

Consensus-based guidelines for Video EEG monitoring in the pre-surgical evaluation of children with epilepsy in the UK

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Introduction

Approximately 30% of children with epilepsy do not respond to antiepileptic medication and may be candidates for a surgical treatment. There is increasing evidence that children should be considered for surgery earlier rather than later, in view of the consequence of on-going seizures on brain development [1,2]. However, there is evidence that only a third of children in the UK receive surgery within 2 years and many wait several years [3].

In 2012 NHS England designated and commissioned four centres across the nation to form the Children's Epilepsy Surgery Service (CESS) to improve this situation. The aim of centralising services was improve the uptake and access to epilepsy surgery by providing pre-surgical evaluation and epilepsy surgery for children in the specialised CESS centres in England [4]; this was subsequently expanded to include Wales. The commissioned CESS centres are Birmingham Children's Hospital NHS Foundation Trust, University Hospitals Bristol NHS Foundation, Great Ormond Street Hospital for Children NHS Foundation Trust with King's College Hospital NHS Foundation Trust, London and Alder Hey Children's NHS Foundation Trust, Liverpool with Central Manchester University Hospitals NHS Foundation Trust (NorCESS). The CESS programme provides comprehensive pre-surgical evaluation, including multidisciplinary team reviews for all children with epilepsy who meet the criteria for surgical amenability, and the co-ordination and conduct of epilepsy surgical procedures for eligible children.

Long term video EEG monitoring or video telemetry is an essential part of the pre-surgical evaluation, which is provided in most centres by a team of Clinical Neurophysiologists and Paediatric Neurologists. Although many Epilepsy Monitoring Units (EMU) work according to published standards [5-9], no paediatric-specific national or international guidelines for video telemetry exist. Recent surveys and service evaluations highlight risks associated with video EEG monitoring, particularly when performed for pre-surgical evaluation [10-16] and indicate a need for specific guidelines.

Video EEG monitoring for epilepsy refers to the simultaneous recording of EEG and video of clinical behaviour over extended periods of time to evaluate patients with paroxysmal disturbances of cerebral function [8]. Video EEG monitoring has an important role in the assessment of patients who present diagnostic or management difficulties following clinical evaluation and routine EEG. The clinical applications of video EEG monitoring include the diagnosis of paroxysmal neurological episodes, including psychogenic non-epileptic seizures, the differentiation between nocturnal epilepsy and parasomnias and the characterisation of seizure type, quantification of interictal epileptiform discharges, seizure frequency, and evaluation of candidates for epilepsy surgery.

Following a review of the available published evidence on guidelines, preferred practices or consensus statements for paediatric video EEG monitoring, it was considered appropriate to develop consensus-based recommendations for children undergoing pre-surgical evaluation within the CESS programme.

Method

A modified Delphi process [17] was undertaken using clinical and academic expertise of the clinical neurophysiology sub-specialty group of CESS. This methodology has previously been applied successfully in paediatric epilepsy to develop clinical guidelines in areas with similar paucity of evidence [6, 18-20].

Stage I: Identification of the consensus working group

The consensus working group was derived from members of the CESS Clinical Neurophysiology sub-specialty group. The technical and clinical expertise of these members had been established previously through the rigorous selection process to become a commissioned CESS centre.

Stage II: Identification of key areas for guidelines

Key areas for the guidelines were identified from national accepted standards and local guidelines where available. Further topics were added from relevant international guidelines and consensus statements [5-9].

Stage III: Consensus practice points

Statements for the guidelines were formulated around the key areas of practice, followed by an iterative process of amendment and agreement until final consensus was reached among all members.

Stage IV: Final review

Following the development of the guidelines, including the supplementary materials (testing protocol, guidelines on how to write the factual report and conclusion, appendices I-III), the document was sent to all members of Clinical Neurophysiology group for final review and rating. A final rating of agreement with the statement was performed using a five-point Likert-type scale (five, "Strongly agree" to one, "Strongly disagree"). Statements that gained consensus (median score was either 4 or 5) are included in the guideline.

Results

Stage 1

All members of the Clinical neurophysiologist departments from six UK hospitals comprising the four CESS centres (Birmingham Children's Hospital NHS Foundation Trust, University Hospitals Bristol NHS Foundation, Great Ormond Street Hospital for Children NHS Foundation Trust with King's College Hospital NHS Foundation Trust, London and Alder Hey Children's NHS Foundation Trust, Liverpool with Central Manchester University Hospitals NHS Foundation Trust) were invited to participate. Thirty five practitioners took part, including doctors, clinical physiologists and clinical scientists (Table A), thereby constituting a national multidisciplinary team of experts.

Stage 2

In the initial face-to-face meeting nine key areas or domains were identified by the group. Table B lists these key areas of video EEG monitoring.

Stage 3

Statements were formulated during the face-to-face meeting using the available national protocols and guidelines as well as the international guidelines and consensus statements mentioned above. These were integrated or modified to reflect age-specificities. All changes were based on published evidence and/or the consensus of the group. Using an iterative process of amendment and agreement, final document was produced after two rounds of feedback and revisions via email and one final face-to-face meeting.

All members contributed to the face-to-face meetings. Of the 35 members, 25 responded in the first round and 9 at the second round.

The consensus guidelines of video EEG telemetry are detailed below:

1. Indications

EEG for pre-surgical evaluation nearly always requires admission to a paediatric epilepsy monitoring unit. Ambulatory recordings without video are not acceptable, but under some circumstances home video telemetry may be considered [21-22]. Duration of video EEG monitoring study is usually 1-7 days with a mean of 3 days, but may depend on the frequency of attacks. It is difficult to determine how many seizures are necessary to accurately localise seizure onset as this depends on several factors, including the number of different seizure types, variability in electrographic seizure onset, neuroimaging, and most importantly, concordance of these findings [9, 23]. Even in the ideal situation when all findings are concordant, it is recommended that a minimum of two seizures of the same type should be recorded and preferably more.

Methods that are commonly used to increase a likelihood of seizures include sleep deprivation, hyperventilation, exercise and antiepileptic drug reduction (the latter usually reserved for pre-surgical evaluation).

Indications for video EEG monitoring in the pre-surgical evaluation include the following:

- Identification of paroxysmal electrographic and/or behavioural abnormalities, including epileptic seizures, overt and subclinical, and documentation of interictal epileptiform discharges.
- Verification of the epileptic nature of events.
- Characterisation of ictal and interictal events.
- Localisation of seizure onset zone (pre-surgical evaluation).
- Quantifications of ictal and interictal events including diagnosis of Electrical Status Epilepticus of slow wave Sleep (ESES).

2. Referral pathway

Referrals are accepted from paediatric neurologists or paediatricians with a special interest in epilepsy.

Patients referred for pre-surgical evaluation should be formally discussed and accepted via a CESS referral meeting or equivalent. A centre-specific pathway should be in place to include the following points:

- Minimum information required:
 - Contact details for patient.
 - Specific clinical question(s) to be addressed.
 - Results of previous EEGs, types and frequency of seizures, nocturnal / diurnal, date of last seizure.
 - Current antiepileptic medication and doses.
- Admission duration depends on seizure frequency and the clinical question. Other than in special circumstances, seizure frequency should be sufficient to capture habitual seizures in one week monitoring period. Guidelines for planning the admission to be tailored on an individual basis are:
 - Daily seizures: 1-2 days video EEG monitoring.
 - Seizures nearly every day with seizure free periods of <2 days: 3 days video EEG monitoring.
 - Seizures on 3-4 days a week: 5 days video EEG monitoring.
 - Less than 4 seizures per week or seizure free periods of >4 days: video EEG monitoring with anti-epileptic drug (AED) reduction
- AED reduction should only be considered for pre-surgical evaluation or if the diagnosis of epilepsy is in question (see below) and initiated following hospital admission.
- Parents or legal guardian are contacted 1-3 weeks prior to admission to confirm seizure frequency and necessity / indication of admission.

- One parent, legal guardian or other legitimately accompanying adult is required to stay with the child through the admission.

3. Recording Techniques

The technical conditions of video EEG monitoring for pre-surgical evaluation should be adapted to the needs of children without impacting on technical standards or safety.

- Electrodes:
 - Reusable or single use disks applied with collodion and gauze.
 - Invasively placed electrodes such as sphenoidal or foramen ovale are not recommended in children.
- Digital EEG system must be able to record a minimum of 32 channels of EEG and at least 3 polygraphic channels. Capacity for 64 or more channels is becoming increasingly available and is necessary for invasive studies.
- Electrode placement:
 - Should be the International 10/20, 10/10 or modified Maudsley system.
 - Additional electrodes may be added (e.g. cheek or 'surface' sphenoidals).
- Montages: Bipolar longitudinal, bipolar transverse, Average Reference, Laplacian or others as appropriate.
- Polygraph channels
 - Minimum ECG and 2 EMG (bilateral deltoid).
 - Oxygen saturation in all patients with a history of status epilepticus, prolonged seizures, ictal or postictal cyanosis/apnoea, at least overnight. Optional in all other patients.
 - Optional: further polygraphic channels such as EMG of one axial muscle (trapezius), respiration, ocular channels (EOG).
- Sampling rate of 512 Hz or higher.
- Performance settings:
 - Low frequency (high-pass) filter of 0.5 Hz or lower.
 - High frequency (low-pass) filter of 70 Hz or higher.
 - Noise level less than 1 μ V RMS.
 - Input impedance of 1 M Ω .
 - Common mode rejection of at least 40 dB.
 - Dynamic range of at least 40 dB.

- Sensitivity range 2 – 2000 μ V.
- Common mode rejection ratio (CMRR) >100dB @ 50 Hz.
- AD conversion with 16-bit minimum resolution.
- Camera with aim to have patient on screen at all times.
- Access to emergency equipment (resuscitation trolley, suction, oxygen).
- Close supervision of patient at all times.
- Written informed consent to record and keep video and use data in multidisciplinary team meeting.
- Review of all EEG and video data and annotations to be performed on a daily basis.

4. Methods of behavioural monitoring

One of the major objectives is to correlate ictal behaviour with electrophysiological findings. Methods of documenting peri-ictal and ictal behaviour should include self-reporting, observer reporting, video recording, polygraphy, testing of clinical status and patient behaviour. Only recently an international consensus protocol for peri-ictal testing has been published by a taskforce of the International League Against Epilepsy (ILAE) and the European Epilepsy Monitoring Unit Association [24]. However, this is mostly target towards adult patients and was considered too complex for younger patients. Hence a more pragmatic and shorter version was developed by the CESS working group specifically for children (appendix II).

In addition to the two recording cameras, the following requirements apply to EEG systems set-up and staffing:

- Video monitoring with at least two cameras and infrared capability.
- Audio monitoring.
- Physiologist and nursing staff responsible for keeping patient in camera view. Parental camera control is acceptable if the recording equipment is not networked.
- Self-reporting with event button and diary for patient and/or parents/guardian.
- Peri-ictal testing using an agreed protocol (appendix II).
- Awareness and training of nursing staff, physiologists, doctors and other health care professionals on clinical and behavioural testing during seizures.
- Information for parents/guardians for individual testing during events.
- Test material available on ward/room (e.g. objects such as toys to name).

5. Safety

Recent surveys and service evaluations provide evidence that patients are at risk from adverse events during video EEG monitoring for pre-surgical evaluation [10-16, 25-27]. Adverse events are mostly caused by seizure-associated falls and injuries, but less commonly sudden unexpected death in epilepsy (SUDEP) has been reported. Adverse events are frequently related to drug withdrawal [12, 28-30]. Adverse events need to be anticipated and prevented to ensure patient safety; effective patient surveillance during seizures is therefore of paramount importance. Concerns have also been raised about the risk of respiratory failure following seizures. In adults and children, approximately one-third of seizures are associated with oxygen desaturation to values lower than 90%, and about 10% with oxygen desaturation lower than 80% [31,32]. A retrospective study of 160 Epilepsy Monitoring Units (MORTEMUS) suggested that SUDEP in epilepsy monitoring units was often due to early postictal alteration of respiratory and cardiac function induced by generalised tonic-clonic seizure [12]. The risk of SUDEP is considered to be increased when patients experiencing a seizure are not attended to and possibly also following antiepileptic drug withdrawal, in particular during night time. Published EEG monitoring guidelines for adults do not include recommendations on the use of oximetry [5-9] but nocturnal monitoring of ECG and oxygen saturation in high risk patients has been suggested [12]. In the light of the above mentioned risks, close supervision of the patient should include:

- Nursing cover of 1:2 for all patients.
- Parent/guardian present at all times when monitoring patients under 17 years of age.
- Parent/guardian with the child during AED reduction at any age.
- Parent/guardian with child aged 17-18 y overnight and most of the day.
- Nursing supervision during invasive monitoring should be 1:1 (1:2 for stereotactic video EEG if without AED withdrawal is also accepted).
- Continuous ECG recording as part of EEG at all times and at night ECG or heart rate visible to ward staff and alarmed.
- Oxygen saturation monitoring in patients with a history of apnoea or desaturation, at least overnight (see Recording Techniques).
- Camera view:
 - Two or more camera views.
 - Trained nursing staff and/or parent/guardian need to be able to adjust camera position to keep patient in view.
- EEG leads tied together and attached to patients.
- Cot sides up or low level bed:

- Always for intracranial patients, postoperative patients or consciousness impaired.
 - Always for children under 5 years of age.
 - At night and during daytime naps.
 - With AED reduction.
 - Cot sides should be padded for patients with drop attacks, hypermotor seizures or when otherwise indicated.
- Antiepileptic drug withdrawal policy (see below).
 - Bathing /showering forbidden.
 - En-suite toilet with sliding doors or doors opening outward.
 - Falls risk assessment policy in place. Patient alarms and seizures alert button, clearly labelled as being different and identified as such to parents/guardian as part of induction to monitoring session.
 - Access to resuscitation equipment.
 - Electrical safety (see below).
 - Patient safety notices provided.
 - Staff training in place.

6. Antiepileptic drug withdrawal policy

The tapering or withdrawal of AEDs is routinely performed in EMUs with the aim of promoting seizures, decreasing the length of hospital admission and reducing associated costs. However, withdrawal of AEDs is associated with an increased risk of seizure clusters, status epilepticus and SUDEP [12, 28-30]. No national or international recommendations or guidelines exist as yet, although the NAEC (The National Association of Epilepsy Centers) recommends that medication reduction should be avoided in the outpatient setting prior to admission for video EEG recording [7]. There is evidence that specific protocols and the avoidance of drug withdrawal in patients with a history of status epilepticus reduces the risk of both status and clusters of seizures [28, 29].

- AED reduction should only be considered for pre-surgical evaluation or if the diagnosis of epilepsy is in question.
- AED reduction should ideally be started after admission to hospital. In rare situations it may be appropriate to perform AED reduction prior to admission in children without a history of status or prolonged seizures. This would require prior agreement by the named Consultant Neurologist.
- AEDs are halved on the first day and may be stopped on the second. Never stop AEDs at once.

- Reduction of drugs with a long half-life (i.e. benzodiazepines, phenobarbital, phenytoin) is associated with increased risk of status epilepticus and provocation of atypical seizures and should therefore be avoided if possible and only be performed under special considerations.
- Reconsider if history of status or >1 prolonged tonic clonic seizure/month.
- Intravenous (IV) access *in situ* for rapid drug administration at all times.
- Status epilepticus protocol in place and available for all on-call staff, using either national or local protocols [33-35]. However, it is recognised that these guidelines have no evidence base [35].
- One-to-one supervision in place (parent/guardian or nurse) at all times.
- Reinstate AEDs if:
 - All habitual seizure typed captured with relevant EEG and video information.
 - Prolonged seizures (depending on individual seizure severity and seizure burden) or secondary generalisation of habitual partial seizures.
 - Status epilepticus or increasing seizure frequency (clusters) with limited recovery.
- Drugs to be **reinstated** 1 day prior to discharge.

7. Electrical safety

All medical equipment must comply with IEC 60601-1-12:2015 (general requirements for safety of Medical equipment) [37] and local Trust policies.

Perform annual safety test on all medical equipment. To be conducted only by suitable qualified biomedical engineers. Please note this test is very different from Portable Appliance Test (PAT) testing of office equipment; PAT testing is **not** appropriate for medical equipment.

Any additional electrical equipment (medical and non-medical) which is brought into the patients' environment on an *ad-hoc basis*, for example, functional stimulation, Event Related Potentials, PCs/laptops used for presenting stimuli (visual/auditory), etc., **must** be checked and approved by appropriate biomedical engineers personnel prior to connecting to patient and/or telemetry equipment.

8. Data storage

- Adequate storage space on server (20-50 GB per 24 hours, depending on number of cameras and video quality, sampling rate, number of recorded channels, but this is likely to increase with progress in technology).
- All video/audio monitoring data as well as associated EEG recordings saved until appropriately analysed.

- All EEG data should be stored whereas video data may be reduced in accordance with national and local guidelines. If videos are clipped, clippings need to include all relevant ictal information and a minimum of 3-5 minutes preceding and following the event (longer if the post-ictal phase includes information critical to the interpretation of the ictal manifestation). All available examples of each identified seizure type should be included if there are less than 5 events per type.
- Storage of relevant data retained until the patient is 25 years of age (or 26 y if they are 17 y when treatment ends) or 8 years after their death, if sooner.
- Data to be stored and to be used in accordance with the Data Protection Act.
- Data which are to be sent externally **must** be encrypted in accordance with local guidelines.

9. Annotations of EEG recording

- Annotate all main features of recording.
- Annotate if awake/drowsy/asleep/arousal.
- Annotate good examples of interictal discharges.
- Annotate all seizure types clinically and electrographically (if more than one type, name them type 1, 2, 3 for example). Mark typical/good examples to show at multidisciplinary meetings.
- Confirm semiology of captured events with parents/guardian, noting any differences between the captured semiology and their accounts of habitual events.

Stage 4

All 35 members of the group were invited by email to score the guidelines which were returned by 24 (69%). All statements received a median score of 5 (Table C) and were thus adopted by the group.

Conclusion

Video EEG is a vital part of the pre-surgical evaluation for paediatric epilepsy surgery. Although video EEG monitoring is usually safe [38] it can be associated with increased risk for morbidity and, rarely, mortality. However, there is no high quality evidence from well-designed studies to inform the development of guidelines, particularly in children. Consequently, no national guidelines exist despite internally acknowledged expertise in the UK. The guidelines for Video EEG telemetry monitoring presented here have been developed using a modified Delphi process by the clinical neurophysiology sub-specialty group of the CESS centres in the UK but could provide a useful starting point for centres in other nations that would wish to develop their specific protocol and standard operating procedures. The recommendations primarily fall

into the category of expert opinion, although where available evidence synthesis combined with reiteration. Although these guidelines have been developed specifically for video monitoring as part of pre-surgical evaluation in children with epilepsy, it would be reasonable to assume and anticipate that most domains would be transferable to any hospital that undertakes video EEG monitoring.

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Table 1: Key areas of video EEG monitoring

Key areas
Indications
Referral pathway
Recording Techniques
Methods of behavioural monitoring
Safety
Antiepileptic drug withdrawal policy
Electrical safety
Data storage
Annotations of EEG recording

Table 2: Composition of expert panel

Profession	
Doctors	15
Clinical neurophysiologists	11
Consultant paediatric neurologists	4
Consultant neurosurgeon	1
Nurses	3
Clinical physiologists	16
Clinical scientist	1

Table 3: Final rating

	Responses	Median rating	Range	Mean	SD
Indications	23	5	4-5	4.96	0.2085144
Referral pathway	23	5	4-5	4.91	0.288104
Recording Techniques	24	5	4-5	4.88	0.337832
Methods of behavioural monitoring	23	5	4-5	4.57	0.662371
Safety	24	5	4-5	4.92	0.28233
Antiepileptic drug withdrawal policy	23	5	3-5	4.78	0.518435
Electrical safety	24	5	4-5	4.88	0.337832
Data storage	24	5	4-5	4.75	0.53161
Annotations of EEG recording	23	5	4-5	4.52	0.845822

Abstract

Introduction: Paediatric Epilepsy surgery in the UK has recently been centralised in order to improve expertise and quality of service available to children. Video EEG monitoring or telemetry is a highly specialised and a crucial component of the pre-surgical evaluation. Although many Epilepsy Monitoring Units work to certain standards, there is no national or international guideline for paediatric video telemetry.

Method: Due to lack of evidence we used a modified Delphi process utilizing the clinical and academic expertise of the clinical neurophysiology sub-specialty group of Children's Epilepsy Surgical Service (CESS) centres in England and Wales. This process consisted of the following stages I: Identification of the consensus working group, II: Identification of key areas for guidelines, III: Consensus practice points and IV: Final review. Statements that gained consensus (median score of either 4 or 5 using a five-point Likert-type scale) were included in the guideline.

Results: Two rounds of feedback and amendments were undertaken. The consensus guidelines includes the following topics: referral pathways, neurophysiological equipment standards, standards of recording techniques, with specific emphasis on safety of video EEG monitoring both with and without drug withdrawal, a protocol for testing patient's behaviours, data storage and guidelines for writing factual reports and conclusions. All statements developed received a median score of 5 and were adopted by the group.

Conclusion: Using a modified Delphi process we were able to develop a universally-accepted video EEG guidelines for the UK CESS. Although these recommendations have been specifically developed for the pre-surgical evaluation of children with epilepsy, it is assumed that most components are transferable to any paediatric video EEG monitoring setting.

Highlights

- There is no national or international guideline for paediatric video telemetry.
- Due to lack of evidence a modified Delphi process was performed utilizing the clinical and academic expertise of the clinical neurophysiology sub-specialty group of Children's Epilepsy Surgical Service (CESS) in the England and Wales.
- The consensus guidelines include the following key areas: indications, referral pathway, recording techniques, methods of behavioural monitoring, safety, antiepileptic drug withdrawal policy, electrical safety, data storage, annotations of EEG recording.
- Although specifically developed for pre-surgical evaluation in children with epilepsy, guidelines are transferable to any hospital that undertakes paediatric video EEG monitoring.

Online only Supporting Information

Appendix I: Protocol for ictal testing.

6 y plus

Testing during seizure

Uncover, check camera view, look for

- Jerks, eye deviation, pallor, flushing, sweating, drooling.

Ictal testing

- Say patient's name.
- *What's happening / what do you feel?*
- *Lift arms.* First say only, if not reacting, show.
- *Where are you right now?*
- *Repeat and remember a word:* cat, ball, table
- *What is this?* Use test item from box.
- *What it is used for / what noise it makes?*
- *Do you remember the word I said?*
- *Can you count to 10 / read from a book.*

Postictal testing

- Did you know what just happened? Did you have a seizure / turn (use child's term for seizure)?
- What words did I tell you? What object did I show you?
- Check for weakness upper and lower limbs, both sides.
- What did you feel / see right before the event?
- Draw visual aura.
- Continue testing until the patient returns to normal.

Testing during seizure

Uncover, check camera view, look for

- Jerks, eye deviation, pallor, flushing, sweating, drooling.

Ictal testing

- Say patient's name.
- *Are you ok?*
- *Lift both arms like Superman / touch toy with right & left hand / clap* First say only, if not reacting, show.
- *Where is mum / dad? Where is your toy?*
- Repeat and remember a word: cat, ball, milk
- *What is this?* (Use test item from box)
- *What it is used for / what noise it makes*
- *Do you remember the words I said?*

Postictal testing

- Did you know what just happened? Did you have a seizure / turn (use child's term for seizure)?
- What word did I tell you? What object did I show you?
- Check for weakness upper and lower limbs, both sides.
- Draw visual aura.
- Continue testing until the patient returns to normal.

Appendix II: Guidelines for writing the factual report

The format of the report will vary amongst different hospitals, but the following is suggested:

- **Clinical summary:** diagnosis, clinical history (summarised from notes/telemetry pathway including birth history, developmental milestones, first seizure, previous and current seizure types and frequency, MRI and previous EEG results if known), family history, current medication, duration of monitoring, aim of monitoring, treatment changes, and number of captured events.
- **Interictal Findings,** including dominant frequencies on passive or voluntary eye closure, diffuse/focal abnormalities, asymmetries, sleep architecture, epileptiform discharges, and activation procedures (e.g. hyperventilation and photic stimulation if undertaken).
- **Seizure semiology:**
 - Description of all seizures types giving specific examples dates/times duration and file details and whether typical/habitual/stereotypical (with or without drug reduction).
 - Detailed description of clinical evolution, including EMG features at onset.
 - Any post-ictal features.
- **Ictal Findings:**
 - EEG: pre-ictal changes of background, initial electrographic change at seizure onset, evolution and spread of EEG features.
 - Post-ictal EEG features.

Appendix III: Guidelines for writing the clinical conclusion

- This is the responsibility of the Consultant Clinical Neurophysiologist (medical) or Consultant Paediatric Neurologist.
- Final report should be sent out within 3 weeks (in exceptional circumstances within 12 weeks) of patient discharge.
- The format of the report will vary amongst different hospitals, but the following is suggested:
 - Initial sentence including dates recorded, occurrence of seizures/events (types, frequency, habitual or not, spontaneously or after provocation/drug withdrawal).
 - Seizure semiology for each seizure type.
 - Ictal EEG changes including pre-ictal changes, EEG at onset, evolution of ictal EEG features, postictal EEG changes.
 - Interictal EEG phenomena, including posterior dominant rhythm, focal or diffuse abnormalities, sleep phenomena, epileptiform discharges, and any other abnormalities.
 - Conclusion, which puts findings into clinical context including a differential diagnosis (such as non-epileptic events, sleep related phenomena like arousals or hypnogogic / hypnopompic jerks, or cardiac events).

Appendix IV: Guidelines for writing the video EEG monitoring case presentation

All patients referred within CESS should be discussed in a multidisciplinary epilepsy surgery team meeting, unless perhaps there is unequivocal evidence from any of the pre-surgical evaluations that the patient is not a surgical candidate. Video EEG monitoring data is an important part of the decision making process and therefore the presentation has to be succinct, but at the same time comprehensible to the multidisciplinary team (MDT). If EEG points are contentious or unclear, they should be discussed in a Neurophysiology Department meeting prior to presentation.

The presentation may be done using slides or raw video EEG monitoring data but should include:

- Patient details, dates recorded, AED reduction, state of patient.
- Previous EEG results.
- Interictal EEG (awake and sleep if appropriate).
- Seizure semiology.
- Ictal EEG findings.
- Two or three summary slides.

If slides are used the following format is suggested (see also Appendix II, PPT template):

- Minimum number of slides to make the points. Maximum of 2 slides to a single point (only if particularly unexpected or contentious). Usual number of slides 10-20.
- Point of each slide should be clear and should be highlighted on EEG example. EEGs themselves should be sufficiently clear for the point to be obvious from a distance (i.e. back of the room). EEG slides should also carry an explanatory heading for members of the MDT not skilled in reading the signals themselves.
- Summary slides at the end should list only the main points and the opinion or conclusion should be stated unequivocally, even if this states that the results are "inconclusive".
- EEG slides should display the calibration mark or numerical settings.