FORM 142

Health Professions Council of South Africa

HEALTH PROFESSIONS COUNCIL OF SOUTH AFRICA

THE PROFESSIONAL BOARD FOR RADIOGRAPHY AND CLINICAL TECHNOLOGY

GUIDELINES FOR THE TRAINING OF EEG TECHNICIANS

EEG TECHNICIANS
TRAINING REQUIREMENTS AND GUIDELINES FOR ACCREDITATION

GENERAL INFORMATION

JOB DESCRIPTION: EEG TECHNICIAN

The term EEG technician is used to describe the basic grade of operation in this field. An EEG technician is defined as a person who is capable of carrying out routine EEG recordings without direct supervision but not in independent private practice. Routine procedures include photic stimulation, hyperventilation and daytime sleep.

REQUIREMENTS FOR ADMISSION TO TRAINING

The minimum requirement is a Senior Certificate or recognised equivalent qualification. Successful completion of examinations at this level in biology and/or physical science and/or mathematics is desirable but not essential.

STUDENT REGISTRATION

Student - EEG Technicians must register with Council by submitting the application form for registration as a student together with the registration fee and required documentation at the commencement with training.

Registration for the full period of training is mandatory for entry to the examination.

PLACEMENT FOR CLINICAL TRAINING

All trainees should be placed at HPCSA-accredited units for the duration of the training.

EXAMINATIONS

The Education Committee of the Professional Board will appoint a moderator and examiner for the examination for EEG technicians on an annual basis. A national examination paper will be drawn up by the examiner and moderator for the annual theoretical and practical examinations to be conducted once per year for trainee EEG technicians.

Training units are required to notify the Professional Board by 1 October annually (closing date for the examination) if candidates are eligible for the examination. Applications for registration for the examination must be accompanied by a letter from the training unit indicating that the unit is currently registered as a training unit and complies with all the requirements for the training of EEG technicians. In the letter the model of equipment currently being used, the name of the clinical tutors in the unit as well as patient numbers during the period in question should also be stated as well as confirmation that the student had received training and supervision on a regular basis.

Applicants will not retain credit for papers passed during previous examinations. Both the theoretical and practical examination <u>have to be passed during the same examination period.</u>

The letter of the Professional Board in which arrangements regarding the examination are reflected together with the examination fee determined by the Board should reach the Registrar at least two weeks before the examination. Alternatively a copy of the letter referred to above together with a copy of the bank deposit slip indicating that the examination fee was deposited into the Council's bank account number 0610-000-169 at any branch of ABSA Bank may be faxed to 012-338 3955 for attention of the Examination Coordinator at the Education and Training Division.

GUIDELINES FOR ACCREDITATION OF EEG TRAINING UNITS

APPLICATIONS FOR ACCREDITATION

Units interested in training EEG Technicians must apply in writing to the Professional Board via the Education and Training Division. An application for accreditation must include the names and registration numbers of training staff, an indication of the available equipment and infrastructure, patient numbers, three EEG recordings recorded during the preceding six months as well as an undertaking that training will comply with the guidelines set out in this document.

An EEG unit must use standard EEG equipment and perform EEG's to currently accepted international standards, such as those advocated in the Minimum Technical Requirements for Performing Clinical Electroencephalography of the American EEG Society, provided that the following criteria are met:

PERSONNEL STRUCTURE OF THE UNIT:

A trainee technician must work under the direct supervision of:

1. A Graduate Clinical Technologist/Clinical Technologist registered with the Professional Board in the category Neurophysiology and employed on a **full -time** basis by the Unit;

   or

2. An EEG Technician registered with the Professional Board in that capacity for at least two years, employed on a **full-time** basis by the Unit.

No more than two students should be permitted per registered clinical technologist or technician as set out in 1 and 2 above.

PATIENT POPULATION AND NUMBERS

The unit should serve both adult and paediatric populations and patient numbers should be such that the trainee is able to personally record no less than 400 EEGs during the one-year training period. The 400 EEGs recorded should include the personal recording by the trainee of at least 10 ICU cases and 50 "sleep" recordings using stick-on cup electrodes. These may be recorded in the unit or under direct supervision, in another unit accredited by the Professional Board as a training unit for EEG Technicians or Clinical Technologists in Neurophysiology.

TRAINING SYLLABUS AND EXAMINATION

The Training Unit must follow the National approved syllabus contained in this document.

CLINICAL TRAINING

Theoretical instruction must take place by means of informal lectures or formal training courses.

Registration for the full period of clinical training is mandatory for entry to the examination.

At the end of the 12-month training period the trainee EEG technician shall apply in writing to the Professional Board for permission to do a final examination. This application must be accompanied by a report from the supervising Technologist/Technician confirming that the applicant complies with the training requirements.

The final examination must include a theoretical and a practical examination conducted by the Professional Board. The moderator has to moderate the examination papers prior to the examination to ensure that the entire content of the syllabus is covered.

Once the individual answer sheets have been moderated final marks expressed as a percentage for both the theoretical and the practical examinations will be made available by the Professional Board. Successful applicants will be registered as EEG technicians. A pass mark of 50% is required for both the theoretical and practical examinations.

The Education and Training Division will supply further information on receipt of written requests.

COMMUNICATION WITH THE PROFESSIONAL BOARD FOR RADIOGRAPHY AND CLINICAL TECHNOLOGY

All communication should be addressed to:

The Registrar
Core Operations: Education and Training Division
P O Box 205
PRETORIA
0001

E-mail: RCTexaminations@hpcsa.co.za
Telephone: 012 338-3955

PROFESSIONAL BOARD FOR RADIOGRAPHY AND CLINICAL TECHNOLOGY
SYLLABUS FOR EEG TECHNICIANS

1.	**TECHNICAL SCIENCES**	**REFERENCE**
1.1	ELECTRICAL CONCEPTS Atoms and molecules, conduction and insulation, voltage, current, resistance, power, Ohm's Law, capacitance and inductance, DC and AC, ions, impedance, magnetism and electricity, measurement units, meters, transformers.	TKM Chap 5
1.2	THE EEGph	
1.2.1	Introduction to the EEGph - basic concepts.	TKM Chap 2
1.2.2	The Differential Amplifier - basic concepts, tubes and transistors, power supply, input impedance, common mode rejection, input I and output II, polarity.	TKM Chap 5
1.2.3	Filters - low frequency filters, (time constants), high frequency filters, frequency response, 50 Hz (notch) filter phase shift, use of controls.	TKM Chap 8
1.2.4	Sensitivity • individual and master controls, dynamic range, use of controls.	TKM Chap 8
1.2.5	Calibration • instrument calibration • bio-calibration	TKM Chap 9
1.2.6	Paper speed	TKM Chap 8
1.2.7	Writing mechanisms	
1.3	**RECORDING TECHNIQUE**	
1.3.1	ELECTRODES • types, characteristics, materials • methods of application (including scalp preparation) • impedance and resistance • effects of repeated EEG recordings • sterilisation • maintenance and infection control.	TKM Chap 10
1.3.2	THE 10- 20 SYSTEM • measurement and placement • caps	TKM Chap 11
1.3.3	POLARITY AND LOCALISATION TECHNIQUES • polarity convention • bipolar and referential recording	TKM Chap 13
1.3.4	Montages	TKM Chap 12
1.4	PATIENT GROUNDING AND ELECTRICAL SAFETY • earth loops • physiological effects of shocks	TKM Chap 6

	• safety precautions	
1.5	FAULT-FINDING AND MAINTENANCE	EEGph Manufacturers Handbook
1.6	MEASUREMENT AND DEFINITION OF EEG CONCEPTS • voltage, frequency, waveform • definition of basic clinical concepts	TKM Chap 14
2.	**CLINICAL SCIENCES**	**REFERENCE**
2.1	NEUROANATOMY	Draper
2.1.1	Central Nervous System • structure of the brain and cerebral hemispheres, crossed laterality. • the brainstem, cranial nerves, cerebellum and spinal cord.	
2.1.2	Blood supply	
2.1.3	Ventricles and CSF Flow	
2.1.4	Autonomic Nervous System	
2.2	NEUROPHYSIOLOGY	Draper
2.2.1	The action potential and neuronal transmission	
2.2.2	Transmission at the synapse.	
2.2.3	Excitation and inhibition.	
2.2.4	The relationship between neuronal activity and EEG.	
2.3	INTRODUCTION TO NEUROLOGY	Draper
2.3.1	Neurological Examination.	
2.3.2	An introduction to disease states affecting the CNS. • genetic and congenital, traumatic, vascular, infective, tumors, degenerative, metabolic and toxic, immunological.	
2.3.3	Epilepsy	
2.4	BASIC EMERGENCY PROCEDURES	
2.4.1	Cardiopulmonary resuscitation.	Any First-Aid Manual
2.4.2	Seizures - Patient and EEGph management	CJ Chap 12
3.	**CLINICAL EEG**	**REFERENCE**
3.1	INTRODUCTION	
3.1.1	Historical introduction	AJET (1984), 24, 133-173 JET (1981), 7, 58-66
3.1.2	Normal: awake and asleep	TKM Chap 14
3.1.3	Abnormal: awake and asleep	TKM Chap 14
3.2	ARTEFACTS Sources and elimination	TKM Chap 16
3.3	PHARMACOLOGY AND DRUG EFFECTS	CJ Chap 7
3.4	STANDARDS FOR PERFORMING CLINICAL EEGphy	CJ Chap 3
3.5	ACTIVATION AND SPECIAL PROCEDURES	TKM Chap 15
3.6	CLINICAL CORRELATIONS	
3.6.1	Epilepsy • International classification • EEG findings	KMO Chap 5
3.6.2	Head injuries and vascular lesions.	KMO Chap 7
3.6.3	Space-occupying lesions.	KMO Chap 6

3.6.4	Infective and non-infective encephalopathies.	KMO Chap 8
3.6.5	Psychiatric disorders.	KMO Chap 9
3.6.6	Sleep disorders	KMO Chap 10

BASIC REFERENCES

AJET:
American Journal of EEG Technology

ASET:
American Society of EEG Technologists (Publications)

CJ:
Clenney S L and Johnson S M
Back to Basics: A handbook of EEG Technology,
Anaheim, California, Beckman Instruments (1983).

Draper I T
Lecture Notes on Neurology
London, Blackwell Scientific Publications (1980)

JET:
Journal of Electrophysiological Technology

KMO:
Kiloh L G, McComas A J and Osselton J W
Clinical Electroencephalography
London, Butterworths (1972).

TKM:
Tyner F S, Knott J R and Mayer W B
Fudamentals of EEG Technology (Vol 1 - Basic Concepts and Methods).
New York, Raven Press (1983)

No R245 11 February 1994

HEALTH PROFESSIONS COUNCIL OF SOUTH AFRICAN

REGULATIONS DEFINING THE SCOPE OF THE PROFESSION OF ELECTROENCE-PHALOGRAPHIC TECHNICIAN

The Minister of National Health and Welfare has, in terms of section 33(1) of the Medical, Dental and Supplementary Health Service Professions Act, 1974 (Act 56 of 1974), on the recommen-dation of the South African Medical and Dental Council, made the regulations set out in the Schedule hereto.

SCHEDULE

1. In these regulations "the Act" means the Medical, Dental and Supplementary Health Service Professions Act, 1974 (Act No 56 of 1974), and any expression to which a meaning has been assigned in the Act shall bear such meaning and unless the context otherwise indicates -

"clinical technologist" means a clinical technologist registered in the category neurophysiology.

2. The following acts, known as standard electroencephalographic recordings, are hereby specified for the purposes of the Act to be acts that pertain specially to the profession of electroencephalographic technician:

(1) The recording of a summary of the patient's clinical history.

(2) The attaching of electrodes to the scalp of the patient according to standards acceptable to the profession.

(3) The recording of an electroencephalo-gram for a period prescribed by a medical practitioner or clinical technologist using appropriate paper speeds, amplification, time constants and filters.

(4) The utilisation of hyperventilation, photic stimulation and sleep as routine activating procedures in the recording of the electroencephalogram, if prescribed by a medical practitioner or clinical technologist.

No R245 11 Februarie 1994

RAAD VIR GESONDHEIDSBEROEPE VAN SUID-AFRIKA

REGULASIES WAT DIE OMVANG VAN DIE BEROEP ELEKTROëNKEFALOGRAFIE TEGNIKUS OMSKRYF

Die Minister van Nasionale Gesondheid en Welsyn het kragtens artikel 33(1) van die Wet op Geneeshere, Tandartse en Aanvullende Gesondheidsdiensberoepe 1974 (Wet 56 van 1974), op aanbeveling van die Suid-Afrikaanse Geneeskundige en Tandheelkundige Raad, die regulasies in die Bylae uiteengesit, uitgevaardig.

BYLAE

1. In hierdie regulasies beteken "die Wet" die Wet op Geneeshere, Tandartse en Aanvullende Gesondheidsdiensberoepe, 1974 (Wet No 56 van 1974), en het 'n uitdrukking waaraan 'n betekenis in die Wet geheg is daardie betekenis, en, tensy uit die samehang anders blyk, beteken -

"kliniese tegnoloog" 'n kliniese tegnoloog wat in die kategorie neurofisiologie geregistreer is.

2. Die volgende handelinge wat bekend staan as standaard elektroënkefalografieop-names, word hierby bepaal as handelinge wat vir die toepassing van die Wet geag word handelinge te wees wat by die beroep van elektroënkefalografietegnikus tuishoort:

(1) Die dokumentering van 'n opsomming van die pasiënt se kliniese geskiedenis.

(2) Die plasing van elektrodes op die skedel van die pasiënt volgens standaarde wat in die beroep aanvaarbaar is.

(3) Die neem van 'n elektroënkefalogram vir 'n tydperk wat 'n geneesheer of kliniese tegnoloog voorskryf deur die gebruik van toepaslike papierspoed, versterking, tydkonstantes en filters.

(4) Die gebruikmaking van hiperventilasie, fotiese stimulasie en slaap as roetineaktiverings-prosedures by die neem van die elektroënkefalo-gram, indien voorgeskryf deur 'n geneesheer of kliniese tegnoloog.

Journal of Clinical Neurophysiology
11(1):2-5. Raven Press, Ltd, New York

Guideline One: Minimum Technical Requirements for Performing Clinical Electroencephalography

INTRODUCTION

Although no single best method exists for recording EEGs under all circumstances, the following standards are considered the minimum for the usual clinical recording of EEGs in all age groups except the very young (see Guideline Two: Minimum Technical Standards for Paediatric Electro-encephalography).

Recording at minimum standards should not give pride to the EEG department working at this level and cannot ensure a satisfactory test. Minimum standards provide barely adequate fulfilment of responsibilities to the patient and the referring physician.

To the minimum standards have been added recommendations to improve standardization of procedures and also facilitate interchange of recordings and assessment among laboratories in North America.

1. Equipment

1.1 To find the distribution of EEG activity, it is necessary to record simultaneously from as many regions of the scalp as possible. When too few channels are used simultaneously, the chances of interpretive errors increase, and, conversely, when more channels are utilized, the likelihood of such errors decreases. This is particularly true for transient activity.

Eight channels of simultaneous recording are the minimum number required to show the areas producing most normal and abnormal EEG patterns, and 16 channels are now found to be necessary by most laboratories. Additional channels are often needed for monitoring other physiologic activities.

1.2 Alternating current (AC) wiring should meet the Underwriters Laboratories standards required for hospital service. Adequate grounding of the instrument must be provided by all AC receptacles. All equipment in each patient area in the EEG laboratory must be grounded to a common point.

1.3 In the usual clinical setting, electrical shielding of the patient and equipment is not necessary, and such shielding need not be installed unless proven necessary.

1.4 Ancillary equipment should include a device for delivering rhythmic, high-intensity flash stimuli to the patient.

2. Electrodes

2.1 Recording electrodes should be free of inherent noise and drift. They should not significantly attenuate signals between 0.5 and 70 Hz. Experimental evidence suggests that silver-silver chloride or gold disk electrodes held on by collodion are the best, but other electrode materials and electrode pastes have been effectively used especially with contemporary amplifiers having high input impedances. High-quality electrodes are available from several manufacturers and are generally preferable to homemade electrodes.

To decrease noise, electrodes must be kept clean, with appropriate precautions taken after recording from patients with contagious diseases (viral hepatitis, Creutzfeldt-Jakob disease, acquired immunodeficiency syndrome) (AEEGS, 1984).

2.2 Needle electrodes are not recommended. If circumstances necessitate their use, they must be completely sterilized, and the technologist who employs them should have been taught the exact techniques, as well as the disadvantages and hazards, of their use. Parallel anteroposterior alignment of the needles is important; misalignment may cause artifactual amplitude asymmetries or distortions.

It is rarely appreciated that proper use of needle electrodes requires more care and expertise than for any other type of electrode. However, needle electrodes can be effectively utilized in comatose patients, in whom pain responses are usually minimal or absent, and who are in medical settings requiring efficient recording with a minimum of delay.

2.3 All 21 electrodes and placements recommend by the International Federation of Societies for EEG and Clinical Neurophysiology (Jasper HH, 1958,1983) should be used. The 10-20 System is the only one officially recommended by the International Federation of Societies for EEG and Clinical Neurophysiology. It is the most commonly used existing system, and it should be used universally. The use of the term "modified 10-20 System" is undesirable when it means that head measurements have not been made and placements have been estimated. In this case, the term "estimated 10-20 placement" is more appropriate. (For neonates, refer to Guideline Two.)

An adequate number of electrodes is essential to ensure that EEG activity having a small area of representation on the scalp is recorded and to analyse accurately the distribution of more diffuse activity. Occasionally, additional electrodes, placed between or below those representing the standard placements, are needed in order to record very localized activity.

A grounding electrode always should be used, except in situations (e.g. intensive care units, operating rooms) in which other electrical equipment is attached to the patient. In such cases, double grounding must be avoided.

2.4 Interelectrode impedances should be checked as a routine prerecording procedure. Ordinarily, electrode impedance should not exceed 5 kohms.

Electrode impedances should be rechecked during the recording when any pattern that might be artifactual appears.

3. Recordings

3.1 Montages should be designed in conformity with Guideline Seven: A Proposal for Standard Montages to Be Used in Clinical Electroencephalography. It is desirable that at least some montages in all laboratories be uniform to facilitate communication and comparison.

3.2 The record should have written on it as a minimum the name and age of the patient, the date of the recording, an identification number, and the name or initials of the technologist.

Identifications should be made at the time of recording. Failure to do so may result in errors that have adverse medical and legal consequences. A Basic Data Sheet, attached to every record, should include the time of the recording, the time and date of the last seizure (if any), the behavioural state of the patient, a list of all medications that the patient has been taking, including premedication given to induce sleep during EEG, and any relevant additional medical history.

3.3 Appropriate square-wave calibrations should be made at the beginning and end of every EEG recording. A recording with all channels connected to the same pair of electrodes should follow at the beginning (biologic calibration). At the outset, all channels should be adjusted, if necessary, so that they respond equally and correctly to the calibration signal. When doubt as to correct functioning of any amplifier exists, a repeat calibration run should be made.

The calibration is an integral part of every EEG recording. It gives a scaling factor for the interpreter, and tests the EEG machine for sensitivity, high- and low-frequency response, noise level, and pen alignment and damping. It also gives information about the competence and care of the technologist. Calibration voltages must be appropriate for the sensitivities used.

In addition to the standard square-wave calibration, a biologic calibration ("bio-cal") may at times be of additional help in detecting errors in the montage selection process or in the pen-writing mechanism. For this purpose, an anteroposterior (fronto-occipital) derivation should be used, since it can include fast and alpha range patterns as well as eye movement activity in the delta range.

3.4 The sensitivity of the EEG equipment for routine recording should be set in the range of 5-10 μV/mm of pen deflection.

Sensitivity is defined as the ratio of input voltage to pen deflection. It is expressed in microvolts per millimeter (μV/mm). A commonly used sensitivity is 7 μV/mm, which,

for a calibration signal of 50 μV, results in a deflection of 7.1 mm.

If the sensitivity is decreased (for example, from 7 to 10 μV/mm), the amplitude of the writeout of a given EEG on the paper also decreases. Conversely, if the sensitivity is increased (for example, from 7 to 5 μV/ mm), the amplitude of the writeout of a given EEG increases,

When the sensitivity is less than 10 μV/mm (for example, 20 μV/mm), significant low-amplitude activity may become indiscernible. If the sensitivity is greater than 5 μV/mm (for example, 3μV/mm), normal EEG activity may overload the system, causing a squaring off of the peaks of the writeout onto the paper.

Note that a sensitivity of 5 μV/mm means that, to obtain a pen deflection of I mm, a 5-μV input voltage is required (and correspondingly, to obtain a 10-mm deflection, an input of 50 μV is required). If the sensitivity is decreased to 10 μV/mm, the same I -mm pen deflection now requires a larger input, i.e., 10 μV rather than 5 μV (and correspondingly, a 10-mm pen deflection now requires an input of 100 μV rather than 50 μV). Thus, as the sensitivity is increased, its numerical value becomes smaller. Conversely, as the sensitivity is decreased, its numerical value becomes larger. This perhaps seemingly paradoxical relationship is actually a logical consequence of the definition of sensitivity as input voltage per unit of pen deflection.

During calibration for routine recordings, the recorded signals should not be distorted but should be large enough to permit measurement to better than ±5% between any of the signals on the different channels.

No matter which sensitivity (within the above limits) is chosen prior to the recording, appropriate adjustments should be made whenever EEG activity encountered is of too high or low amplitude to be recorded properly.

3.5 For standard recordings, the low-frequency filter should be no higher than 1 Hz (-3 dB) corresponding to a time constant of at least 0.16 s. The high-frequency filter should be no lower than 70 Hz (-3 dB).

A low-frequency filter setting higher than 1 Hz should not be used routinely to attenuate slow-wave artifacts in the record. Vital information may be lost when pathologic activity in the delta range is present. Similarly, a setting lower than 70 Hz for the high frequency filters can distort or attenuate spikes and other pathologic discharges into unrecognizable forms and can cause muscle artifact to resemble spikes. Production of a record with lost or inaccurate information is poor medical practice.

It must be emphasized, however, that judicious use of the low- or high-frequency filters-with appropriate annotation on the record-can emphasize or clarify certain types of patterns in the record. These filter controls, therefore, should be used selectively and carefully.

3.6 The 60-Hz (notch) filter can distort or attenuate spikes; it therefore should be used only when other measures against 60 Hz interference fail.

3.7 A paper speed of 3 cm/s should be utilized for routine recordings. A paper speed of 1.5 cm/s is sometimes used for EEG recordings in newborns, during polysomnograms, or in other special situations.

3.8 When instrument settings (sensitivities, filters, paper speed, montage) are changed during the recording, the settings should be clearly identified on the record at the time of the change. The final calibration(s) should include each sensitivity and filter settings used in the recording, and should include calibration voltages appropriate to the sensitivities actually used. It is especially important to record calibration signals at very high sensitivities when these settings have been used.

3.9 The baseline record should contain at least 20 min of technically satisfactory recording. Longer recordings are often more informative.

The EEG is a short sample in time from the patient's life. Within reasonable limits, the longer the recording, the better the chance of recording an abnormality or abnormalities demonstrating the variability of these.

Experience in many centres shows that a very minimum of 20 min of artefact-free recording is necessary to assess baseline waking EEG activity. The addition of photic stimulation, hyperventilation, and especially sleep-which should be recorded whenever possible-often requires an increase of recording time.

3.10 The recordings should include periods, when the eyes are open and when they are closed.

Proper EEG recordings require examining the effect of stimuli upon the EEG. A comparison between the eyes-open and eyes-closed condition constitutes one important means for assessment. Some rhythms can be masked by the alpha activity and are visible only when the alpha rhythm has been attenuated by eye-opening. Certain forms of eye movement may appear to be frontal delta or theta activity but eye-opening and closing helps in differentiation. Finally, paroxysmal activity may appear only when the eyes are opened or only when the eyes are closed or at the times these conditions change. Thus, failure to record with eye-opening and closing as a routine procedure can reduce chances of obtaining potentially important information. This procedure is so simple that it is unjustifiable not to request eye-opening and closure whenever patient cooperation permits, or to manually open and close the eyes when it does not.

3.11 Hyperventilation should be used routinely unless medical other justifiable reasons (e.g., a recent intracranial haemorrhage, significant cardiopulmonary disease, sickle cell disease or trait, or patient inability or unwillingness to cooperate) contraindicate it. It should be performed for a minimum of 3 min with continued recording for at least 1 min after cessation of overbreathing. At times, hyperventilation must be performed for a longer period in order to obtain adequate activation of the EEG. To evaluate the effects of this activation technique, at least 1 min of recording with the same montage should be obtained before overbreathing begins. The record should contain an assessment of the quality of patient effort during hyperventilation. It is often helpful to record electrocardiographic (ECG) activity directly on one EEG channel during this and other parts of the recording, particularly if spikes and sharp waves, or pulse or ECG artefact, are in question. With an additional (e.g., 17th) channel, the ECG can be monitored continuously.

3.12 Sleep recordings should be taken whenever possible but not to the exclusion of the waking record.

It is increasingly evident that considerable additional information can be obtained by recording during drowsiness and sleep. Some laboratories use sleep recording routinely. Sleep recording is usually essential for patients with suspected or known convulsive disorders.

3.13 The patient's level of consciousness (awake, drowsy, sleeping, or comatose), and any change thereof, should be noted by the technologist on the EEG recording. Any commands or signals to the patient, and any movement or clinical seizure activity or absence thereof, should also be noted on the recording. Careful observation of the patient with frequent notations is often essential, particularly when unusual waveforms are observed in the tracing. Abbreviations used should be standardized, with their definitions readily available to the reader.

In stuporous or comatose patients and those showing invariant EEG patterns of any kind, visual, auditory, and somatosensory stimuli should be applied systematically during recording. The stimuli and the patient's responses or failure to respond should be noted on the recording paper as near as possible to their point of the occurrence.

It is the responsibility of the electroencephalographer to recognize the patterns usually associated with different states of consciousness, However, observations by the technologist about the patient's clinical status can be of considerable interpretative value, particularly when discrepancies or unusual correlations occur.

To facilitate assessing awake background activity, it is important for the technologist to ascertain that the patient is maximally alert for at least a portion of the record.

3.14 Special procedures that are of some risk to the patient should be carried out only in

the presence of a qualified physician, only in an environment with adequate resuscitating equipment, and with the informed consent of the patient or responsible relative or legal guardian.

3.15 EEGs for the evaluation of cessation of cerebral function ("cerebral death") require special procedures and extraordinary precautions (see Guideline Three: Minimum Technical Standards for EEG Recording in Suspected Cerebral Death).

REFERENCES

American Electroencephalographic Society. Infectious Diseases Committee Report. *J Clin Neurophysiol* 1984; 1:437-41.

Jasper HH. The ten-twenty electrode system of the International Federation. *Electroencephalogr Clin Neurophysiol 1958;10:* 371-3.

Jasper HH. The ten-twenty electrode system of the International Federation. In: *International Federation of Societies for Electroencephalography and Clinical Neurophysiology: Recommendations for the practice of clinical electroencephalography.* Amsterdam: Elsevier, 1983:3-10.