Understanding EEG Indications and Reports: A Survey of NCHDs

Abstract
Since the discovery of EEG almost 150 years ago, it remains a valuable tool in the work-up of suspected epilepsy. However, EEG is not without its limitations and an understanding of the indications & how to interpret the findings is essential to avoid over-reliance on an investigation which can lead to misdiagnosis if inappropriately used. We conducted a survey of NCHDs to assess their level of understanding for EEG. Overall 45% (54/119) do not have a clear understanding of the indications for EEG associated with transient loss of consciousness, 5% (6/119) failed to correctly interpret a report & 6% (7/119) are unclear as to when an EEG should be ordered.

Introduction
Irish figures estimate that up to 36,000 individuals over the age of five years are affected by epilepsy and that these numbers are substantial. Neurology departments remain a limited resource. To achieve effective and cost-effective productivity requests must be appropriate and results of these correctly interpreted. For this reason, we questioned whether or not the NCHDs in our Institution understood the correct indications for EEG, with particular reference to seizure versus syncope and if they could sufficiently interpret certain reports.

Methods
A simple and brief three-stem questionnaire was developed. 179 questionnaires were distributed among the staff of the Hospital before scheduled teaching sessions between July and December 2010. Each question contained a common clinical scenario related to EEG.

Results
Question one involved a 17-year old girl who after a long period of standing, noticed buzzing in her ears and a blackness coming over her eyes. As she collapses, her friend catches her and notices she is pale and unresponsive. Once on the ground, she regains consciousness quickly and is not confused. The question asked was whether or not this girl should be referred for EEG.

Question two reported on a 25-year old man who while sitting at his desk in work, collapses. Witnesses notice he stiffens and develops rhythmic jerking of all four limbs. He becomes cyanosed and the episode lasts approximately 1 minute, with confusion afterwards. An EEG reports no seizure activity seen and NCHDs were asked if this meant he did not have a seizure. The final question related to an 80-year old woman admitted to hospital after a collapse and if she should have sufficient collateral is obtained. The answer to all three questions was no.

Discussion
Although small, our survey highlighted a number of issues. Although the majority of questions were answered correctly, a substantial number of NCHDs answered question one incorrectly. The focus was on seizure vs. syncope and if NCHDs could recognise pertinent facts which determined which was more likely. In this case, vasovagal syncope. Transient loss of consciousness is much more common than epilepsy, with almost 1 in 2 people suffering a blackout at some stage in life. The ability to recognise the clinical features suggestive of vasovagal syncope was crucial in order to answer this question correctly. These were standing, buzzing, blueing, past, recovers consciousness quickly and not confused afterwards. Clinical signs suggestive of a seizure were limb jerks. Despite clues in favour of syncope, the confounding factor was the limb jerking. TLoC as a cause may lead to a period of cerebral hypoperfusion and this can manifest as seizure-like activity e.g. myoclonic jerking of the limbs. A videometric analysis of 56 healthy individuals with induced syncope illustrates this point. 90% of patients who collapsed with a loss of consciousness displayed myoclonic jerking; 79% had additional features such as head turns, automatisms, righting movements and 60% reported either visual or auditory hallucinations. An EEG is not warranted under the circumstances of question one. NICE advise an EEG should be performed only to support a diagnosis of epilepsy in adults whom the clinical history suggests that the seizure is likely epileptiform in origin. These guidelines also state an EEG should not be performed in the case of probable syncope because of the possibility of a false-positive result.

Question two addressed the interpretation of EEG reports. No seizure activity does not equal to No seizure. An audit by NICE of referring doctors believed EEG could diagnose or exclude epilepsy. An EEG has a relatively high specificity (78-98%), but low sensitivity (25-56%) which means a normal EEG may have particular features such as head turns, automatism, righting movements and 60% reported either visual or auditory hallucinations. An EEG is not warranted under the circumstances of question one. NICE advise an EEG should be performed only to support a diagnosis of epilepsy in adults whom the clinical history suggests that the seizure is likely epileptiform in origin. These guidelines also state an EEG should not be performed in the case of probable syncope because of the possibility of a false-positive result.

Finally, question three focused on when an EEG should be requested. In the event of a transient loss of consciousness, every attempt should be made to obtain a clear history from the patient & any witnesses. If epilepsy is strongly suspected from initial observations then an EEG can be useful. Additional indications for EEG include impaired consciousness which can be contributing or the patient is in a non-convulsive status epilepticus. EEG may also demonstrate a functional abnormality, when imaging is non-contributory & certain encephalopathies may have particular features on EEG.

Discussion
The more frequent a question is repeated, the more likely an IED will be captured and from this, the number of IEDs may be predictive of seizure recurrence procedures such as hyperventilation, photic stimulation and sleep deprivation exist to improve inter-ictal yield. However, up to 10% of individuals with epilepsy may never have an abnormal inter-ictal EEG.

References
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