American Clinical Neurophysiology Society

Guideline 7: Guidelines for Writing EEG Reports[1]

These guidelines are not meant to represent rigid rules but only a general guide for reporting EEGs. They are intended to apply to standard EEG recordings rather than to special procedures. When reporting on more specialized types of records (e.g., neonatal records, records for suspected electrocerebral silence), description of technical details should be more complete than in the case of standard recordings. However, if the technique used is the one recommended for those special procedures in the "Guidelines in EEG," (ACNS, 2006), a sentence to that effect should be sufficient (Guidelines 1, "Minimum Technical Requirements (MTR) for Performing Clinical EEG"; 2, "Minimal Technical Standards for Pediatric Electroencephalography"; and 3, "Minimum Technical Standards for EEG Recording in Suspected Cerebral Death" .

1. *The printed forms or templates for reporting EEGs should provide for a minimum of information about the patient, which could be copied from the Basic Data Sheet (Guideline 1, Sec.3.2) by the person who enters the report. It should be, therefore, unnecessary for the electroencephalographer to repeat in the report the age, sex, etc., of the patient. However, in order to avoid confusion, the name of the patient and the EEG identification number should be included.*

2. *The report of an EEG should consist of three principal parts. (A) Introduction, (B) Description of the record, and (C) Interpretation, including (a) impression regarding its normality or degree of abnormality, and (b) correlation of the EEG findings with the clinical picture.*

3. Introduction. *The introduction should start with a statement of the kind of preparation the patient had, if any, for the recording session.*

The initial sentence should state whether the patient received any medication or other preparation, such as sleep deprivation, as well as the patient's state of consciousness at the onset of the record. If the patient was fasting, this should be stated. Any medication that could influence the EEG should be included in the electroencephalographer's report, whether it is a regular medication that the patient is receiving or specifically administered for the recording. If the number of electrodes used is not the standard 21 of the 10-20 System or if monitoring of other physiologic parameters is used, this should be stated in the introduction. Reporting the total recording time is also advisable if for some special reason this is significantly shorter or longer than recommended in the American Clinical Neurophysiology Society (ACNS) (Guideline 1, Sec. 3.9).

4. Description. *The description of the EEG should include all the characteristics of the record, both normal and abnormal, presented in an objective way, avoiding as much as possible, judgment about their significance.*

[1] This topic was previously published as Guideline 8.

The aim is to produce a complete and objective report that would allow another electroencephalographer to arrive at a conclusion concerning the normality or degree of abnormality of the record from the written report, without the benefit of looking at the EEG. This conclusion could conceivably be different from that of the original interpreter, since it is by necessity a subjective one.

The description should start with the background activity,[2] beginning with the dominant activity, its frequency, quantity (persistent, intermittent), location, amplitude, symmetry or asymmetry, and whether it is rhythmic or irregular. The frequency should be given preferably in Hertz or cycles per second. For the purpose of standardizing the report, while recognizing that any decision on this point must be arbitrary, it is recommended that the amplitude of this activity be determined in derivations employing adjacent scalp electrodes placed according to the 10-20 System. It is desirable but not mandatory that the estimated mean amplitude be given in microvolts. This will obviate the need for defining terms such as "low," "medium," and "high."

Enumeration of nondominant activities with their frequency, quantity, amplitude, location, symmetry or asymmetry, and rhythmicity or lack of it should follow, using the same units as for the dominant frequency.

Response to opening and closing eyes as well as to purposeful movement of the extremities when appropriate, should then be described. The response should be described as symmetric or asymmetric, complete or incomplete, sustained or unsustained.

Abnormal records, infants' records, or records limited to sleep may not have clearly dominant frequencies. In those cases, the different activities with their amplitude, frequency, etc., should be described, in any order. When the record shows a marked inter-hemispheric asymmetry, the characteristics of each hemisphere should be described separately (i.e., dominant, nondominant frequency, etc., of one hemisphere first, followed by those of the other).

The description of the background activity should be followed by description of the abnormalities that do not form part of this background activity. This should include a description of the type (spikes, sharp waves, slow waves), distribution (diffuse or focal), topography or location, symmetry, synchrony (intra- and interhemispheric), amplitude, timing (continuous, intermittent, episodic, or paroxysmal), and quantity of the abnormal patterns. Quantity has to be expressed in a subjective fashion, since in clinical, unaided interpretation of the EEG, no exact quantities or ratios can be given.

When the abnormality is episodic, attention should be given to the presence or absence of periodicity[3] between episodes and to the rhythmicity or irregularity of the pattern within each episode. The range of duration of the episodes should be given.

In the description of activation procedures, a statement should be included pertaining to their quality (e.g., good, fair, or poor hyperventilation, duration of sleep, and stages attained). The type of photic stimulation used (i.e., stepwise or glissando) should be stated and the range of frequencies given. Effects of hyperventilation and photic stimulation should be described, including normal and abnormal responses. If hyperventilation or photic stimulation is not done, the reason for this omission should be given. If referring clinicians know that these procedures are used routinely, they may expect results even if they have not been specifically requested.

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[2] The term "background activity" is used here as defined by the International Federation of Clinical Neurophysiology (IFCN) Committee on Terminology (Chatrian GE, et al: A glossary of terms most commonly used by clinical electroencephalographers. *Electroencephalogr Clin Neurophysiol* 1974;37:538-48).

[3] For definition of "periodic" see Chatrian GE, et al. quoted in footnote 1. Acceptance 2 applies in this instance.

There is no point in including in the description the absence of certain characteristics, except for the lack of normal features, such as low-voltage fast frequencies, sleep spindles, etc. Phrases such as "No focal abnormality" or "No epileptiform abnormality" have a place in the impression when the clinician has asked for it either explicitly or implicitly in the request form. They have no place in the description.

Artifacts should be mentioned only when they are questionable and could represent cerebral activity, when they are unusual or excessive (eye movements, muscle) and interfere with the interpretation of the record, or when they may provide valuable diagnostic information (e.g., myokymia, nystagmus, etc.)

5. Interpretation.

(a) Impression. *The impression is the interpreter's subjective statement about the normality or abnormality of the record.* The description of the record is directed primarily to the electroencephalographer who writes it for review at a later date, or to another expert, and should be detailed and objective. The impression, on the other hand, is primarily written for the referring clinician and should, therefore, be as succinct as possible. Most clinicians know that their information will not significantly increase by reading the detailed description, and hence limit themselves to reading the impression. If this is too long and seemingly irrelevant to the clinical picture, the clinician will lose interest and the report of the record becomes less useful.

If the record is considered abnormal, it is desirable to grade the abnormality in order to facilitate comparison between successive records for the person who receives the report. Since this part of the report is largely subjective, the grading will vary from laboratory to laboratory, but the different grades should be properly defined and the definitions consistently adhered to in any given laboratory.

After the statement regarding normality or degree of abnormality of the record, the reasons upon which the conclusion is based should be briefly listed. When dealing with several types of abnormal features, the list should be limited to the two or three main ones; the most characteristic of the record. If all the abnormalities are enumerated again in the impression, the more important ones become diluted and emphasis is lost. If previous EEGs are available, comparison with previous tracings should be included.

(b) Clinical correlation. *The clinical correlation should be an attempt to explain how the EEG findings fit (or do not fit) the total clinical picture. This explanation should vary, depending on to whom it is addressed. More careful wording is necessary if the recipient is not versed in EEG or neurology.*

If an EEG is abnormal it is *indicative* of cerebral dysfunction, since EEG is a manifestation of cerebral function. However, the phrase "cerebral dysfunction" may sound too strong to some and it should be used only when the abnormality is more than mild and when enough clinical information is available to make the statement realistic within the clinical context. Otherwise, a sentence like, "The record indicates minor irregularities in cerebral function," may be appropriate.

Certain types of EEG patterns are *suggestive* of more or less specific clinical entities; a delta focus may suggest a structural lesion in the proper clinical context; certain types of spikes or sharp waves suggest potential epileptogenesis. If the EEG abnormality fits the clinical information containing the diagnosis or the suspicion of the presence of a given condition, it may be stated that the EEG finding is *consistent* with or supportive of the diagnosis.

In EEG reports, the term "compatible with" is frequently found. Strictly speaking, any EEG is compatible with practically any clinical picture. Therefore, the term is not helpful and should not be used.

In cases in which the EEG is strongly suggestive of a certain condition that is not mentioned in the clinical history, it is prudent to mention the fact that such EEG abnormalities are frequently found in association with the clinical condition but are not necessarily indicative of it.

An EEG can be said to be *diagnostic* of a certain condition only in the rare cases in which there is a clinical manifestation present at the time of the recording of an EEG and the record shows an electrical abnormality known to be generally associated with the specific clinical manifestation. Such a case would be one in which a patient presents a typical absence concomitant with a bilaterally synchronous 3/s spike-and-wave burst.

In situations in which the diagnostic clinical impression seems at odds with the EEG findings, some possible reasons for the apparent discrepancy should be offered in the EEG report. These reasons should be presented cautiously, trying to avoid any impression of criticism of the clinical diagnosis, or to appear apologetic for an apparent failure of the EEG as a supplemental diagnostic test.

If an EEG is abnormal, but the abnormal features could be produced, at least in part by medication or other therapeutic interventions such as recent electroconvulsive treatment, it should be so stated.

Under no circumstances should the electroencephalographer suggest changes in medication or other clinical approaches. However, the clinical correlation statement could be followed by a recommendation pertaining to further EEGs with different added procedures, e.g., "In view of the clinical picture a sleep record could be useful," or "Since the record was taken shortly after a clinical seizure, a follow-up EEG may be helpful in determining whether the slow wave focus present in this record is of permanent or of only transitory nature."

A normal record does not, in general, require further explanation. However, when the clinical information suggests a serious question between two conditions, such as hysteria and epilepsy, a statement should be added that might prevent the clinician from jumping to a wrong conclusion. Such a statement could be: "A normal record does not rule out epilepsy. If the clinical picture warrants, a recording with (some type of activation) may be helpful."

Digital recording, reporting, and report transmission often make it feasible to incorporate brief samples of the actual recording, and under such circumstances including examples of abnormalities is desirable.

