstrate technical ability to the satisfaction of an appropriate assessor.

(NB Some sections of the syllabus contain information duplicated for sake of clarity)

SPECIFIC TRAINING AIMS
OF THE CLINICAL NEUROPHYSIOLOGY CURRICULUM

The educational process in Clinical Neurophysiology aims to produce physicians who:

1. Execute core neurophysiological techniques competently, as well as more specialised techniques (see summary of syllabus).
2. Are able to act as independent practitioners who can make a clinical assessment where necessary; formulate a differential diagnosis; choose relevant techniques appropriate to the clinical context; and interpret and report on the results.
3. Understand basic relevant science including physics and electronics, and are competent in information technology.
4. Have managerial and leadership skills appropriate to administration of a department of Clinical Neurophysiology, including evaluation of equipment and preparation of bids for funding.

SUMMARY OF SYLLABUS

INVESTIGATIVE TECHNIQUES IN CLINICAL NEUROPHYSIOLOGY

Trainees must attain competence in all core Clinical Neurophysiological techniques and a number of additional specialist techniques.

1. CORE TECHNIQUES

Trainees must attain competence in all of the following:

- **Electroencephalography (EEG)** - in adults, children and neonates; in waking and sleeping states; with application of activation procedures (hyperventilation, photic stimulation).
- **Nerve conduction studies (NCS) and electromyography (EMG)** - in adults and children (recognising that paediatric NCS and EMG accounts for a small proportion of Clinical Neurophysiology practice outside specialised units); assessment of peripheral nerves; evaluation of the neuromuscular junction; EMG investigation of neurogenic and myopathic conditions.
- **Evoked potential studies** - visual, auditory and somatosensory modalities.

2. SPECIALISED TECHNIQUES

Trainees are expected to spend about 20% of training becoming proficient in up to 5 specialised techniques. Trainees should select at least one technique from the 3 major categories (S6, S8 & S10), though they may still select several procedures specific to their expected sub-specialisation.

- **Specialised EEG** - some of the following: video EEG; telemetry; ambulatory monitoring; pre-operative assessment for epilepsy surgery including invasive EEG studies; electrocorticography; cortical stimulation; cerebral function monitoring; polygraphy; sleep studies and multiple sleep latency tests.

- **Specialised NCS and EMG** - some of the following: quantitative EMG (single fibre EMG; turns/amplitude analysis; motor unit potential analysis; EMG frequency analysis, macro EMG); quantitative sensory testing; autonomic nervous system assessment; uroneurophysiology; application of botulinum toxin therapy.
- **Specialised evoked potential studies** - some of the following: intraoperative monitoring; magnetic stimulation studies; detailed investigation of visual system including electroretinography; event related potentials.

DISORDERS AMENABLE TO CLINICAL NEUROPHYSIOLOGY STUDY

(Adults and children)

1. Congenital and hereditary disorders of the nervous system
2. Degenerative disorders of the nervous system
3. Vascular disorders of the nervous system
4. Metabolic disorders of the nervous system
5. Infective disorders of the nervous system
6. Traumatic disorders of the nervous system
7. Inflammatory and immunological disorders of the nervous system
8. Demyelinating disorders of the nervous system
9. Neoplastic disorders of the nervous system
10. Epilepsy and other disorders of consciousness
11. Sleep disorders
12. Cranial nerve disorders including diseases of the eye and ear
13. Peripheral neuropathy, focal and generalised
14. Radicular disorders
15. Diseases of motor neurones
16. Muscle disease
17. Neuromuscular transmission disorders
18. Psychiatric disorders

CORE AND SPECIALISED TRAINING SECTIONS

S1. TECHNOLOGY

S2. HEALTH AND SAFETY

S3. BASIC NEUROSCIENCE

S4. NEUROLOGY

S5. ELECTROENCEPHALOGRAPHY

S6. SPECIALISED EEG TECHNIQUES

- Video EEG, telemetry and ambulatory monitoring
- Clinical Neurophysiology support for epilepsy surgery
- Polysomnography and multiple sleep latency tests

S7. NERVE CONDUCTION STUDIES AND EMG

S8. SPECIALISED NERVE CONDUCTION STUDIES AND EMG

- Quantitative EMG
- Quantitative sensory testing
- Uroneurophysiology
- EMG guided botulinum toxin therapy

S9. EVOKED POTENTIAL STUDIES

S10. SPECIALISED EVOKED POTENTIALS

CORE TRAINING S1

TECHNOLOGY

Objective

To understand and utilise the technology which underpins practice of Clinical Neurophysiology

Subject matter

(i) Knowledge

- Measurement techniques, electrodes and transducers
- Analogue-to-digital and digital-to-analogue conversion, effects of time and voltage resolution, aliasing
- Amplifiers and their characteristics
- Stimulators
- Signal processing including: averaging; trigger and delay techniques; Fourier and spectral analysis; brain mapping
- Component parts of recording systems used in Clinical Neurophysiology
- Computer technology
- Information technology including Data Protection Act, general and specialised software used in departments, analysis and research tools
- Simple testing and repair of equipment
- Safety and legal issues surrounding equipment

(ii) Skills

The trainee will be able to:

1. make rational purchasing decisions of recording and administrative systems
2. design, implement and monitor safety standards
3. recognise artefacts
4. assess and utilise new technologies
5. supervise and train non medical and medical staff in basic technology
6. observe legal and professional requirements for safe use of technology

Teaching / learning method

Self directed learning (A1)

Formal training on study days, post-graduate courses (A3, A4)

And

Practical experience during supervised recording sessions with technologists, physicists and Clinical Scientists

Assessment

Trainer's report (B1)

Training record (B2)

Multiple-choice questions (B5)

Evidence of competence

Satisfactory trainer's report (C1)

Satisfactory Training Record (C2)

Appropriate score on MCQ (C5)

CORE TRAINING S2

HEALTH AND SAFETY

Objectives

To enable the trainee to be conversant with and implement measures that ensure the safe working of a Department of Clinical Neurophysiology for staff and patients.

Subject matter

- hazards relating to the use of medical equipment (electrical and magnetic)
- hygiene and sterilisation procedures, procedures for prevention of cross infection including MRSA, Hepatitis B, HIV, prion diseases including CJD
- Control of substances hazardous to health (COSHH regulations)
- procedures relating to specific clinical situations: pacemakers, anti-coagulant therapy, theatre work, withdrawal of anti-epileptic medication
- manual handling
- Hepatitis B vaccination
- needle stick injury - prevention and action on occurrence
- policies for dealing with violent/abusive patients or relatives
- employment policy: sick leave, abuse and victimisation, grievance procedures, alcohol/smoking/drug use etc

Teaching / learning method

Self directed learning (A1)

Formal training on study days, post-graduate courses (A3, A4)

And

Departmental and Trust protocols and procedures

National guidelines from Dept of Health, Medical Devices Agency, COSHH, specialist and professional bodies

Assessment

Trainer's report (B1)

Training record (B2)

Multiple-choice questions (B5)

Evidence of competence

Satisfactory trainer's report (C1)

Satisfactory Training Record (C2)

Appropriate score on MCQ (C5)

CORE TRAINING S3

BASIC NEUROSCIENCE

Objectives

To acquire and reinforce knowledge of basic neuroanatomy, neurophysiology, neuropharmacology and neuropathology

Subject matter

(i) Knowledge

- **Neuroanatomy**
Knowledge of the major subdivisions of the central and peripheral nervous systems. Fibre tracts and nuclei. Cortical subdivision and function. Visual, sensory, auditory and motor pathways. Basal ganglia. Cerebellum. Autonomic nervous system. Vascular supply to the brain. Maturation of the nervous system.
- **Neurophysiology**
Basic knowledge of nerve conduction from ion channel function to the massed responses of nerve trunks, fibre tracts and nuclei. Synaptic function (inhibitory and excitatory) and the neuromuscular junction. Different motor unit types. Motor control and the cerebellum. Visual, auditory and somatosensory physiology from receptor to cortex. Biophysics of nerve stimulation (electrical and magnetic) and recording.
- **Neuropharmacology**
Central nervous system neurotransmitters and drugs which modulate them. Mode of action of drugs affecting the central and peripheral nervous systems.
- **Neuropathology**
Reactions of peripheral and central nervous systems to disease: tumours, infections, inflammation, infarction and immune mediated mechanisms. Demyelination and degeneration in the central nervous system; ephaptic transmission. Pathophysiology of epilepsy; mechanisms of excessive or hypersynchronous neural activity and of the generalised cortico-reticular epilepsies. Demyelination, degeneration and regeneration in the peripheral nervous system. How nerve conduction can be affected by pathology, particularly axonal degeneration and demyelination; how these two basic types of neuropathic abnormalities may be differentiated, and how they may overlap and inter-relate. Changes in nerve conduction and needle EMG in neuropathic and myopathic conditions. Temporal evolution of EMG and nerve conduction findings after complete and partial nerve injury. Different patterns of neuropathies and the ways in which peripheral neuropathies may present (diffuse sensori-motor, predominantly sensory, predominantly motor (with conduction block), multifocal. Patterns and distribution of myopathic disorders. Pre- and post-synaptic defects of neuromuscular transmission.

Skills

To be able to interpret the findings of Clinical Neurophysiology investigations at their most basic level i.e. localisation in the nervous system and the mechanisms of pathogenesis.

Teaching / learning method

Self directed learning (A1)

Formal training on study days, post-graduate courses (A3, A4)

And

Clinico-pathological conferences

Assessment

Trainer's report (B1)

Training record (B2)

Multiple-choice questions (B5)

Evidence of competence

Satisfactory trainer's report (C1)

Satisfactory Training Record (C2)

Appropriate score on MCQ (C5)

CORE TRAINING S4

NEUROLOGY

Objectives

To provide the trainee with the knowledge and skills to be able to:

- i. Examine, investigate, diagnose, treat and evaluate the effects of treatment in a range of neurological disorders
- ii. Ensure a consistently compassionate approach to patients and their carers.
- iii. Be aware of current clinical trials and evidence based medicine

Subject matter

1. Take a clinical history
2. Perform a neurological examination
3. Formulate a diagnostic plan
4. Plan appropriate investigations and interpret results
5. Initiate treatment as appropriate involving a multidisciplinary approach
6. Assess outcome of treatment
7. Counsel patient/carers concerning diagnosis, prognosis and treatment

Teaching / learning method

Self directed learning (A1)

Apprenticeship learning (A2)

Formal training on study days, post-graduate courses (A3, A4)

And

Grand rounds and case conferences

Assessment

Trainer's report (B1)

Training record (B2)

Mini Clinical Examination (B3)

Multiple-choice questions (B5)

Evidence of competence

Satisfactory trainer's report (C1)

Satisfactory Training Record (C2)

Satisfactory Mini Clinical Examinations (C3)

Appropriate score on MCQ (C5)

CORE TRAINING S5

ELECTROENCEPHALOGRAPHY

Objectives

To provide the trainee with the knowledge and skills to be able to record and report on EEGs across all age groups and medical conditions.

Subject matter

(i) Knowledge

- Use and limitations of EEG in a range of medical disorders
- EEG technology
- Physiological basis of EEG signals
- Requirements of specific recording environments e.g. intensive care unit

(ii) Skills

1. Record EEGs and recognition of artefacts
2. Recognition of normal components of the EEG and evolution of maturational changes
3. Recognition of normal variants and abnormalities
4. Write a factual report
5. Interpretation of EEG in clinical setting
6. Comment on EEG findings to referring clinician
7. Care of patient during recording, with particular reference to disorders of consciousness including epilepsy

Teaching / learning method

Self directed learning (A1)

Apprenticeship learning (A2)

Formal training on study days, post-graduate courses (A3, A4)

And

EEG reporting sessions (multidisciplinary)

Assessment

Trainer's report (B1)

Training record (B2)

DOPS: Observation by trainer/independent observer of technical ability during detailed procedures(B4)

And

Quality of EEG recording and reporting

Evidence of competence

Satisfactory trainer's report (C1)

Satisfactory Training Record (C2)

DOPS: Detailed procedures observed by independent observer and judged to be satisfactory (C4)

SPECIALISED TRAINING S6

SPECIALISED EEG TECHNIQUES

I. EEG Telemetry and Ambulatory Monitoring

Objectives

To acquire competence to:

- i. supervise and report on video EEG telemetry.
- ii. supervise and report on ambulatory EEG recordings

Subject Matter

(i) Knowledge

- Semiology and classification of epileptic seizures and epilepsies.
- EEG correlates of different seizure types.
- Indications for long-term EEG monitoring and the limitations of these techniques.
- Technology of video EEG telemetry and ambulatory monitoring, including the setting up and operation of equipment and fault finding.
- Differential diagnosis of epileptic and non-epileptic seizures.
- Common antiepileptic drugs, their uses, dosage and side effects.
- Management of status epilepticus.
- Role of EEG in presurgical assessment of epilepsy.

(ii) Skills

1. Assessing seizure histories and proposing differential diagnosis.
2. Evaluating video recordings of seizures of epileptic and non-epileptic origin.
3. Reading ictal and interictal EEGs in persons with epileptic and non-epileptic attacks.
4. Setting up telemetric and ambulatory recordings, selection of montages, polygraphy etc; changing media (tapes etc); identification of common faults.
5. Managing initial stages of status epilepticus.
6. Management of seizures and acute psychotic episodes in telemetry unit.
7. Explaining procedures to patients and carers and obtaining their co-operation.
8. Co-ordinating and leading the telemetry team.

Teaching / Learning Methods

Self directed learning (A1)

Apprenticeship learning (A2)

Formal training on study days, post-graduate courses (A3, A4)

And

Attendance at ward rounds and case conferences on telemetric and ambulatory investigations.

Setting up, supervision and reporting of telemetric and ambulatory recordings.

Assessment

Trainer's report (B1)

Training record (B2)

DOPS: Observation by trainer/independent observer of technical ability during detailed procedures(B4)

And

Quality of EEG recording and reporting

Evidence of competence

Satisfactory trainer's report (C1)

Satisfactory Training Record (C2)

DOPS: Detailed procedures observed by independent observer and judged to be satisfactory (C4)

SPECIALISED TRAINING S6

SPECIALISED EEG TECHNIQUES

II. Clinical Neurophysiological Support for Epilepsy Surgery

Objectives

To acquire competence to:

- i. supervise and report on sub-acute electrophysiological recordings with intracranial electrodes.
- ii. supervise and report on acute electrocorticograms
- iii. participate in functional brain mapping
- iv. participate in carotid amygdala tests

Subject Matter

(i) Knowledge

- Role of scalp and monitoring EEG techniques in pre-surgical assessment of epilepsy
- Strategies of epilepsy surgery and multidisciplinary presurgical assessment.
- Invasive EEG correlates of different seizure types.
- Understand the uses, interpretation and limitations of electrocorticography.
- Use of functional brain mapping in presurgical assessment.
- Procedure, uses and interpretation of carotid amygdala test and simultaneous EEG recording.
- Risks and benefits of epilepsy surgery and its associated procedures.

(ii) Skills

1. Setting up sub-acute intracranial recordings, selection of montages, identification and correction of common faults.
2. Interpretation of intracranial recordings.
3. Assisting surgeon and supervising technician in setting up and performing acute electrocorticographic recordings and in identification correction of common artefacts and faults.
4. Assisting at carotid amygdala tests.
5. Assisting at functional brain mapping.
6. Explaining these procedures accurately and comprehensibly to patients and carers.

Teaching / Learning Methods

Self directed learning (A1)

Apprenticeship learning (A2)

Formal training on study days, post-graduate courses (A3, A4)

And

Attendance at ward rounds, outpatient clinics and case conferences on presurgical patients with epilepsy.

Attendance at insertion of intracranial electrodes.

Attendance and assisting at carotid amygdala tests and at functional brain mapping.

Setting up, supervising and reporting of sub-acute intracranial recordings using foramen ovale, subdural and intracerebral electrodes.

Assessment

Trainer's report (B1)

Training record (B2)

DOPS: Observation by trainer/independent observer of technical ability during detailed procedures(B4)

And

Quality of EEG recording and reporting

Evidence of competence

Satisfactory trainer's report (C1)

Satisfactory Training Record (C2)

DOPS: Detailed procedures observed by independent observer and judged to be satisfactory (C4)

SPECIALISED TRAINING S6

SPECIALISED EEG TECHNIQUES

III. Polysomnography and Multiple sleep Latency Tests

Objectives

To acquire competence to:

- i. supervise and report on polysomnography
- ii. supervise and report on Multiple Sleep Latency Tests

Subject Matter

(i) Knowledge

- Classification and semiology of sleep disorders.
- Normal EEG and polygraphic findings in sleep.
- Indications for polysomnography and MSLT and the limitations of these techniques.
- Rechtschaffen & Kales' sleep staging criteria; manual and automated methods of staging.
- Technology and procedures for polysomnography and Multiple Sleep Latency Tests.

(ii) Skills

1. Eliciting and assessing histories of possible sleep disorders and proposing differential diagnosis.
2. Sleep staging and recognising polygraphic features of common sleep disorders.
3. Setting up polygraphy both in the laboratory and using ambulatory recordings, selection of montages, transducers etc; changing media; identification of common faults.
4. Explaining procedures to patients and carers and obtaining their co-operation.
5. Co-ordinating and leading the sleep studies team.

Teaching / Learning Methods

Self directed learning (A1)

Apprenticeship learning (A2)

Formal training on study days, post-graduate courses (A3, A4)

And

Attendance at ward rounds and case conferences on sleep studies

Attendance at sleep clinic

Assessment

Trainer's report (B1)

Training record (B2)

DOPS: Observation by trainer/independent observer of technical ability during detailed procedures(B4)

And

Quality of EEG recording and reporting

Evidence of competence

Satisfactory trainer's report (C1)

Satisfactory Training Record (C2)

DOPS: Detailed procedures observed by independent observer and judged to be satisfactory (C4)

CORE TRAINING S7

NERVE CONDUCTION STUDIES + ELECTROMYOGRAPHY

Objectives

To enable the trainee to understand the indications for nerve conduction studies and electromyography (EMG); to perform these investigations; and to report on the findings.

Subject matter

(i) Knowledge

- Physiology of nerve conduction, neuromuscular transmission and excitation -contraction mechanisms in muscle
- Clinical presentation and pathophysiology of diseases of the peripheral nerves, neuromuscular junction and muscles
- Anatomy of peripheral nerves and muscles with regard to electrode placement and needle insertion
- Techniques for study of peripheral nerves including sensory, motor, and F wave studies, H reflex, repetitive nerve stimulation and blink reflex. Adaptations necessary in particular patient groups or difficult recording situations
- Techniques of electromyography including at least one quantitative method for recognition of neurogenic and myopathic disorders. Adaptations necessary in particular patient groups or difficult recording situations
- Normal values, including anatomical variants; effects of age, temperature, height and co-morbid conditions. Use of internal controls e.g. the opposite limb in contralateral conditions

(ii) Skills

1. Liaise with referring colleagues and advise on appropriate investigations.
2. Describe and interpret findings of the investigation in the report
3. Take a history from and examine the patient to formulate the problem for investigation. Select and perform the appropriate tests, with modification as required during neurophysiological examination
4. Care for the patient throughout the consultation by explaining the procedure, obtaining co-operation, and minimising discomfort. Provide appropriate information to the patient after the examination
5. Supervise training and practice of physiological measurement technicians in performance of basic nerve conduction studies and report on their findings

Teaching / Learning Methods

Self directed learning (A1)

Apprenticeship learning (A2)

Formal training on study days, post-graduate courses (A3, A4)

And

Specialised anatomy and physiology textbooks for less commonly encountered techniques

Assessment

Trainer's report (B1)

Training record (B2)

DOPS: Observation by trainer/independent observer of technical ability during detailed procedures(B4)

And

Quality of EMG recording and reporting

Evidence of competence

Satisfactory trainer's report (C1)

Satisfactory Training Record (C2)

DOPS: Detailed procedures observed by independent observer and judged to be satisfactory (C4)

SPECIALISED TRAINING S8

SPECIALISED NERVE CONDUCTION STUDIES AND EMG

I. QUANTITATIVE EMG

Objectives

To acquire knowledge of and technical competence in two or more specialised EMG techniques which include single fibre EMG, macro EMG, scanning EMG, EMG frequency analysis, turns/amplitude analysis and motor unit potential analysis.

Subject matter

(i) Knowledge

- Basic principles of EMG quantification, including frequency analysis
- Indications for quantitative methods
- Technical aspects: needles, EMG filtering, statistical analysis on data generated
- Single fibre EMG using voluntary activation and axonal stimulation
- Principles of jitter, blocking and fibre density measurement
- Principles of quantification of recruitment patterns; turns/amplitude analysis; frequency analysis
- Principles of quantification of motor unit potentials; amplitude, duration and phase measurement

(ii) Skills

1. Liaise with referring colleagues and advise on appropriate investigations.
2. Take a history from and examine the patient to formulate the problem for investigation. Select and perform the appropriate tests, with modification as required during neurophysiological examination
3. Care for the patient throughout the consultation by explaining the procedure, obtaining co-operation, and minimising discomfort. Provide appropriate information to the patient after the examination
4. Describe and interpret findings of the investigation in the report
5. Supervise training and practice of physiological measurement technicians in performance of basic nerve conduction studies and report on their findings

Teaching / Learning Methods

Self directed learning (A1)

Apprenticeship learning (A2)

Formal training on study days, post-graduate courses (A3, A4)

And

Specialised anatomy and physiology textbooks for less commonly encountered techniques

Assessment

Trainer's report (B1)

Training record (B2)

DOPS: Observation by trainer/independent observer of technical ability during detailed procedures(B4)

And

Quality of EMG recording and reporting

Evidence of competence

Satisfactory trainer's report (C1)

Satisfactory Training Record (C2)

DOPS: Detailed procedures observed by independent observer and judged to be satisfactory (C4)

SPECIALISED TRAINING S8

SPECIALISED NERVE CONDUCTION STUDIES AND EMG

II. QUANTITATIVE SENSORY TESTING

Objectives

To acquire understanding of the pathophysiological concepts of sensory perception relating to the peripheral and central sensory nervous systems; and to obtain technical competence in different methods of quantitative sensory testing.

Subject matter

(ii) Knowledge

- Anatomy, physiology and pathology of sensory receptors, and of peripheral and central sensory neural pathways
- Biochemistry of molecules involved in mediating sensation in health and disease
- Principles of different available methods and paradigms of quantitative sensory testing for warm and cool thresholds; heat and pain and cold as pain thresholds. Limitations of psychophysical techniques
- Principles of methods of quantitative sensory testing for touch thresholds
- Principles of other indirect methods of quantitative testing such as measurement of reflex vasodilatation using laser Doppler, and nicotine and acetylcholine induced sweating quantified by an evaporimeter.
- Interaction between the autonomic nervous and sensory systems. Use of autonomic function tests in assessment of patients with neuropathic disorders.

(ii) Skills

1. Liaise with referring colleagues and advise on appropriate investigations.
2. Take a history from and examine the patient to formulate the problem for investigation. Select and perform the appropriate tests, with modification as required during neurophysiological examination
3. Care for the patient throughout the consultation by explaining the procedure, obtaining co-operation, and minimising discomfort. Provide appropriate information to the patient after the examination
4. Describe and interpret findings of the investigation in the report

Teaching / Learning Methods

Self directed learning (A1)

Apprenticeship learning (A2)

Formal training on study days, post-graduate courses (A3, A4)

And

Specialised anatomy and physiology textbooks for less commonly encountered techniques

Assessment

Trainer's report (B1)

Training record (B2)

DOPS: Observation by trainer/independent observer of technical ability during detailed procedures(B4)

And

Quality of quantitative sensory testing technique and reporting

Evidence of competence

Satisfactory trainer's report (C1)

Satisfactory Training Record (C2)

DOPS: Detailed procedures observed by independent observer and judged to be satisfactory (C4)

SPECIALISED TRAINING S8

SPECIALISED NERVE CONDUCTION STUDIES AND EMG

III. URONEUROPHYSIOLOGY

Objectives

To enable the trainee to understand the indications for uroneurophysiological investigations; to perform these procedures; and to report on the findings.

Subject matter

(iii) Knowledge

- Anatomy and normal function and control of the urological system. Neural innervation and control of urethral and anal sphincters. Normal characteristics on motor neurones in Onuf's nucleus
- Consequences for urological and sexual function in neurological and general medical disorders, including endocrine disease such as polycystic ovary syndrome. Clinical presentation and underlying pathology of these conditions
- Technique of needle EMG examination of sphincters; normal and abnormal findings. Use of EMG recording as part of urodynamic assessment. Adaptations of technique necessary in particular patient groups or difficult recording situations
- Use and limitations of other techniques to assess bladder and sexual function, such as pudendal nerve conduction studies, sacral reflexes and cortical sensory/motor evoked responses

(ii) Skills

1. Liaise with referring colleagues and advise on appropriate investigations.
2. Take a history from and examine the patient to formulate the problem for investigation. Select and perform the appropriate tests, with modification as required during neurophysiological examination
3. Care for the patient throughout the consultation by explaining the procedure, obtaining co-operation, and minimising discomfort or anxiety. Provide appropriate information to the patient after the examination
4. Describe and interpret findings of the investigation in the report

Teaching / Learning Methods

Self directed learning (A1)

Apprenticeship learning (A2)

Formal training on study days, post-graduate courses (A3, A4)

Assessment

Trainer's report (B1)

Training record (B2)

DOPS: Observation by trainer/independent observer of technical ability during detailed procedures(B4)

And

Quality of EMG recording and reporting

Evidence of competence

Satisfactory trainer's report (C1)

Satisfactory Training Record (C2)

DOPS: Detailed procedures observed by independent observer and judged to be satisfactory (C4)

SPECIALISED TRAINING S8

SPECIALISED NERVE CONDUCTION STUDIES AND EMG

IV. EMG GUIDED BOTULINUM TOXIN THERAPY

Objectives

To enable the trainee to understand the indications for botulinum toxin therapy, methods of administration and effects of therapy..

Subject matter

(i) Knowledge

- Pharmacology of Botulinum toxin, including dosage and dilution schedules related to different strains of toxin and different manufacturers.
- Clinical conditions where its use is indicated.
- Method of delivery using EMG guidance.
- Anatomy of muscles with regard to site of needle insertion.
- Complications of therapy

(ii) Skills

1. Liaison with doctor or team referring patient for treatment
2. Take a history and examine the patient with a view to setting out a treatment plan.
3. Explanation of the procedure to the patient in a manner which is understandable and gain patient's consent. Establish patient co-operation to minimise discomfort during the procedure.
4. Perform EMG guided toxin therapy in a range of disorders, including focal limb dystonia, diffuse dystonic disorders, spasmodic torticollis, spasticity.

Teaching / Learning Methods

Self directed learning (A1)

Apprenticeship learning (A2)

Formal training on study days, post-graduate courses (A3, A4)

And

Specialised anatomy textbooks for needle insertion techniques.

Assessment

Trainer's report (B1)

Training record (B2)

DOPS: Observation by trainer/independent observer of technical ability during detailed procedures(B4)

Quality of EMG recording and reporting

Evidence of competence

Satisfactory trainer's report (C1)

Satisfactory Training Record (C2)

DOPS: Detailed procedures observed by independent observer and judged to be satisfactory (C4)

CORE TRAINING S9

EVOKED POTENTIAL STUDIES

Objectives

To understand the technical basis and methods of recording visual, somatosensory and auditory brain stem evoked potentials; appreciate when these tests may be used, and the expected changes from normal in a variety of pathological conditions

Subject matter

(i) Knowledge

- technical aspects of stimulation using pattern reversal and flash visual, electrical peripheral nerve and auditory methods
- technical aspects of recording, including averaging methods
- technical difficulties of recording from children and adults in a variety of circumstances, including the intensive care unit
- anatomical generators of evoked potentials, and the basis for determining these generators
- measurement of latency, amplitude and polarity in normal subjects, and the effect of altering stimulus parameters
- physiological basis for alteration in evoked potential response amplitude and latency in demyelinating and degenerative pathological processes affecting the central and peripheral nervous system
- sensitivity and specificity of evoked potential abnormalities for the diagnosis of multiple sclerosis, and changes expected in other demyelinating, degenerative, traumatic or vascular nervous system diseases

(ii) Skills

1. Competency in setting up stimulus and recording apparatus to elicit reproducible visual, somatosensory and brain stem auditory evoked potentials
2. Performance of each modality on adults and children
3. Analysis of main evoked potential components
4. Recognition of limits of normality and interpretation of alterations due to nervous system disease

Teaching / Learning Methods

Self directed learning (A1)

Apprenticeship learning (A2)

Formal training on study days, post-graduate courses (A3, A4)

Assessment

Trainer's report (B1)

Training record (B2)

DOPS: Observation by trainer/independent observer of technical ability during detailed procedures(B4)

Quality of EMG recording and reporting

Evidence of competence

Satisfactory trainer's report (C1)

Satisfactory Training Record (C2)

DOPS: Detailed procedures observed by independent observer and judged to be satisfactory (C4)

SPECIALISED TRAINING S10

SPECIALISED EVOKED POTENTIAL STUDIES

Objectives

To understand the technical basis, methods of recording and clinical application of specialised evoked potentials; acquire proficiency in performance of these studies, and expertise in the interpretation of clinical significance of findings

Subject matter

(i) Knowledge

Technical and physiological basis, methods of recording, clinical applications for one or more of the following:

- Intra-operative monitoring
 - a. multimodality stimulation
 - b. peripheral/sub-cortical/cortical recordings
 - c. multispeciality applications, including orthopaedics, neurosurgery and ophthalmology
- Magnetic stimulation studies: cortical and peripheral stimulation techniques
- Visual physiology, including electroretinography, electronystagmography, electrooculography: evaluation of function of rods and cones, retinal pigment, epithelium and ganglion cells
- Intra-operative functional mapping of cerebral cortex
- Event and movement related cortical potentials

(ii) Skills

Proficiency in performance and clinical interpretation of designated technique for each selected category

Teaching / Learning Methods

Self directed learning (A1)

Apprenticeship learning (A2)

Formal training on study days, post-graduate courses (A3, A4)

Assessment

Trainer's report (B1)

Training record (B2)

DOPS: Observation by trainer/independent observer of technical ability during detailed procedures(B4)

Quality of EMG recording and reporting

Evidence of competence

Satisfactory trainer's report (C1)

Satisfactory Training Record (C2)

DOPS: Detailed procedures observed by independent observer and judged to be satisfactory (C4)

APPENDIX A

TEACHING AND LEARNING METHODS

A1: Self directed learning (textbook, journal and internet sources)

A2: Apprenticeship learning

A3: Formal training in national study training days, post-graduate courses

A4: Attendance at approved conferences and scientific meetings

A5: Simulated patients

A6: Video based case material (EMG, EEG)

*Some training areas may involve additional methods of teaching/learning; these are identified in specific sections

APPENDIX B

ASSESSMENT METHODS

B1: Trainer's Report

B2: JCHMT training record including log book

B3: Mini CEX: Clinical Examination

B4: DOPS: Observation by trainer &/or independent observer of technical ability during detailed procedures.

B5: Multiple-choice questions.

B6: 360 Degree Assessment

B7: Patient Survey

B8: Case Presentations

B9: Case oriented problem-solving exercises

B10: Independent Assessor's report

* Some training areas may include additional methods of assessment; these are identified in specific sections

* Some assessment methods are under development

APPENDIX C

EVIDENCE OF COMPETENCE FOR INCLUSION IN RECORD

- C1: Satisfactory Trainer's report
- C2: Correctly maintained and up-to-date JCHMT Training Record/log book
- C3: Mini CEX: Mini Clinical Examinations judged to be satisfactory
- C4: DOPS: Detailed procedures observed by independent observer and judged to be satisfactory
- C5: Appropriate score on MCQ
- C6: Satisfactory 360 degree assessment
- C7: Satisfactory Patient Survey assessment.
- C8: Satisfactory case presentations to peers and teachers
- C9: Satisfactory case orientated problem-solving exercises
- C10: Satisfactory report by Independent assessor.
- C11: Documented attendance at national training days, approved conferences and scientific meetings.
- C11: Documented attendance at other approved conferences and scientific meetings.