VANDERBILT UNIVERSITY

MEDICAL CENTER

Center for Programs in Allied Health

Neurodiagnostic Technology Program

Program Handbook
2018-2019

Updated: March 21, 2018

INTRODUCTION TO PROGRAM HANDBOOK

The purpose of the Program Handbook is to serve as a reference and resource for the students in each of the programs in the VUMC Center for Programs in Allied Health (CPiAH). The Program Handbook is one of the important documents that provide operational guidance to students, to assist them in their successful progression through their programs. Other key documents with policy and procedure information important to students include:

- Catalog of the VUMC Center for Programs in Allied Health – Source of important policies and other information related to VUMC, the CPiAH and each program. The catalog is available on the VUMC CPiAH website.
- Program Handbook – Each CPiAH program provides students its own Program Handbook. The policies and procedures in the Program Handbook are aligned with VUMC, CPiAH and program policies that appear in the Catalog, as well as other locations. The purpose of the Program Handbook is to provide more specific details about each program, with a particular focus on operational information and procedures.
- VUMC CPiAH website and Program Website – The Center for Programs in Allied Health has its own website, and that website houses a website for each program within the CPiAH. Students will find important information regarding both the institution and the programs on these sites.

IMPORTANT NOTICE TO STUDENTS:

All students enrolled in VUMC Center for Programs in Allied Health (CPiAH) programs are bound by all VUMC, CPiAH and Program policies. By enrolling in a CPiAH program, every student acknowledges his or her responsibility to abide by and adhere to all institutional and programmatic policies and procedures. Students therefore have the responsibility of being familiar with the policies and procedures described in the Program Handbook, in the Catalog of the Center for Programs in Allied Health, and on the CPIAH and respective program's websites.

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IMPORTANT PROGRAM INFORMATION PROVIDED IN THE CPIAH CATALOG

The Catalog of the Center for Programs in Allied Health (CPiAH) contains important information about Vanderbilt University Medical Center, the Center for Programs in Allied Health and this program specifically.

Students are advised to refer to the CPiAH Catalog in order to obtain the following information about this program:

- Program Description
- Certification/Credentialing Information
- Mission, Credo and Goals
- Goals and Objectives
- Staff and Faculty
- Program Accreditation/Approvals
- Graduation Requirements
- Academic Calendar
- Admission Information
- Academic Program
- Course List & Descriptions
- Grading & Satisfactory Academic Progress Requirements
- Professional Code of Ethics
- Program-Specific Technology Requirements

ACADEMIC CALENDAR

First Day of School	Tuesday, September 5, 2017
Thanksgiving Break	Thursday, November 23, 2015 and Friday, November 24, 2017
Christmas Break	Monday, December 20, 2017 through Monday, January 2. 2018
Memorial Day	Monday, May 28, 2018
July 4th Holiday	Monday, July 4, 2018
Labor Day	Monday, September 3, 2018
Thanksgiving Break	Thursday, November 22, 2018 and Friday, November 23, 2018
Winter Break	Friday, December 20, 2018 through Monday, January 2, 2019
Graduation	Saturday, March 2019 (Day TBD)

PROGRAM DESCRIPTION

The VUMC Neurodiagnostic program is an innovative program developed with the adult learner in mind. The majority of students admitted have earned a college degree. They have families and work full time jobs. Understanding that the biggest challenge students face in completing a course of study is the stress of trying to balance school, family and work, the program has been structured with a great deal of latitude.

Students must realize that they are not in a traditional learning environment with someone policing every move. The resources to become a successful technologist are made available and it is the student's responsibility to take advantage of the opportunities. The most successful technologists are those who are self-starters without the need for constant supervision. This is true both in didactic and clinical arenas.

Attendance is a requirement of the program especially during the didactic portions but the program is designed to give students more freedom than that with traditional programs.
Rather than a set number of days a student must attend, more emphasis is placed on whether the student is progressing satisfactorily and utilizing time wisely. Students are counseled whenever they appear to be falling behind or show lack of interest in the program.

Students are required to submit certificates of completion for each of the online courses in a timely manner without having strictly imposed deadlines. The reason for this is twofold: 1) the student takes responsibility for their own schedule which teaches them the responsibility of working in a health care environment and 2) it relieves the stress of having too many conflicting assignments involving school, work and family.

STUDENT CONDUCT / ACADEMIC INTEGRITY

Students are admitted into the NDT program based on their level of maturity and desire to become health care professionals. All students are bound by several standards of conduct, as outlined in the CPiAH Catalog, including:

- VUMC Code of Conduct
- VUMC Center for Programs in Allied Health Honor Code
- ASET Statement of Professional Ethics

Adherence to these Codes and the ASET Statement of Professional Ethics is required of students at all times.

COMMUNICATION POLICY

The Program Director's role is to help students reach their goals. Students are encouraged to consult with the Program Director regarding any questions or concerns. Individual advising times are scheduled regularly, but a student should not wait until their scheduled time if in need of assistance.

ATTENDANCE POLICY

Students are required to be present during all scheduled classroom hours, assigned medical lectures and assigned clinical rotations.

- Hours of class are 8:00am–3:00 pm Monday through Friday. Location is dependent on classroom availability.
- Medical lectures are scheduled September through May, at 8:00am Monday (every other Monday), 8:00am Tuesday (every other Tuesday), and 12:00pm (noon) Wednesdays. Additional lectures are sometimes added at noon and students will be notified by email of the additions.
- Epilepsy Surgery Conferences are held on Thursday at noon and Friday afternoons starting at 12:30 pm.

Absences

Students are considered absent when they are not in their assigned location at the scheduled date and time, regardless of the reason.

- Scheduled/Excused Absence: Students are required to notify the Program Director (or designee) by email as early as possible if they expect to be absent. Documentation may be requested to determine whether to excuse an absence. Excused absences will not have a negative effect on the student's recorded hours. However, the student is responsible for completing any assignments missed during the absence.
- Unscheduled Absence: Failure to notify the Program Director in advance of an absence will result in the student incurring an unscheduled absence.
- Excessive Unscheduled Absences:
    - Students who incur three consecutive days of unscheduled absences are considered dismissed from the program.
    - Excessive unscheduled absences that do not occur on consecutive days will result in disciplinary action, up to and including probation or dismissal from the program.

Tardiness

Students are considered tardy when the Program Director checks the roll and the student is not present. Excessive tardiness is defined as late arrival that occurs on three (3) or more occasions during any 30-day calendar period, or on seven (7) or more occasions in any 6-month period. Excessive tardiness will result in

disciplinary action, up to and including probation or dismissal from the program.

A student may request an approved late arrival, but the student is required to notify the Program Director (or designee) by email as early as possible if they expect to be tardy. Documentation may be requested to determine whether to approve a late arrival.

OUTSIDE EMPLOYMENT

Students may be employed while enrolled in the NDT program, Employment hours must be scheduled outside of the scheduled NDT program hours. Program schedules are subject to change. The program director will give as much notice of scheduling changes as possible but it is the student's responsibility to check the posted schedule for classroom dates and times.

Students are strongly discouraged from working in positions related to the NDT field until competency is approved by the program. Under no circumstance will work performed in a position outside of the program be counted as clinical time.

INCLEMENT WEATHER POLICY

The Program Director may cancel classes on days when the weather is severe and dangerous for travel. Students will be notified by text and email if those services are available. If students do not receive notification from the program director of classes being cancelled, they should use their own judgment about the safety of travel during inclement weather. If classes have not been officially canceled by the Program Director or the Director of the Center for Programs in Allied Health, any time missed during inclement weather will be treated as an absence.

Clinical rotations ARE NOT CANCELLED in the event of inclement weather. Students should use their own judgment about the safety of travel in inclement weather.

REQUIRED TEXTBOOKS

Title	Author	ISBN/Publisher	Year	Retail Price
Anatomy and Physiology Text	Open Stax College	Creative Commons Attribution	2013	Free Downloadable and included in tuition
Medical Terminology: The Language of Health Care, 2nd Ed	M.C. Willis	13:978-1451176766 10:1451176767 Lippincott, Williams and Wilkins	2006	$55.00
Practical Approach to Electroencephalography	M.H. Libenson	13:978-0750674782 10:0750674784 Elsevier, Inc.	2010	$89.00
Contemporary Diagnosis and Management of the Patient with Epilepsy, 6th Ed	I.E. Leppik	13:978-1931981576 10:1931981574	2006	$85.00

DRESS CODE

Students are required to dress in an appropriate professional manner, in keeping with VUMC institutional dress code (Appendix D of the CPiAH Catalog). In addition, Neurodiagnostic Technology Program students are required to adhere to the following attire guidelines:

- The designated color of scrubs is steel gray from the Grey's line of scrubs.
- The scrubs are to be worn without the addition of shirts underneath or jackets on top (the only exception being a warm-up jacket from the same line of scrubs). (In the event jackets from the scrub line are not available, a student may ask for approval from the Program Director to wear a different style.) During orientation week, students are instructed on the proper way to wear the uniform. A slide presentation is presented and the program director outlines what is appropriate and in compliance with dress code.
- Jackets, hoodies, sweat shirts and other similar articles are not permitted to be worn with the scrubs. Because classrooms are often cold, students must be prepared with appropriate attire (as described above) to remain compliant with the dress code.

AGREEMENT CONCERNING PROFESSIONAL SOCIETY & NATIONAL CERTIFICATION

American Society of Neurodiagnostic Technologists

I understand that ASET represents an important component of my education and that as a student in the VUMC Neurodiagnostic Technology Program I will be expected to maintain a student membership status. Student membership is $50 per year and I will be required to join and pay my dues by November 30, 2017 for the year 2018. Dues for 2019 will be due in November 2018. These dues are considered to be part of the lab fees discussed during the initial interview.

_____

Printed Name

_____

Signature

American Board of Registration of EEG and EP Technologists

I understand that the goal of the VUMC Neurodiagnostic Technology Program is to educate students who will be eligible and prepared for the ABRET registry exam in EEG. Graduates of the VUMC NDT program are eligible for the exam under Pathway I immediately following graduation. The cost of the exam is currently $700. Applying to take the exam is my responsibility.

_____

Printed Name

_____

Signature

INFORMATION ON NATIONAL CERTIFICATION EXAM

The following chart shows four different eligibility pathways to become an R. EEG T. (registered electroencephalographic technologist). Graduates of the VUMC NDT program are eligible under Pathway I.

2018 Eligibility Requirements	EEG Pathway I CAAHEP Accredited NDT Program	EEG Pathway II Non-CAAHEP Formal NDT Program	EEG Pathway III Associates Degree /RPSGT
	**Graduate** of Program	Certificate of Completion from ABRET recognized Program *current listing on ABRET.org	Associates Degree (Higher Degrees Acceptable) or RPSGT certificate
	Current CPR/BLS certification	Documentation of 100 EEGs	1 year *clinical EEG* experience (1)
		Current CPR/BLS certification	Documentation of 150 EEGs following 1 year experience (1)
			30 EEG ASET Credits (2)
			Current CPR/BLS certification
R. EEG T. achieved upon successfully passing the EEG Exam			

NEURODIAGNOSTIC TECHNOLOGY PROGRAM GRADUATE COMPETENCIES

The graduate competencies for performing an electroencephalogram (EEG) and additional neurodiagnostic procedures, including introductory level Evoked Potential Studies (EP), Polysomnography Studies (PSG), Nerve Conduction Studies (NCS), Intraoperative Neurophysiological Monitoring (IONM), and Long Term Monitoring in Epilepsy (LTME) are recommended as standards for the education of post-secondary students in neurodiagnostic technology (NDT) programs. These standards are presented as Appendix A to this handbook. Employers can expect the graduates of CAAHEP-accredited NDT programs to be competent in these areas.

VANDERBILT UNIVERSITY MEDICAL CENTER
PHYSICAL REQUIREMENTS & ENVIRONMENTAL CONDITIONS

Physical Requirements Group: Physical Requirements Group 57
Physical Requirements Website: https://hr.mc.vanderbilt.edu/careers/requirements/Group57.pdf

***Strengths Needed*:** This job is considered in the "Light Work" category requiring exertion up to 20 lbs. of force occasionally and uses negligible amounts of force to move objects.

Category	Physical Requirement	Frequency	Description
Movement	Sitting:	Frequent	Remaining in seated position.
Movement	Standing:	Frequent	Remaining on one's feet without moving.
Movement	Walking:	Occasional	Moving about on foot.
Movement	Lifting under 35 lbs:	Frequent	Raising and lowering objects under 35 lbs from one level to another.
Movement	Lifting over 35 lbs:	Occasional	Raising and lowering objects from one level to another, includes upward pulling over 35 lbs, with help of coworkers or assistive device.
Movement	Carrying under 35 lbs:	Frequent	Transporting an object holding in hands, arms or shoulder.
Movement	Carrying over 35 lbs:	Not Applicable	Transporting an object holding in hands, arms or shoulders, with help of coworkers or assistive device.
Movement	Push/Pull:	Occasional	Exerting force to move objects away from or toward.
Movement	Bending/Stooping:	Occasional	Trunk bending downward and forward by bending spine at waist requiring full use of lower extremities and back muscles.
Movement	Balancing:	Occasional	Maintaining body equilibrium to prevent falling when walking, standing, crouching or maneuvering self, patient and equipment simultaneously while working in large and small spaces.
Movement	Climbing:	Occasional	Ascending or descending stairs/ramps using feet and legs and/or hands and arms.
Movement	Crawling	Not Applicable	Moving about on hands and knees or hands and feet.
Movement	Kneeling:	Occasional	Bending legs at knees to come to rest on knee or knees.
Movement	Crouching/Squatting:	Occasional	Bending body downward and forward by bending legs and spine.
Movement	Reaching above shoulders:	Occasional	Extending arms in any direction above shoulders.
Movement	Reaching below shoulders:	Frequent	Extending arms in any direction below shoulders.
Movement	Handling:	Frequent	Seizing, holding, grasping, turning or otherwise working with hand or hands.
Movement	Fingering:	Frequent	Picking, pinching, gripping, working primarily with fingers requiring fine manipulation.
Movement	Bimanual Dexterity:	Frequent	Requiring the use of both hands.
Sensory	Communication:	Continuous	Expressing or exchanging written/verbal/electronic information.
Sensory	Auditory:	Continuous	Perceiving the variances of sounds, tones and pitches and able to focus on single source of auditory information.
Sensory	Vision:	Continuous	Clarity of near vision at 20 inches or less and far vision at 20 feet or more with depth perception, peripheral vision, color vision.
Sensory	Smell:	Continuous	Ability to detect and identify odors.
Sensory	Feeling:	Not Applicable	Ability to perceive size, shape, temperature, texture by touch with fingertips.
Sensory	Taste:	Not Applicable	Ability to detect quality, texture, consistency and taste of prepared foods/quality control.
Sensory	Noise:	Not Applicable	May include exposure to occupational noise levels which equal or exceed an 8-hr time-weighted average of 85 decibels, requiring enrollment in VUMC's Hearing Conservation Program which includes training, use of hearing protection, and periodic audiometry.
Environmental	Chemicals and Gases:	Occasional	Medications, cleaning chemicals, oxygen, other medical gases

Conditions			used in work area.
Environmental Conditions	Pathogens:	Occasional	Risk of exposure to btoodbome pathogens and other contagious illnesses.
Environmental Conditions	Radiation:	Not Applicable	May be exposed to occupational radiation, requiring enrollment in VUMC's Radiation Safety Program which includes training, use of personal protective equipment with lead shlelding. and personal dose monitoring.
Environmental Conditions	Olmate:	Not Appflcable	Ability to withstand exposure to atmospheric extremes Including heat, cold, humidity, and barometric pressure changes.
Environmental Conditions	Vibration:	Not Appllcable	Subject to oscillating movement.

Vanderbilt University Medlcal Center ls an Equal Opportunity Employer and adheres to the parameters of Section 504 of the Rehabilitation Act of 1973. In compliance with the Americans with Disabilities Act as amended, we will provide reasonable accommodations to qualified Individuals with dlsablli1!es and encourage both prospective and current employees to discuss potential reasonable accommodations with us.

SUPPLEMENTAL TRAINING MATERIALS – HEAD LICE (PEDICULOSIS)

What are head lice?

- Lice are tiny insects that live on the scalp and crawl through the hair.
- Lice need human blood to live, and die within 24 hours if they cannot feed.
- Lice lay eggs (nits) that cling to the hair close to the scalp. Nits are oval shaped and most often can be seen in the hair behind the ears or near the neck.
- Lice hatch from nits after about 6 days, and can lay more eggs after 10 days.
- Head lice are not a sign of uncleanliness, and they don't spread disease.

What are the symptoms?

Scalp itching is the most common symptom.

How are head lice spread?

- Head lice are usually spread by head-to-head contact.
- Less often, lice can be spread by sharing clothing, combs, brushes, bedding, or sharing storage compartments (like lockers) with someone who has lice.

How are head lice treated?

- The American Academy of Pediatrics says the treatment of choice is permethrin 1% creme rinse (such as Nix®). It is available without a prescription. Follow the instructions on the package carefully.
- Permethrin creme rinse kills live lice, but not all of their eggs. You may need to apply it again after 7-10 days to treat the lice that hatch from the surviving eggs. Some experts recommend doing this even if you don't see live lice.
- Many alternative "chemical free" treatments are available, but there is not much scientific information on how well they work. Some might interfere with permethrin treatment.
- No treatment works 100% of the time. If you have questions or if treatment doesn't work, contact your health care provider.

What else do I need to do?

- Combing out nits after treatment with permethrin or other lice-killing medications is not necessary to prevent spreading lice.
- Some people do so that others won't mistake them for having live lice.
- Check everyone in your household for head lice. Treat those who share a bed with the person with infestation, and those with live lice or nits close to the scalp.
- Clean hair items and bedding used by infested persons. Washing, soaking, or drying items at temperatures greater than 130º F will kill stray lice or nits.
- Don't spend a lot of time housecleaning, as lice are spread by head-to-head contact. Focus on items, clothing, furniture, or carpeting that have been in contact with the head of the person with infestation in the 24 to 48 hours before treatment. Use a vacuum for carpeting, car seats, and other fabrics or fabric covered items. Don't use chemicals or insect sprays.
- Human head lice don't feed on pets, so pets do not need to be treated.

What about school?

- No child should be excluded from school or allowed to miss school because of head lice.
- Children with nits only should be allowed to return to school.

Additional information

- Ask your child care program or school if you have questions about their head lice policy.
- Visit the Centers for Disease Control and Prevention website: www.cdc.gov/parasites/lice/head

HEAD LICE INFORMATION FROM THE ASET CURRICULUM

http://www.hsph.harvard.edu/headlice.html
The link above contains information on the recognition of head lice and treatment options. Unfortunately since END technologists routinely handle the patient's hair and our electrodes rest on the patient's scalp, we will occasionally discover the presence of head lice on our patients. It is very important to remember that lice are insects and anyone, even those with the very best of personal hygiene can pick up head lice. It is most common in school age children and in recent years lice have become immune to the treatments that have been used for years.

A well-equipped END lab will be prepared for such an incident. If the patient is an inpatient, the nursing staff should be alerted. Special care should be taken to carefully clean all electrodes and surfaces of the equipment so as not to spread the insects to the next patient. If the patient is an outpatient you may want to establish a policy to cancel the appointment and reschedule after the lice have been eliminated. An information sheet on the treatment of lice is very helpful and should be provided to the patient at this time along with recommendations for eliminating the lice from not only the patient's hair, but bedding, clothing and carpeting within the home. The information sheet should encourage the patient or parents of the patient to not only treat the patient's hair, but to spray bedding and then wash clothing, bedding and pillows in hot water. Combs and brushes should be washed in hot water. A child's car seat cover, towels, and stuffed animals should be washed. The best way to eliminate lice from a home is to assume that the entire family should be treated and that the house should be treated as well. Also, prepare the patient or parents for the likelihood that there will be another outbreak in a week or so requiring an additional treatment.

Telling a patient or parent of a patient about the presence of head lice is a delicate matter. First of all, do not over react. It is only a bug. It is easy to pick up head lice and parent's should be reassured that there is no shame in it. If this is the first time you have seen it as an END technologist, rest assured that it will not be the last time you will see it. It is not a sign of lack of personal hygiene. As a matter of fact, lice prefer clean hair. It merely is an insect which is easily transferred from one person to another.

Some of the ways that lice can be transmitted are through the sharing of combs and brushes, sharing ball caps on the playground, and little girls playing dress up or beauty shop. It only takes brushing up against someone who is infested and it is very easily passed to an unsuspecting person. While it is not a shameful condition, though it is often perceived as such, it is something that should be treated as soon as possible to prevent spreading. After treatment, nits should be removed with a nit comb under a strong light. This process may take a long time but is the best way to prepare the child for re-entry to school and is the only way to make sure that the lice have been eliminated. Many parents will deal with this at some point during child raising and your attitude and reassurance will make it less traumatic for the child and parent or patient.

There are several treatment options which are detailed in the following website. The treatments may kill all the lice and some of the eggs but a repeat treatment in 10 days is usually needed. It is usually the policy that children should have no nits before they can return to school. Your lab should have a policy on head lice. Some patients may need to have their EEG completed and the lab closed down briefly for spraying after the test is complete. A surgical gown, gloves and surgical bonnet worn by the technologist, may help prevent spread of the lice to the staff. When rescheduling a patient with active head lice, explain that you also have a responsibility to the other patients who have testing scheduled in the lab today and you must go through a cleaning process before you can allow another patient into the lab. If care is not taken, the EEG lab can become a source of infestation for other patients. Most patients will understand this and happily reschedule.

This site has fun activities for kids and educational material about head lice.
http://www.headlice.org/kids/animations/picknits.htm

Things to remember:

- Be factual and polite.
- Be supportive and understanding

- Provide helpful information for the elimination of the lice from the patient, home and surroundings.
- Add illustrations and be creative.

Regulations that protect us:
The Environmental Protection Agency and Occupational Safety and Health Administration set standards for safe environment for employees. It is good to know the areas covered by these regulation that protect us in the workplace. http://www.epa.gov/ http://www.osha.gov/

APPENDIX A: NEURODIAGNOSTIC TECHNOLOGY PROGRAM GRADUATE COMPETENCIES

NATIONAL COMPETENCY SKILL STANDARDS FOR PERFORMING AN ELECTROENCEPHALOGRAM

Electroencephalographic (EEG) providers practice in accordance with the facility policy and procedure manual which details every aspect and type of recording.

The American Society of Electroneurodiagnostic Technologists, Inc. presents this document to provide the national criteria for evaluating competencies for technologists performing an electroencephalogram (EEG). These competencies were established following a survey of the membership in the Fall of 1996. The Professional Testing Corporation (PTC) in New York City completed the survey process and provided the analysis. The ASET Board of Trustees approved this document August 11, 1997. This document was updated in the Spring of 2010 according to nationally recognized and accepted criteria and approved by ASET's Board of Trustees in March 2011.

The elements for quality patient care and interaction as well as basic knowledge and technical performance were considered. The technical components include those defined in the American Clinical Neurophysiology Society (ACNS) 2006 Revisions to the EEG Guidelines published in the *Journal of Clinical Neurophysiology*, Volume 23, Number 2, April 2006.

Section I: EEG Core Knowledge

The electroencephalographic (EEG) technologist has the knowledge base to interact with the patient and obtain a quality, interpretable EEG recording that will yield information about the brain's neuronal activity. The technologist possesses the appropriate knowledge level of diseases to correlate patient history and clinical symptoms to determine appropriate maneuvers to be performed during the EEG. Technical Skills and Other Abilities:

The EEG technologist provides a safe recording environment by:

- verifying identity of the patient
- disinfecting electrodes after each procedure or using disposable products
- following standard precautions for infection control per facility policy and procedures
- attending to patient needs as established by facility policy and procedures
- recognizing/responding to life-threatening situations
- being certified to perform cardiopulmonary resuscitation
- following facility policy and procedures for sedation
- complying with facility policy and procedures for emergency and disaster situations
- complying with hazardous material handling procedures
- maintaining instrument/equipment in good working order
- taking appropriate precautions to ensure electrical safety.

The EEG technologist establishes rapport with the patient and the patient's family by:

- using personal communication skills to achieve patient relaxation/cooperation
- explaining all test procedures including activation procedures
- explaining the electrode application method (paste, collodion, etc.)
- interacting on a level appropriate to patient's age and cognitive ability
- maintaining respect and patient confidentiality.

The EEG technologist evaluates the patient to:

- determine the patient's mental age, mental state, and comprehension level
- note the patient's overall physical condition
- determine appropriate method of electrode application
- ascertain the patient's capacity to cooperate with activation procedures
- determine if hyperventilation/photic stimulation is contraindicated
- accommodate for disabilities or special needs
- determine the need for additional physiological monitors
- document unusual or inappropriate behavior suggestive of seizure or psychogenic nonepileptic event
- determine the possible need for restraints or emergency intervention.

The EEG technologist prepares a basic data sheet that includes:

- patient's information (name, age, ID number, doctor, etc.)
- recording time, date, and technologist's name or initials
- pertinent patient history and familial medical history
- previous EEG reports
- current medication/sedation and time of last dosage
- time of last meal
- time, date, aura, and circumstances of last seizure or symptoms
- patient's mental, behavioral, and consciousness states
- diagram of skull defects or anomalies (if any)
- diagram of any modifications in electrode placement.

The EEG technologist's electrode application follows a method that includes:

- ensuring accurate electrode placement according to the International 10–20 System or modified 10–10 System
- adjusting electrode placement for anatomical defects or anomalies
- cleaning the electrode site to reduce skin impedance prior to scalp electrode application
- applying surface electrodes with EEG conductive paste or with collodion and electrolyte
- verifying surface electrode impedances measure below 5,000 Ohms
- verifying when sterile, disposable subdermal needle electrodes are used, impedances measure below 10,000 Ohms
- applying electrodes to record ECG.

Section II: Instrumentation

The EEG technologist documents the working condition of a digital EEG instrument by:

- calibrating system amplifiers
- verifying standard filter settings

- verifying sensitivity settings
- inputing a biological (bio-cal) signal to all channels
- observing the first 30 seconds of the recording from the primary system-reference montage when instrumental and biological calibration cannot be performed
- correcting or reporting deviations per facility policy and procedure.

The EEG technologist applies the principles of electronics and mathematics to recording by:

- knowing how differential amplifiers work
- computing voltage and frequency of waveforms
- calculating the duration of waveforms
- understanding the polarity of waveforms
- understanding impedance
- understanding analog to digital conversion.

The EEG technologist knows how digital waveforms are affected by:

- 60 hertz filter
- filter settings
- digital filters
- sensitivity settings
- referential and bipolar montages
- electrodes type and electrode material composition
- malfunctioning equipment
- printer conversion of data.

Section III: Recording Principles

The EEG technologist obtains a standard EEG that includes:

- a minimum of 20 minutes of technically acceptable recording
- eye opening and closing to check effects of stimuli on EEG
- hyperventilation for a minimum of 3 minutes
- photic stimulation at frequencies appropriate for history and reactivity
- minimum recording of one minute post hyperventilation/photic stimulation
- mental stimulation/assessment procedures
- periodic checks of electrode impedance
- natural drowsiness and sleep, if possible
- notations of montage, filters, display speed, and sensitivity setting changes
- notes of observed behavior, clinical seizure manifestations, etc.
- minimum recording of 2 minutes post any questionable event.

The EEG technologist customizes the recording procedure by:

- evaluating reason for referral, history, and observed waveforms
- utilizing techniques to bring out or enhance clinical symptoms
- selecting montages appropriate for abnormalities seen and/or expected
- selecting appropriate instrument settings, i.e., filters, sensitivity, timebase
- encouraging drowsiness and sleep
- applying additional electrodes and adjusting montage, if needed, to localize abnormal activity
- recording respiration, if appropriate
- recording ECG rhythms.

The EEG technologist differentiates artifacts from cerebral waveforms by:

- recognizing possible artifactual waveforms
- documenting (on the recording) patient movements
- applying electrodes to record eye movements
- replacing electrodes exhibiting questionable activity or contact
- troubleshooting for possible electrical interference.

The EEG technologist:

- reports critical tests results* to the interpreting physician and supervisor and documents this communication according to facility policy and procedures
- documents sedation used, dosage, and effects (if applicable)
- reviews EEG for appropriate documentation or amplifier settings and montage changes
- removes electrode paste/collodion/adhesive from the patient's scalp and hair.

Section IV: Knowledge Base Statements

The EEG technologist understands (has a working knowledge of):

- medication effects on the EEG background and waveforms
- medical terminology and accepted abbreviations
- signs, symptoms, and EEG correlates for adult neurological disorders
- signs, symptoms, and EEG correlates for pediatric neurological disorders
- seizure manifestations, classifications, and EEG correlates
- psychiatric and psychological disorders and EEG correlates.

The EEG technologist understands and follows technical criteria for

- recording electrocerebral inactivity (brain death)
- recording neonatal EEG
- recording pediatric EEG.

The EEG technologist recognizes:

- normal and normal variants awake and asleep patterns for each age range
- abnormal awake and asleep patterns for each age range
- EEG patterns for levels of consciousness
- clinical and nonconvulsive seizure patterns.

The EEG technologist possesses the knowledge base necessary to correlate patient history and clinical symptoms in order to determine the appropriate electrode application and recording parameters in the following disease processes:

- seizure classification
- stroke
- trauma
- encephalopathy
- altered consciousness.

The EEG technologist maintains and improves knowledge and skills by:

- reviewing EEG records with the electroencephalographer on a regular basis
- reading journal articles
- studying textbooks related to the field
- attending continuing education courses in clinical neurophysiology
- completing online EEG courses
- participating in quality assurance/improvement reviews
- participating in professional organizations for neurodiagnostics
- achieving EEG certification and meeting recertification requirements.

* Critical test results – any values/interpretations where delays in reporting may result in serious adverse outcomes for patients. MA Coalition for Prevention of Medical Errors; www.macoalition.org/document/CTRPractices.pdf

-- Approved by ASET Board of Trustees March 2011

NATIONAL COMPETENCY SKILL STANDARDS FOR PERFORMING EVOKED POTENTIAL STUDIES

Evoked Potential (EP) providers practice in accordance with the facility policy and procedure manual which details every aspect and modality of testing.

The American Society of Electroneurodiagnostic Technologists, Inc. presents this document to provide national criteria for evaluating competencies for performing evoked potential (EP) studies. These National Competencies were established following analysis of survey data collected in the Spring of 1998. The tabulation was completed by Robert L. Clark & Associates, of Silver Spring, Maryland. This document was updated in the Fall of 2010 according to nationally recognized and accepted criteria and approved by ASET's Board of Trustees in March 2011.

The elements for quality patient care and interaction as well as basic knowledge and technical performance were considered. The technical components include those defined in the American Clinical Neurophysiology Society (ACNS) 2006 Revisions to the Evoked Potential Guidelines published in the *Journal of Clinical Neurophysiology*, Volume 23, Number 2, April 2006.

Section I: Evoked Potential Core Knowledge

The evoked potential (EP) technologist has a level of technical knowledge of electrical conduction of motor and sensory nerves in the human body. The technologist possesses the appropriate knowledge level of diseases to correlate patient history and clinical symptoms to determine appropriate evoked potential studies to be performed.

Technical Skills and Other Abilities:

The EP technologist provides a safe recording environment by:

- verifying identity of the patient
- cleaning electrodes after each procedure
- following standard precautions for infection control per facility policy and procedures
- attending to patient needs as established by facility policy and procedures
- recognizing/responding to life-threatening situations
- being certified to perform cardiopulmonary resuscitation
- following facility policy and procedures for sedation
- complying with facility policy and procedures for emergency and disaster situations maintaining instrument/equipment in good working order
- taking appropriate precautions to ensure electrical safety.

The EP technologist establishes rapport with the patient and patient's family by:

- using personal communication skills to achieve patient relaxation/cooperation
- explaining all test procedures

- explaining the electrode application method (paste, collodion, etc.)
- interacting on a level appropriate to patient's age and mental capacity.

The EP technologist evaluates the patient to:

- determine the patient's mental age, mental state, and comprehension level
- accommodate for disabilities and/or special needs
- note the patient's overall physical condition
- decide appropriate method of electrode application.

The EP technologist prepares a patient data sheet that includes:

- patient's information (name, age, gender, ID number, doctor, etc.)
- procedure number, recording time, date, and technologist's name or initials
- significant, relevant medical history and clinical findings specific to the modality studied
- patient's mental, behavioral, and present clinical complaints
- all medications
- results of other clinical studies relevant to the EP modality being tested, such as audiogram for brainstem auditory evoked potential (BAEP), visual field testing for visual evoked potential (VEP), and nerve conduction studies for somatosensory evoked potential (SSEP).

The EP technologist:

- reports critical care results* to the interpreting physician and supervisor and documents this communication according to facility policy and procedures.

The EP technologist follows a method of electrode application that includes:

- measuring the patient's head using the International 10–20 System and/or Queens Square method of electrode placement as appropriate for the evoked potential
- cleaning the patient's scalp and skin prior to electrode application
- using surface electrodes or needle electrodes, as appropriate
- using additional electrodes or modified placements as needed or as indicated by facility policy and procedures
- applying surface electrodes with paste or with collodion and electrolyte
- verifying that electrode impedances are balanced and below 5000 Ohms.

The EP technologist verifies the integrity of the evoked potential instrument by:

- calibrating with a square pulse of appropriate amplitude and using parameters that will be used for the recording
- recognizing and correcting malfunctions seen with calibration, if more frequently as needed or as indicated by facility policy and procedures
- maintaining individual equipment logs (safety checks, breakdowns, repairs, and such).

The EP technologist obtains a standard EP record that includes:

- clearly resolved waveforms
- at least two replications demonstrating consistency of latency and amplitude measurements
- use of appropriate recording and stimulus parameters
- additional electrode derivations and other techniques as needed to enhance or clarify the abnormality
- obligate peaks displayed according to facility policy and procedures.

The EP technologist identifies and eliminates or reduces artifacts contaminating the waveforms by:

- checking the quality of the raw signal regularly or whenever needed
- understanding the meaning and significance of artifact rejection
- understanding the relationship of signal to noise ratio
- recognizing whether the artifact is physiologic or nonphysiologic
- identifying source of the artifact (poor electrode application, malfunctioning stimulator, or positioning of cables)
- calculating frequency (in hertz) of rhythmic artifacts and understanding the effects of aliasing
- proper grounding of the patient and equipment
- enhancing signal to noise ratio by increasing the number of sweeps.

When the EP recording is finished, the EP technologist:

- removes electrode paste/glue from patient's scalp, hair, and skin
- prepares a detailed test data worksheet that includes: montage; time and voltage calibration scales; filter settings; side stimulated; stimulus parameters-type, (polarity, rate, duration, delay, masking, intensity, and visual angle); number of trials averaged; polarity convention; and other modality-specific relevant information such as visual acuity, hearing thresholds, limb length and height
- documents sedation used, dosage, and effect (if applicable)
- marks the obligate peaks and documents their latencies and amplitudes
- prepares hard copy of the waveforms
- stores information on electronic media according to facility policy and procedures.

The EP technologist understands:

- recommended criteria for assessing evoked potential abnormalities and maturation of EP components
- basic electricity and electronics concepts
- basic functional neuroanatomy and neurophysiology
- anatomy of EP systems and generators of EP components
- medical terminology and accepted abbreviations
- EP correlates of certain clinical conditions such as neurologic, orthopedic, neurosurgical, and audiologic disorders
- pathologic and non-pathologic factors affecting EPs
- the technical aspects, electrical hazards, and recording techniques unique to hostile environments (ICU, OR, radiology suites)
- EP normative data.

The EP technologist applies the principles and concepts of EP instrumentation to the recording by understanding:

- signal averaging and noise reduction
- analog to digital conversion including amplitude resolution, sampling rate, analysis time, sampling interval (dwell time), and Nyquist frequency
- the function of differential amplifiers including input impedance, common mode rejection, polarity convention, and gain
- effects of stimulus and recording parameters on EP waveforms
- electrode impedance and its importance
- electrical safety.

The EP technologist maintains and improves knowledge and skills by:

- reviewing EP records with clinical neurophysiologist on a regular basis
- reading journal articles
- studying textbooks related to the field
- attending continuing education courses in clinical neurophysiology
- completing online EP courses
- participating in quality assurance/improvement reviews
- participating in professional organizations for neurodiagnostics
- achieving EP certification and meeting recertification requirements.

Section II: Brainstem Auditory Evoked Potential

The EP technologist records a technically adequate Brainstem Auditory Evoked Potential (BAEP) by:

- obtaining relevant audiologic, neurologic, and/or neurosurgical history – hearing loss, ear infections, dizziness, tinnitus, etc.
- assessing the patient's ear canals
- establishing hearing thresholds
- correlating elevations in thresholds with any existing hearing loss or conditions of ear structures
- noting the results of prior hearing evaluations
- using a montage derivation of vertex to ipsilateral and vertex to contralateral ears
- choosing the appropriate timebase, number of stimuli, sensitivity, and bandpass settings
- choosing the appropriate click polarity, rate, and intensity according facility policy and procedures.
- expressing click intensity measures in equivalent units of dBSL, dBHL, or dBSPL
- adequate resolution of obligate components Waves I, III, and V
- using techniques to enhance Wave I resolution such as an ear to ear montage derivation or using an ear canal electrode or increasing stimulus intensity
- measuring and calculating the absolute latencies, amplitudes, and interpeak intervals of obligate peaks
- masking of opposite ear and understanding its use and effects
- performing a latency intensity series for auditory assessment in infants and other patients whenever indicated.

Section III: Somatosensory Evoked Potential

The EP technologist obtains a technically adequate Somatosensory Evoked Potential (SSEP) by:

- obtaining relevant neurologic, orthopedic, and/or neurosurgical history or any other relevant pathway specific
- information such as the presence of peripheral neuropathy
- selecting appropriate timebase, sensitivity, and bandpass settings according to facility policy and procedures
- applying the appropriate stimulating electrodes: active cathode over the nerve and anode placed distally
- properly grounding the patient to reduce stimulus artifact

- selecting current of sufficient intensity and duration to elicit a motor twitch from the appropriate areas of stimulation
- using a montage that records responses from multiple levels of the pathway such as peripheral nerve, spinal cord, subcortical, and cortical responses
- adequately resolving of the obligate components of Erbs Point, N13, P14, N18, and N20 of the median nerve SSEP
- adequately resolving of the obligate components of popliteal fossa, Lumbar, N34, and P37 of the posterior tibial nerve SSEP
- marking waveforms and calculating the absolute latencies, amplitudes, and interpeak intervals of the obligate components
- calculating peripheral nerve conduction velocity
- using additional techniques that clarify the abnormalities seen.

Section IV: Visual Evoked Potential

The EP technologist obtains a technically adequate Visual Evoked Potential (VEP) by:

- obtaining relevant ophthalmologic and neurologic history
- using a montage that records responses from both hemispheres according to facility policy and procedures
- assessing the patient's visual acuity
- selecting an adequate check size and positioning the patient at a distance from the pattern stimulator appropriate for the desired visual angle
- close monitoring of the patient's attention during the test
- performing the study with the same parameters and conditions used for normative studies including ambient light, pattern luminance, and contrast according to facility policy and procedures
- adequately resolving peaks N75, P100, and N145
- measuring and calculating the absolute latency, amplitude, amplitude ratios, and intraocular latency difference of P100
- using flash stimuli in selected patients when use of pattern reversal stimulus is not possible
- understanding the limitations of use of flash stimuli
- using hemifield testing when indicated to clarify asymmetries or other abnormalities according to facility policy and procedures.

* Critical test results – any values/interpretations where delays in reporting may result in serious adverse outcomes for patients. MA Coalition for Prevention of Medical Errors; www.macoalition.org/document/CTRPractices.pdf

-- Approved by ASET Board of Trustees, March 2011

NATIONAL COMPETENCY SKILL STANDARDS FOR PERFORMING POLYSOMNOGRAPHY/SLEEP TECHNOLOGY

Polysomnography/Sleep Technology providers practice in accordance with the facility policy and procedure manual which details every aspect and modality of testing.

The American Society of Electroneurodiagnostic Technologists, Inc. (ASET) presents this document to provide national criteria for evaluating the competencies needed by technologists to perform Polysomnography/Sleep Technology. These national competencies were established following the analysis of survey data collected in the Fall of 2005. The tabulation was completed by ASET staff and the PSG Task Force, according to nationally recognized and accepted criteria. This document was updated in the Fall of 2010 according to nationally recognized and accepted criteria and approved by ASET's Board of Trustees in March 2011.

The standards referred to in this document are those defined by the American Academy of Sleep Medicine (AASM) in their Standards of Practice and Clinical Guidelines that are published on their website: www.aasmnet.org

Section I: General Competencies for Polysomnography/Sleep Technology

The PSG/Sleep technologist prepares for the study by:

- assessing the physician's order and reviewing the medical record to assure appropriateness of testing
- interviewing the patient to obtain additional information
- determining and making accommodations for the patient's age-specific needs, disability, and/or other special needs
- providing patient and family education as appropriate including expectations of technical procedures;
- answering questions related to sleep disorders testing
- determining the need for and selection of additional physiological monitors and recording devices, i.e., CO_2 monitoring indicated for pediatric polysomnogram
- anticipating the possible need for emergency intervention.

The PSG/Sleep technologist prepares appropriate documents including pre-sleep questionnaire and technologist data sheet. Information should include:

- patient's demographic information (name, age, gender, ID number, referring physician, reason for referral, etc.)
- procedure information (procedure type, procedure number, date of test, technologist name, recording time, etc.)
- chief complaint, relevant medical history and clinical findings specific to procedure
- height, weight, neck circumference, BMI, Epworth sleepiness scale
- sleeping medications taken or administered during the study
- any special circumstances necessitating changes in standard protocols outlined in the facility policy and procedures.

The PSG/Sleep technologist verifies the integrity of the recording equipment by:

- performing an all-channel and montage calibration
- recognizing and correcting recording equipment malfunction observed during calibration, including amplifiers, ancillary equipment, and audiovisual equipment
- performing a post-calibration procedure to verify the integrity of recorded data
- maintaining documentation of required safety equipment checks.

The PSG/Sleep technologist follows a method of electrode and sensor application that includes:

- identifying the appropriate method of electrode application
- determining setup and recording protocols including montage derivations
- using standard precautions for infection control during patient preparation
- measuring the patient's head according to the International 10–20 System of electrode placement;
- cleaning and preparing the patient's scalp and skin prior to electrode application
- following established standards and department protocols documented in facility policy and procedures for placement of ECG, EMG, EOG, and other recording electrodes and sensors, i.e., nasal/oral airflow, pressure transducers, respiratory effort devices, intercostal electrodes and oximeter sensors
- utilizing additional electrodes or modified placements based on the patient's history or medical needs
- ensuring security and integrity of electrodes for an extended period of time
- verifying and documenting balanced and acceptable electrode impedances according to facility policy and procedures.

The PSG/Sleep technologist obtains an accurate recording by:

- acquiring and verifying physiological calibrations prior to "lights out" to document integrity of the physiological monitors
- recognizing and minimizing artifacts so that all recording channels can be easily read and interpreted throughout the recording
- recognizing and documenting relevant data such as body position changes, life-threatening events, EEG and ECG abnormalities, parasomnias, etc.
- documenting periodically throughout the recording to include observed behaviors, montage and equipment change, sleep stages, respiratory events, limb movements, oxygen saturations, etc.
- recognizing the need for clinical interventions (oxygen, positive airway pressure titration, CPR, etc.) according to alarm criteria outlined in facility policy and procedures.

The PSG/Sleep technologist:

- report critical test results* to the interpreting physician and supervisor and documents this communication according to facility policy and procedures.

At the end of the recording, the PSG/Sleep technologist:

- performs a post-calibration following "lights-on" to document integrity of the recording
- removes electrodes and sensors from the patient
- documents a summary of the polysomnogram and clinical observations to assist with the interpretation (apnea-hyponea index, periodic limb movement index, clinically significant behavior, significant cardiac arrhythmia, lowest oxygen desaturation, etc.)

- completes patient's data and chart
- performs transfer of data, data backup, archiving in accordance with facility policy and procedures
- disposes of single-use items safely, and cleans and disinfects electrodes and other reusable equipment according to manufacturer's guidelines and/or facility policy and procedures.

The PSG/Sleep technologist identifies and provides a comprehensive report to the physician that includes:

- review of computer generated and/or final scoring report to assure accuracy
- sleep stages, arousals, respiratory events, movements, and ECG scored in accordance with the AASM Manual for the Scoring of Sleep and Associated Events and facility policy and procedures
- sleep latency, REM latency, total sleep time, sleep efficiency, and percentage of sleep stages
- respiratory event counts by type with indices
- periodic limb movement count with indices
- arousal count with indices
- documentation of bradycardia, tachycardia, asystole, atrial fibrillation, or significant ECG arrhythmias
- documentation of atypical EEG patterns and relevant sleep/wake behaviors
- summary of therapeutic intervention.

The PSG/Sleep technologist provides education and support for sleep disorders patients by:

- following facility policy and procedures to assist the patient in receiving follow-up care
- providing positive airway pressure support and education on equipment as needed
- providing a community support group (A.W.A.K.E.) to promote interaction and education
- maintaining contact with the referring physician when a patient using positive airway pressure is seen for issues with treatment
- recognizing the role of the technologist versus the role of the physician in the treatment and care of the patient using positive airway pressure recognizing when there is a need for physician contact/intervention according to facility policy and procedures
- participating in community awareness health and education programs to provide education about sleep disorders.

Section II: Positive Airway Pressure (PAP) Titration

The PSG/Sleep technologist will perform a positive airway pressure (PAP) titration by:

- assuring the PAP device is calibrated appropriately and interfaced properly to the recording equipment
- explaining the PAP procedure to the patient during the setup process and answering any questions
- sizing the patient with a mask and allowing the patient to acclimate to PAP prior to "lights out" and initiation of PAP
- assessing patient response to PAP following established standards and facility policy and procedures regarding the need to change to bi-level PAP

- understanding the contraindications and complications of PAP therapy
- identifying when to adjust the pressure to achieve optimal delivery (respiratory events, snoring, arousals, desaturations, etc.) providing documentation and reasons for changes in PAP
- verifying optimal pressure during REM and supine sleep, if possible
- identifying and correcting factors that may compromise delivery of effective PAP pressures, i.e., substantial mask leakage or mouth breathing
- recognizing the need to change to bi-level ST or other advanced PAP therapy
- recognizing need to contact the medical director or senior technologist for advice according to facility policy and procedures
- cleaning and disinfecting PAP equipment according to required manufacturer specifications.

Section III: Oxygen Titration

The PSG/Sleep technologist will perform oxygen titration by:

- assuring proper function of equipment providing oxygen delivery
- recognizing contraindications for supplemental oxygen
- properly fitting and adjusting the nasal cannula for oxygen delivery with or without PAP
- understanding the use of PAP and combined oxygen supplementation
- identifying when to adjust the level of supplemental oxygen to achieve optimal oxygenation saturation
- identifying clinical signs of the patient's reduced drive to breathe and making appropriate adjustments
- documenting changes in oxygen saturation on the recording and the technologist summary report.

Section IV: Multiple Sleep Latency Test (MSLT)

The PSG/Sleep technologist performs the multiple sleep latency test (MSLT) by:

- verifying and documenting use and/or discontinuation of all prescription medications, over-the-counter medications, herbal and dietary supplements, and other substances or activities that would impact test results
- obtaining sleep logs prior to the MSLT to assess sleep-wake schedules
- documenting by polysomnogram the previous night's sleep
- removing recording sensors used for the polysomnogram that are not needed for the MSLT
- encouraging the patient to dress in comfortable clothes
- obtaining a urine drug screen test if ordered
- following established standards and facility policy and procedures for the performance of the MSLT procedure
- administering questionnaires as appropriate
- providing documentation and reports, i.e., start and end times of each nap opportunity, latency from lights out to the first epoch of sleep, mean sleep latency, and number of sleep-onset REM periods.

Section V: Maintenance of Wakefulness Test (MWT)

The PSG/Sleep technologist performs the maintenance of wakefulness test (MWT) by:

- verifying and documenting use and/or discontinuation of all prescription medications, over-the-counter medications, herbal and dietary supplements, and other substances or activities that would impact test results
- obtaining sleep logs prior to the MWT to assess sleep-wave schedules
- documenting by polysomnogram the previous night's sleep
- encouraging the patient to dress in comfortable clothes
- obtaining a urine drug screen test if needed, as ordered
- following established standards and facility policy and procedures for the performance of the MWT procedure
- administering questionnaires as appropriate
- providing documentation and reports, i.e., start and stop times for each trial, sleep latency, total sleep time, stages of sleep achieved for each trial, and the mean sleep latency if any.

Section VI: Knowledge Statements in Polysomnography/Sleep Technology

The PSG/Sleep technologist understands:

- the principles of polysomnography/sleep technology and the clinically relevant questions to be answered for each individual patient
- medical terminology and accepted abbreviations
- basic electricity and electrical concepts of analog and digital equipment
- anatomy and physiology, especially cardiopulmonary and neurology
- basic safety issues with multiple equipment interfaces to the patient
- polysomnographic patterns and correlations with specific disorders
- basic breathing mechanisms and airway physiology
- major medication classifications and their possible impact on sleep architecture
- therapeutic modalities (mechanical, pharmacological, surgical, etc.)
- infection control procedures
- professional ethics and appropriate age-specific behaviors.

The PSG/Sleep technologist can identify indications for sleep studies by understanding:

- International Classification of Sleep Disorders
- signs and symptoms for adult sleep disorders
- signs and symptoms for pediatric sleep disorders
- seizure manifestations and classifications.

The PSG/Sleep technologist maintains and improves knowledge and skills by:

- reviewing recordings with sleep medicine physicians on a regular basis
- reading journal articles
- attending continuing education courses relating to polysomnography and sleep medicine
- studying textbooks related to sleep medicine and polysomnography
- participating in hospital inservices, case presentations, and departmental conferences on sleep disorders
- completing online sleep courses
- participating in quality improvement activities and reviews
- participating in professional organizations for polysomnography and sleep medicine

- achieving sleep technologist certification and meeting periodic sleep credential recertification requirements.

The PSG/Sleep technologist understands details of polysomnographic/sleep technology instrumentation:

- computer operation, including file organization and storage
- various types of recording and storage media
- basic concepts of digital recording, including sampling rates, reformatting, aliasing, amplitude and horizontal resolution, digital video, etc.
- interfacing and calibration of ancillary equipment
- use of recording parameters (i.e., filter settings, sensitivity settings)
- electrical safety issues
- limitations of automated scoring modules
- technique for re-referencing and use of a system reference
- audio/video instrumentation, including digital video technology.

The PSG/Sleep technologist can perform duties specific to polysomnography/sleep technology:

- securing and protecting sensors and cables for extended monitoring
- cleaning and sterilization procedures for reusable equipment according to the facility policy and procedures
- reviewing, analyzing, scoring, and extracting clinical events from recorded data
- adjusting video recording system and troubleshooting problems
- adjusting ancillary recording equipment and troubleshooting problems.

The PSG/Sleep technologist understands the use of the following electrodes and sensors:

- surface electrodes for EEG, EOG, ECG, limb and other monitoring
- respiratory inductance plethysmography
- piezo-electric belts
- intercostal EMG
- nasal/oral thermistor
- nasal/oral thermocouple
- nasal pressure transducer
- positive airway pressure/bi-level flow, advanced PAP devices
- snore microphone
- pulse oximetry
- end-tidal CO_2 monitor
- transcutaneous CO_2 monitor
- gastroesophageal reflux monitor
- esophageal pressure monitor.

* Critical test results – any values/interpretations where delays in reporting may result in serious adverse outcomes for patients. MA Coalition for Prevention of Medical Errors; www.macoalition.org/document/CTRPractices.pdf

-- Approved by ASET Board of Trustees March 2011

NATIONAL COMPETENCY SKILL STANDARDS FOR PERFORMING NERVE CONDUCTION STUDIES

Nerve Conduction Study (NCS) providers practice in accordance with the facility policy and procedure manual which details every aspect and modality of testing.

The American Society of Electroneurodiagnostic Technologists, Inc. (ASET) presents this document to provide national criteria for evaluating the competencies needed by technologists to perform Nerve Conduction Studies (NCS). These national competencies were established following the analysis of survey data collected in the Fall of 2004. This document was updated in the Spring of 2010 according to nationally recognized and accepted criteria and approved by ASET's Board of Trustees in March 2011.

Section I: NCS Core Knowledge

The NCS technologist has a level of technical knowledge of electrical conduction of motor and sensory nerves in the human body. The technologist possesses the appropriate knowledge level of diseases to correlate patient history and clinical symptoms to understand the appropriate nerve conduction studies to be performed.

Technical Skills and Other Abilities:

The NCS technologist prepares for the study by:

- ensuring that the laboratory and testing site adheres to Occupational Safety and Health Administration (OSHA) standards
- ensuring that standard precautions are followed
- ensuring that filter, sensitivity, and timebase are accurate according to facility policy and procedures
- explaining the procedure to the patient
- addressing any patient concerns regarding the test
- communicating with patient at the age and educationally appropriate level
- adequately preparing the skin to reduce impedance
- adequately warming site(s) to be tested.

The NCS technologist prepares a data sheet that includes:

- patient demographics (name, date of birth, age, ID number, referring physician, reason for referral)
- procedure date, procedure number, technologist's name, interpreting physician's name
- detailed history pertinent to the referring physician's reason for request, medications (anticoagulants, etc.)
- results and/or copies of other relevant studies.

The NCS technologist identifies and eliminates or reduces artifact by:

- positioning the patient to ensure adequate accessibility and patient comfort
- creating an environment which is optimal for patient relaxation

- cleansing the skin where the electrode will be placed to reduce skin impedance
- placing the stimulus probe so that the cathode is directed towards the recording electrode when stimulating, except when performing H-reflexes, F-waves (late responses)
- recognizing, identifying, and resolving artifacts and determining whether physiologic or nonphysiologic
- applying stimulus at a low intensity level and slowly increasing intensity with each stimulus given
- verifying correct nerve stimulation by observing appropriate muscle contraction
- removing or unplugging extraneous equipment, i.e., diathermy machine, fluorescent lighting, etc.

When studies are completed, the NCS technologist:

- removes recording electrodes and cleans electrodes and stimulation sites according to facility policy and procedures
- prepares the patient and equipment for the needle examination, if applicable
- stores copy of study according to facility policies and procedures (paper, hard copy, electronic media)
- disinfects recording electrodes and stimulator probe according to facility policy and procedures.

The NCS technologist documents the following for physician review:

- waveform latencies in milliseconds
- waveform amplitudes in microvolts or millivolts, as applicable for study
- conduction velocities in meters/second, if applicable
- limb temperature
- any unusual characteristics of the waveforms
- nerve(s) stimulated and recording and stimulation sites with annotation of abnormal nerve responses or technical difficulties encountered.

The NCS technologist should possess the appropriate knowledge to distinguish (not interpret) the difference between normal and abnormal waveforms, and should:

- understand the physiology of the study being performed
- perform studies with adherence to standard precautions and facility infection control policy and procedures
- understand the cause for variance, i.e., artifact vs. disease vs. anomaly
- understand the importance the effect of height can make on certain studies including conduction velocities, F-waves, and H-reflexes
- understand the relevance of abnormalities as associated with clinical symptoms
- understand the importance of morphology
- understand the appropriate use of sensitivity, intensity, timebase, averaging, and duration to maximize and ensure integrity of the response
- determine appropriate studies to provide clarification of disease process and/or clinical correlation.

The NCS technologist:

- reports critical test results* to the interpreting physician and supervisor and documents this communication according to facility policy and procedures.

Section II: Electrical Principles and Instrumentation

The NCS technologist should adhere to the following with regard to electrical safety:

- calibrate or have qualified personnel calibrate the electromyography (EMG)/NCS equipment as recommended by the facility policy and procedures or equipment manufacturer guidelines
- ensure the equipment is turned-on prior to applying or removing electrodes from the patient
- ensure equipment is grounded with a 3-prong electrical plug and outlet that has been checked and monitored for electrical safety and meets facility biomedical guidelines
- maintain safety with protected electrical power cords, ensuring that there is no current leakage
- provide proper grounding for the patient, ensuring that additional metal near the patient does not form a "ground loop"
- understand the physiology of electrical safety in electrically sensitive patients (pacemakers, cardiac catheters, etc.)
- discard disposable electrodes or disinfect reusable electrodes after each patient
- disinfect stimulator probe after each patient per facility policy and procedures
- perform studies with the electrodes plugged only into the equipment amplifier
- guarantee the equipment is clear of all liquids.

The NCS technologist should adhere to the following with reference to the stimulator:

- determine stimulation intensity to produce the proper waveforms by using milliamps (0 to 99 mA) or volts (0 to 400 V)
- coordinate the proper stimulus pulse duration (0.05 msec to 1.0 msec) with the correct stimulus intensity using the correct impulse for each study
- understand the difference in stimulus pulse durations and stimulus intensity and how it affects the patient and the study results
- use the stimulator correctly via the anode (+) and cathode (–) to produce the appropriate waveforms and ensure desired polarity for the particular study being performed
- use a conductive solution (saline or electrode gel) on the stimulator to maximize conductivity.

The NCS technologist should adhere to the following with reference to the electrodes used in nerve conduction studies:

- clean the electrode site to reduce skin impedance
- understand the basis of the active, reference, and ground electrodes as they apply to each study
- apply surface electrodes using disposable or metal electrodes with conductive gel
- evaluate how skin resistance (i.e., oily or rough skin) affects electrode impedance
- position electrodes correctly for each study as determined by facility policy and procedures
- ensure that the ground is place between stimulating and recording sites.

The NCS technologist should adhere to the following with reference to the equipment amplifier:

- record the nerve conduction study at the appropriate sensitivity for each procedure: general guidelines include sensory setting of 5 to 10 µV per vertical division, and motor settings of 1,000 µV (1 mV) to 10,000 µV (10 mV) per vertical division or 1 mV to 10 mV per vertical division
- maintain consistent sensitivity settings and filter settings for each study in accordance with normal values
- identify proper filter settings for each study
- use motor settings that filter frequencies below 1.6 Hz and above 16 KHz
- use sensory settings that filter frequencies below 32 Hz and above 3.2 KHz
- understand the effects of filter settings on each study
- assess the proper timebase for each study
- ensure that the entire waveform acquired is fully displayed on the oscilloscope and is expressed in millisecond per division, or full screen milliseconds
- troubleshoot interference artifact (electrical, 60 Hz, muscle, movement, or stimulus artifact) and eliminate it.

Section III: F-Wave Studies

The NCS technologist obtains F-wave studies utilizing steps that include:

- placing recording, reference, and ground electrodes utilizing anatomical sites for study being performed
- a completed motor study on the nerve from which the F-wave will be obtained to assess nerve status
- adequately warming the patient
- stimulator probe oriented so that the anode is distal to the cathode increasing from a low stimulus intensity to supramaximal until a series of sample F-waves can be obtained
- a series of F-waves to offer a true representation of proximal motor unit status
- the ability to differentiate between A-waves, H-reflex, and F-waves
- waveforms displayed according to facility policy and procedures
- waveform measurements according to facility policy and procedures
- additional studies, if necessary, to clarify abnormalities
- studies tailored to patient history, maximizing information for best diagnostic capability
- comparison studies on the contralateral side if normal values are not established.

The NCS technologist should possess the appropriate knowledge base in order to distinguish (not interpret) the difference between normal and abnormal waveforms, to include:

- cause for variance, i.e., artifact vs. disease
- relevance of abnormalities associated with clinical symptoms
- use of sensitivity, intensity, timebase, and duration to maximize responses
- understanding of appropriate studies, as identified by the supervising physician, to provide clarification of disease process and/or clinical correlation.

Section IV: Repetitive Nerve Studies

The NCS technologist obtains the repetitive nerve stimulation study by:

- ensuring the equipment is appropriately equipped to obtain a repetitive stimulation study
- adequately warming the patient
- ensuring the patient has not taken any form of cholinesterace inhibitor, such as Mestinon®, within the last 24 hours
- positioning the patient to ensure limited/restrained movement during testing
- obtaining a pre-repetitive supramaximal motor conduction study to assess nerve function and ensure correct electrode placement
- placing the stimulus probe in a manner that ensures consistent stimulus in a precise location
- securing the stimulating electrodes to the skin to reduce movement artifact
- utilizing 3 to 10 Hz to stimulate the nerve
- obtaining two pre-exercise repetitive stimulations utilizing a train stimuli determined by facility policies and procedures to notate any decrement and to ensure optimal placement of electrodes and to notate any pre-exercise decrement
- isometrically exercise the patient's muscle and understand how the exercise protocol affects the study (either through directives to the patient, or using 50 Hz stimulus if the patient is unable to cooperate)
- instructing the patient to relax post-exercise
- continuing to test in time intervals as described in facility policy and procedures
- continually supporting the patient through verbal reassurance
- ensuring waveforms are displayed in accordance with facility policy and procedures.

The NCS technologist should possess the appropriate knowledge level in order to distinguish (not interpret) the difference between an abnormal and normal set of waveforms, to include:

- recognizing presence of nonartifactual decremental response and the significance
- recognizing variations of waveforms that can be the result of other neurological disorders, such as botulism poisoning or Lambert-Eaton
- recognizing the effects of neuromuscular blocking agents used in the intensive care unit (ICU)/critical care patient, or in the operating theatre.

Section V: H-Reflex Studies

The NCS technologist obtains the H-reflex utilizing steps that include:

- adequately warming the patient
- placement of recording, reference, and ground electrodes utilizing anatomical sites for the study being performed
- use of nonconnected recording and reference electrodes to ensure proper placement of reference electrode at a point off the muscle being recording, i.e., bone or tendon;
- stimulator probe oriented so that the anode is distal to the cathode
- appropriate submaximal stimulus rate and long duration level to obtain optimal results

- a series of waveforms showing initial appearance of H-reflex from onset through maximal height of amplitude and subsequent attenuation of H-reflex waveform with corresponding increase in motor response
- waveforms displayed according to facility policy and procedures
- waveform measurements according to facility policy and procedures
- studies tailored to patient history, maximizing information for best diagnostic capability
- comparison studies on the contralateral side if normal values are not established.

The NCS technologist should possess the appropriate knowledge level in order to distinguish (not interpret) the difference between an abnormal and normal set of waveforms, to include:

- the cause for variance, i.e., artifact vs. disease
- relevance of abnormalities associated with clinical symptoms
- use of sensitivity, intensity, timebase, and duration to maximize responses
- observe appropriate limb movement with stimulation of the nerve
- understanding of appropriate studies, as identified by the supervising physician, to provide clarification of disease process and/or clinical correlation.

Section VI: Blink Reflexes

The NCS technologist obtains the blink reflex by:

- appropriately grounding the patient
- placement of the recording electrode over the orbicularis oculi bilaterally
- placement of the reference electrode over the outer canthus bilaterally
- connecting the electrodes from the stimulated side of the face into the EMG instrument to display appropriate responses
- connecting the electrodes from the indirectly stimulated side of the face into the EMG instrument to display appropriate responses
- locating the supraorbital notch for stimulation
- ensuring that the cathode is pointed toward the eye
- applying the stimulus at a slow and low intensity level, increasing with each subsequent stimulus given until optimal response is recorded
- maintaining dialogue with patient to prepare patient for next stimulus
- ensuring correct nerve stimulation by observing muscle response, i.e., blinking of the eyes
- recording 3 to 4 waveforms representing the R1, R2, and R2 prime components if obtainable
- measuring latencies for each of the R1, R2, and R2 prime components
- repeating the process for the contralateral side
- ensuring waveforms are displayed according to facility policy and procedures.

The NCS technologist should possess the appropriate knowledge level in order to distinguish (not interpret) the difference between an abnormal and normal set of waveforms, to include:

- recognizing presence or absence of all components (R1, R2, R2 prime) and their significance
- recognizing variations of waveforms for various disease processes, i.e., Bell's palsy, cerebropontine angle tumors, Guillain-Barre syndrome, and multiple sclerosis.

Section VII: Knowledge Base Statements

The NCS technologist possesses the knowledge base necessary to correlate patient history and clinical symptoms in order to understand the appropriate nerve conduction studies, as identified by the supervising physician, in the following disease processes:

- Amyotrophic Lateral Sclerosis (ALS)
- Charcot Marie Tooth (HMSN Type I)/CMT
- Chronic Inflammatory Demyelinating Polyneuropathy (CIDP)
- Friedreich's Ataxia
- Guillain-Barre Syndrome/Acquired Inflammatory Demyelinating Polyneuropathy (AIDP)
- Kugelberg-Welander (adult onset SMA)
- Lambert Eaton Myasthenic Syndrome (LEMS)
- Myasthenia Gravis
- Werdnig-Hoffman (SMA)
- other peripheral nerve injuries and disease processes that may be present.

The NCS technologist maintains and improves knowledge and skills by:

- reviewing NCS records with the electromyographer on a regular basis
- reading journal articles
- studying textbooks related to the field
- attending continuing education courses in NCS and EMG
- completing online NCS courses
- participating in quality assurance/improvement reviews
- participating in professional organizations for neurodiagnostics
- achieving NCS certification and meeting recertification requirements

* Critical test results – any values/interpretations where delays in reporting may result in serious adverse outcomes for patients. MA Coalition for Prevention of Medical Errors; www.macoalition.org/document/CTRPractices.pdf

-- Approved by ASET Board of Trustees, March 2011

NATIONAL COMPETENCY SKILL STANDARDS FOR PERFORMING INTRAOPERATIVE NEUROPHYSIOLOGIC MONITORING

Intraoperative Neurophysiologic Monitoring (IONM) providers practice in accordance with the facility policy and procedure manual which details every aspect and modality of testing.

The American Society of Electroneurodiagnostic Technologists, Inc. presents this document to provide national criteria for evaluating competencies for performing intraoperative neurophysiologic monitoring (IONM).

Intraoperative neurophysiologic monitoring is an advanced level of practice in the neurodiagnostic field. Training and education should reflect this advanced level and achievement of recognized professional credentials should be accomplished.

These national competencies were established following analysis of survey data collected July thru August 2003, with tabulation completed by the ASET Executive Office. This document was updated according to nationally recognized and accepted criteria and approved by ASET's Board of Trustees in March 2011.

Basic knowledge and technical performance, as well as quality patient care and patient interaction, were considered. The technical components include standards of practice defined in the publications of the American Clinical Neurophysiology Society (ACNS) and the American Society of Neurophysiological Monitoring (ASNM). These resources are found on their respective websites: ACNS – www.acns.org; ASNM – www.asnm.org.

Section I: Intraoperative Neurophysiologic Monitoring Core Knowledge

Pre-surgical considerations
The IONM technologist:

- confirms procedure orders for surgical monitoring requested
- obtains relevant patient history
- verifies patient identity according to The Joint Commission Standards
- explains IONM procedure to the patient
- obtains or verifies informed consent for IONM
- reviews all IONM contraindications based on patient history and surgeon orders
- establishes and confirms an online HIPPA-compliant connection with the attending neurophysiologist
- determines monitoring and anesthetic preferences of attending neurophysiologist
- initiates pre-surgical communications with anesthesia team regarding these preferences
- selects montage(s) appropriate for surgical procedure being performed.

Select the appropriate instrumentation and settings
The IONM technologist:

- maintains equipment in good working order and confirms bi-annual maintenance checks have been performed according to the hospital's biomedical standards
- if using preprogrammed templates, is sure that the template for the selected surgery to be performed has appropriately set parameters
- ensures that averager and stimulator are functioning appropriately
- ensures that all stimulators are delivering expected stimuli to the correct site.

Operating room environment
The IONM technologist:

- follows standard precautions for infection control per facility policy and procedures
- avoids contamination of sterile drapes, personnel, instruments, etc.
- passes sterile electrodes to the surgical personnel in an approved sterile fashion
- places bloody or contaminated items in biohazard containers and sharps in a sharps container
- follows hazardous material management guidelines
- observes electrical and general safety precautions in connecting the patient to equipment by arranging cables and equipment to prevent injury.

Intraoperative Neuromonitoring
The IONM technologist:

- confers with the surgeon regarding structures at risk, modalities to be monitored, and documents the conversation
- communicates the IONM preferences of surgeon to the attending neurophysiologist and confirms the appropriateness of modalities to be monitored
- communicates IONM preferences to the anesthesia team and other operating room personnel in a clear, definite, and collegial manner and documents conversation(s)
- before the patient enters the operating room suite, and/or during intubation and prepping:
    - sets up and confirms proper operation of all equipment
    - applies electrodes (primary and backup) and secures placement
    - tests equipment and checks integrity of electrodes by checking and documenting impedances
    - arranges head box, cables, and electrodes for minimization of artifacts and electrical hazards preventing electrodes from being dislodged, dried out, or contaminated with fluids
- obtains initial responses and obligate peaks after induction and prior to incision and sets baselines as appropriate to the procedure; marks waveforms and calculates the absolute latencies, amplitudes, or inter-peak intervals at baseline
- sets or resets baselines as appropriate to the surgical procedure according to the facility policy and procedures, but in all cases prior to any part of the surgery that puts neural tissue at risk
- obtains an interpretation of baselines from the attending neurophysiologist and communicates the information to the surgeon
- throughout the surgery, reports any change in data which meets the alarm criteria outlined in the facility policy and procedure manual

- during the recording, changes methods of data collection as needed according to facility policies and procedures including:
    - adjusting stimulus rate as needed to reduce time-locked artifacts
    - establishing and documenting that stimulating parameters are within safe limits
    - recording from additional electrode derivations in case of technical problems in order to allow continuous recording
    - using a montage that records obligate peak responses from peripheral nerve, spinal cord, subcortical structures, and the cerebral cortex as appropriate.
- at the end of the procedure, removes and discards disposable supplies, especially sharps and contaminated items according to facility policies and procedures; cleans and disinfects equipment, cables, etc.

During and throughout the procedure
The IONM technologist documents:

- procedure
- modalities performed and areas monitored
- surgical maneuvers and events
- levels of inhaled anesthetics, dosage of intravenous anesthetics, and use of muscle relaxants
- blood pressure, temperature, and other physiologic parameters as appropriate
- any and all communications or warnings relevant to patient care:
    - with attending surgeon, surgeon replies, and corrective action taken
    - with attending neurophysiologist
    - with anesthesia team and/or other operating room personnel
- all technical problems and corrective troubleshooting steps performed
- and saves all data according to the practice of medical records retention in the state in which the surgery was performed
- exact time, obligate waveform labels, latencies, and amplitudes for all printed traces as detailed in the facility policy and procedures
- and prepares the documentation for the attending neurophysiologist according to facility policy and procedures.

Intraoperative Communications/Data Analysis
The IONM technologist:

- recognizes significant changes, according to facility alarm criteria, and alerts the surgeon and attending neurophysiologist as detailed in facility policy and procedures
    - if needed, notifies the surgeon that monitoring is momentarily interrupted for troubleshooting
- prepares technologist report of case for the attending neurophysiologist according to facility policy and procedures.

Section II: Knowledge and Skills

The IONM technologist understands:

- critical periods during the surgery when iatrogenic injury is most likely to occur and other points in surgery that could cause possible data changes.
- blood pressure and other physiologic factors

- surgical procedure being performed
- structures at risk
- unique surgical instruments and the effects of their use
- effects of corrective forces exerted by implanted instrumentation
- anatomy of monitored pathways, source of blood supply, electrode derivations, and generators of components and obligate waveforms
- pre-operative deficits, intraoperative injuries, and possible post operative outcomes
- waveform changes generated by ischemia, blood pressure, oxygen saturation, core and limb temperature
- how anesthetic and physiological changes affect desired patient data per modality including:
    - changes in concentration of volatile agents (MAC)
    - interactions between nitrous oxide and potent volatile anesthetics
    - unstable physiological factors such as changes in CO_2, Hemo/Hemato, blood pressure, and metabolic rates
- how the method of delivering anesthetics (inhalation, infusion, bolus injection, low flow inhalation, total intravenous) affects data
- modalities being performed and how to obtain desired data relative to anesthesia
- operating room etiquette in the following areas:
    - use of collodion, acetone, or other flammable materials
    - potentially bio-hazardous material
    - use of sharp electrodes
    - electrical safety issues related to:
        - types of recording and stimulating electrodes
        - cautery units and return grounding pads
        - other instruments that are connected to the patient
        - simultaneous multiple earth grounds and how equipment in the OR can create ground loops
        - use of new equipment in the OR (bio-med checks at individual hospitals)
        - placement of other equipment (blood warmers, microscopes, etc.) effects on the quality of the intraoperative recording
        - placement of power cords relative to other equipment.

The IONM technologist maintains and improves knowledge, skills, and professional stature by any or all of the following:

- hospital in-service programs, especially post-operative review of monitored surgical cases with attending neurophysiologist
- reading books and journal articles
- attending professional meeting, seminars, and online education opportunities
- providing education to staff members
- participating in research activities
- other educational opportunities that become available
- achieving intraoperative neuromonitoring certification and meeting recertification requirements.

Section III: Modalities

As detailed in the facility policy and procedure manual, during the intraoperative neurophysiological monitoring, the IONM technologist:

- discusses anesthetic recommendations for monitoring, in a definitive but cordial manner, with anesthesia staff
- ensures that the data collection portion of the IONM instrument and stimulators are correctly synchronized
- ensures that all stimulators are correctly delivering expected stimuli to the selected side
- chooses the appropriate stimulus rate and adjusts as needed to reduce time-locked artifacts
- has knowledge of stimulation rate and number of averages to obtain the greatest amount of data in the shortest amount of time
- establishes and documents that stimulating parameters are within safe limits
- recognizes, documents, and attempts to eliminate or reduce all artifacts
- establishes baseline values prior to induction of anesthesia and positioning of the patient, if appropriate (as in cases of unstable cervical spine)
- reestablishes baselines accordingly to facility policy and procedures
- performs electrographic measurement of muscle relaxant agents on compound muscle action potentials with techniques used in peer-reviewed scientific literature to ensure that levels are adequate for monitoring motor pathways
- monitors continuously during critical periods of the procedure, documents evoked potential tracings at frequent intervals as directed by facility policy and procedures
- archives data:
    - preserves and archives data based on the facility policy and procedures
    - makes electronic as well as hard copy print outs of data for documentation purposes
    - even in the absence of significant changes, documents waveforms along with descriptions of surgical events.

Intraoperative electroencephalography (EEG)
The IONM technologist:

- selects montage(s) appropriate for surgical procedure being performed according to facility policy and procedures
- selects the appropriate instrumentation settings according to facility policy and procedures and makes instrument changes as appropriate
- recognizes, documents, and attempts to eliminate or reduce all artifacts
- monitors appropriate evoked potential modalities and physiological characteristics appropriate to the EEG monitoring
- understands necessity of recording activity pre-position and post-position of the patient's head
- establishes a preoperative post-anesthetic baseline prior to incision and re-establishes that baseline if necessary
- recognizes and documents all EEG patterns during the monitoring and explains the relevance of the underlying patterns to the performance of IONM monitoring
- recognizes significant EEG changes, according to facility alarm criteria, and alerts the surgeon and attending neurophysiologist as detailed in facility policy and procedure

- documents warnings to surgeon and surgeon's response, as well as any corrective action and/or recovery, following facility policy and procedures.

Spontaneous or evoked electromyography (EMG)
The IONM technologist:

- has knowledge of anesthetic techniques preventing inhibition of neuromuscular junction transmission
- performs electrographic measurement of muscle relaxant agents on compound muscle action potentials with techniques used in peer-reviewed scientific literature to ensure that levels are adequate for monitoring motor pathways
- selects appropriate recording parameters and montage for EMG
- is aware of the resistance to neuromuscular blockade relative to body location
- is aware of the effects of other nonmuscle relaxing agents such as some vancomycin, blood pressure lowering agents, and magnesium
- understands anatomy and physiology of muscles relative and at risk to surgery performed
- understands the appropriate use and safety issues related to subdermal needle electrodes
- recognizes significant EMG activity and alerts the surgeon and attending neurophysiologist according to facility policy and procedures
- understands rate of stimulation relative to neuromuscular blockade during evoked EMG
- uses safety precautions with regard to duration and intensity when performing direct nerve stimulation.

Motor cranial nerve recording
The IONM technologist:

- selects appropriate recording parameters and montage for EMG
- applies needle, adhesive electrodes, or hook-wire recording electrodes to the appropriate muscles to record spontaneous and evoked EMG responses from the specific nerves
- tests impedance and recording function prior to prepping and draping
- performs electrographic measurement of muscle relaxant agents on compound muscle action potentials with techniques used in peer-reviewed scientific literature to ensure that levels are adequate for monitoring motor pathways
- ensures neuromuscular blockade level complies with facility policy and procedures
- monitors the ongoing EMG through a loud speaker or earphone which provides continuous auditory feedback
- provides an appropriate sterile stimulating probe according to the surgeon's preference
- selects appropriate stimulus intensity, duration, and polarity to produce an appropriate muscle response from the cranial nerve being stimulated while being cognizant of patient safety issues
- records spontaneous free-running EMG, signal-triggered EMG, and evoked CMAPs
- informs the attending surgeon of spontaneous activity, mechanical stimulation of the nerve and results of nerve stimulation
- recognizes significant EMG changes, according to facility alarm criteria, and alerts the surgeon and attending neurophysiologist as detailed in the facility policy and procedures

- documents surgical events, warnings to surgeon, etc., as stated in the facility policy and procedures.

Spinal Screw and Direct Nerve Stimulation – Threshold Testing
The IONM technologist:

- selects appropriate recording parameters and montage for EMG
- applies needle, adhesive electrodes, or hook-wire recording electrodes to the appropriate muscles to record spontaneous and evoked EMG responses from the specific nerves
- tests impedance and recording function prior to prepping and draping
- performs electrographic measurement of muscle relaxant agents on compound muscle action potentials with techniques used in peer-reviewed scientific literature to ensure that levels are adequate for monitoring motor pathways
- ensures neuromuscular blockade level complies with facility policy and procedures
- monitors the ongoing EMG through a loud speaker or earphone which provides continuous auditory feedback
- provides an appropriate sterile stimulating probe according to the surgeon's preference
- selects appropriate stimulus intensity, duration, and polarity to produce an appropriate muscle response from the screw or nerve being stimulated while being cognizant of patient safety issues
- is aware of how excessive fluid in the sterile field can cause stimulus shunting and the effect it may have on threshold levels
- records spontaneous free-running EMG, signal-triggered EMG, and evoked CMAPs
- informs the attending surgeon of spontaneous activity, mechanical stimulation of the nerve and results of nerve stimulation
- documents surgical events, screw threshold levels, warnings to surgeon, etc., as stated in the facility policy and procedures.

Intraoperative somatosensory evoked potential (SSEP)
The IONM technologist:

- maintains appropriate stimulating electrode impedance and assures proper stimulation by decreasing stimulus artifact
- maintains appropriate recording electrode impedance, relatively balanced and below 5000 Ohms to ensure proper recording and decrease artifact
- uses a montage that records obligate peak responses from peripheral nerve, spinal cord, subcortical structures, and the cerebral cortex as appropriate
- records from electrodes overlying the scalp surface, peripheral sites of mixed nerves, and from electrodes placed in the spinous process or epidural spaces
- marks waveforms and calculates the absolute latencies, amplitudes, and/or inter-peak intervals at baseline and throughout the monitoring procedure
- is prepared to use alternative stimulating or recording paradigms in order to compensate for complex technical problems.

Localization of sensorimotor cortex
The IONM technologist:

- obtains a relevant patient history
- obtains a pre-incision baseline with surface electrodes to confirm function of the somatosensory pathway and approximate latency of the N20 peak

- selects appropriate timebase, sensitivity, and band pass settings
- selects the appropriate stimulation site (normally, contralateral median nerve)
- uses appropriate electrodes placed or manipulated by surgeon
- prepares stimulus site to reduce stimulating electrode impedance
- monitors subcortical peripheral nerve site to verify stimulus effect
- uses a referential and bipolar montage that records direct cortical responses and allows identification a "phase reversal" and amplitude gradients
- obtains adequate resolution of the obligate waveform components
- records from multiple cortical sites in order to obtain adequate localization
- prints out a hard copy of simultaneous or sequentially recorded SSEPs for the purpose of studying the amplitude gradient and polarity of the responses in relation to the location of the gyri.

Intraoperative brainstem auditory evoked potential (BAEP)
The IONM technologist:

- establishes hearing threshold and documents any existing hearing loss or condition of ear structures
- uses molded ear speakers or insert transducers to avoid contamination of the surgical field
- uses waterproof adhesive tape, Tegaderm™, and/or bone wax to protect the ear speaker and ear canal from blood or fluids
- chooses the appropriate montage, timebase, number of stimuli, sensitivity, and band pass settings
- understands use of condensation, rarefaction, and alternating click to obtain best response as appropriate
- uses an appropriate stimulus intensity based on facility policy and procedures and adjusts intensity based on patient hearing assessment
- has knowledge of the adverse effects on peak components that changing the stimulus rate has and can only adjust the stimulus rate according to facility policy and procedures
- uses an appropriate stimulus rate to resolve the most important BAEP components and maintains the same rate throughout that obtains the most data in the shortest amount of time
- obtains adequate resolution of obligate component(s) waves I, III, and V
- measures and calculates the absolute latencies, amplitudes and inter-peak intervals of obligate peaks at baseline and throughout monitoring
- masks the contralateral ear with appropriate white noise intensity
- continuously monitors the ear ipsilateral to surgical intervention (contralateral ear monitoring is also appropriate for large posterior fossa tumors, or as a control)
- during certain posterior fossa procedures, records direct nerve action potentials from the 8th cranial nerve simultaneously with the BAEPs by:
    - providing the surgeon with a sterile direct nerve electrode for placement on the exposed 8th cranial nerve
    - communicates to the surgeon the correct placement of the recording electrodes
    - using the same auditory clicks to stimulate the ipsilateral ear at the same intensity and stimulus rate as that used with the BAEPs
    - using a montage referencing the direct nerve electrode to the ipsilateral ear
    - selecting appropriate timebase and recording sensitivity to record these high amplitude responses

- reporting significant changes in morphology, latency and amplitude of these responses as outlined in the facility policy and procedures.

Intraoperative transcranial electrical motor evoked potentials (TCeMEP)
The IONM technologist:

- reviews the patient's history/physical checking for medical conditions which may contraindicate the use of TCeMEPs; reviews these findings with the attending neurophysiologist
- chooses the appropriate stimulation sites by measuring the head using the International 10–20 System of electrode placement
- applies stimulating electrodes that are below 5000 Ohms and balanced
- chooses the appropriate muscles to be monitored based on the surgical procedure being performed
- securely applies recording electrodes that are below 5000 Ohms and balanced to ensure proper recording of the muscle activity
- collaborates with the anesthesia team to ensure the proper anesthetic regimen for protocol being used
- collaborates with the anesthesia team to ensure that appropriate mouth and tongue protection is in place according to facility policy and procedures
- chooses the appropriate stimulation parameters including, intensity, duration, and frequency of stimulation delivery
- recognizes significant change, according to facility alarm criteria, and alerts the surgeon and attending neurophysiologist as detailed in the facility policy and procedures.

-- Approved by ASET Board of Trustees, March 2011

NATIONAL COMPETENCY SKILL STANDARDS FOR LONG-TERM MONITORING IN EPILEPSY

LTME providers practice in accordance with the facility policy and procedure manual which details every aspect and type of recording.

The American Society of Electroneurodiagnostic Technologists, Inc. presents this document to provide national criteria for evaluating competencies for performing studies associated with Long-term Monitoring in Epilepsy [LTME]. These national competencies were established following analysis of survey data collected in the summer of 2004. The tabulation was completed by the ASET office and the LTME team, according to the standards set by the Professional Testing Corporation, New York, NY. This document was revised for consistency in terminology with the new Scope of Practice and approved by the ASET Board of Trustees in April 2011.

Basic knowledge and technical performance, as well as quality patient care and patient interaction, were considered. The components include those defined in the publication of *Guideline 12: Guidelines for Long-Term Monitoring for Epilepsy, 2008,* authored by the American Clinical Neurophysiology Society [formerly the American EEG Society]. The ASET *National Competency Skill Standards for Performing an Electroencephalogram* are pre-requisite to the LTME competencies.

Section I: Core Knowledge Statements

LTME technologists will have the knowledge background to interact with the patient and obtain a quality, interpretable LTME recording that will yield information about the brain's neuronal activity. The following statements involve knowledge and concepts that are essential in collecting and processing LTME data.

Scope of Practice:

- Successful completion of national board examinations associated with practice administered by the American Board of Registration of Electroencephalographic and Evoked Potential Technologists, Inc. [ABRET]
- Specific training on procedures unique to LTME
- Additional training on equipment specific for LTME recordings.

Technical Skills and Other Abilities:

[These build on ASET's National Competency Skill Standards for Performing an Electroencephalogram]

- Follows American Clinical Neurophysiology Society [ACNS] guidelines for head measurement [International 10–20 System or modified 10–10 system]
- Is proficient in the best electrode application method using paste, collodion, or electrode caps as appropriate
- Employs methods to ensure electrode security and integrity

- Uses other special electrodes and assists in their application or set-up as needed [i.e., needle, sphenoidal, or subdural and depth electrodes]
- Knows head dressing and wrapping techniques to secure implanted electrode tails and reduce the risk of infection
- Follows facility policy and procedures for infection control
- Follows conscious sedation protocol if indicated
- Knows that sedation is ordered by the attending physician and administered by the resident or the staff nurse; then nursing staff monitors the patient closely
- Follows patient safety protocols especially those for seizures
- Is certified in CPR and knows hospital code for cardio-respiratory arrest
- Knows unit's procedures for high patient acuity [severity of patient's condition], i.e., respiratory distress or arrest codes, contagious diseases, death, etc.
- Is highly skilled in EEG pattern recognition to provide clinical descriptive information to clinical neurophysiologist or surgeon;
- Recognizes or minimizes artifacts, or when possible, eliminates artifacts on recordings in all electrically hostile units such as the operating room [OR]
- Possesses skills and cognitive abilities in videography
- Possesses knowledge and skills in data reformatting and data reduction techniques
- Understands computer operations and networking sufficiently to do basic troubleshooting and to report to information technology [IT] support services
- Is able to create custom montages using implanted electrodes or additional non-standard electrodes
- Able to work under stressful conditions, work quickly and accurately in urgent care areas such as the operating room or the angiography suite
- Recognizes EEG seizure activity and conducts seizure interview, and technical neuroassessment during seizures;
- Alerts nurse of the occurrence of sub-clinical and clinical seizure activity
- Instructs when to inject radioisotope for ictal SPECT scans
- Recognizes and acts appropriately when a patient experiences a respiratory or cardiopulmonary arrest initiating CPR procedures as needed
- Reports critical test results* to the interpreting physician and supervisor and documents this communication according to facility policy and procedures
- Completes and maintains patient documentation for charges, statistics, and medical records
- Demonstrates supportive behaviors necessary for age-specific care.

Knowledge Statements in LTME

The LTME technologist understands principles of LTME and the clinically relevant questions to be answered for each individual patient:

- Medical terminology and accepted abbreviations in LTME
- Basic electricity and electronic concepts of LTME equipment
- Basic safety [patient and electrical] issues relating to the patient and the patient's LTME biomedical equipment
- Basic functional neuroanatomy and neurophysiology relevant to LTME
- Anatomical correlation of EEG waveforms
- Pathologic and nonpathologic factors affecting LTME
- Electrographic correlates of clinical conditions such as generalized tonic-clonic seizures, complex partial seizures, and nonepileptic events

- Current antiepileptic medications and their effects
- Infection control standards [sterile techniques regarding patient and equipment].

The LTME technologist knows indications for LTME:

- Diagnosis of epilepsy
- Classification and characterization of seizures
- Quantification of seizures
- Localization of seizures using surface or implanted electrodes
- Determination of cortical function using electrical stimulation
- Differentiation of epileptic versus non-epileptic events.

The LTME technologist maintains and improves knowledge and skills by:

- Reviewing recording with clinical neurophysiologist or by alternative criteria (such as reviewing reports) on a regular basis
- Reading journal articles
- Attending didactic continuing education courses in clinical neurophysiology
- Studying textbooks related to the field of LTME and epilepsy monitoring
- Participating in hospital in-service and department conferences on LTME patients
- Completing online courses
- Participating in quality assurance/improvement activities and reviews
- Achieving LTM certification and meeting recertification requirements.

The LTME technologist is proficient in LTME recording options.

- Scalp electrodes without video, continuous trace EEG
- Scalp electrodes with video
- Intracranial electrodes with video
- Added scalp and/or sphenoidal electrodes without video
- Added scalp and/or sphenoidal electrodes with video.

The LTME technologist understands details of LTME instrumentation.

- Various types of recording and storage media
- Basic concepts of digital recording, including appropriate sampling rates, aliasing, Nyquist frequency, sampling skew, amplitude resolution, horizontal resolution [analysis time] and digital video specifications
- Effects of recording parameters [filters, gain/sensitivity] on EEG waveforms
- Electrode impedance test current, appropriate amperes for electrode type
- Electrical safety issues of equipment
- Automatic seizure detection software including understanding of basic algorithms used for detection
- Parameters used in event detection, how to alter these parameters and their effects
- Computer operation including organization of file structures and maneuvering around a menu environment
- Calibration appropriate for analog or digital recording and how to make adjustments when standards are not met
- Technique of reformatting and the use of a system reference
- Audio/video instrumentation, including digital video technology.

The LTME technologist knows duties specific to LTME:

- Using electrode application techniques appropriate for extended monitoring and for patients in critical care settings
- Securing and protecting invasive monitoring cable connections
- Assisting with sterile procedures including sphenoidal electrode insertion and dressing patient's head
- Reviewing events detected by automated spike/seizure detection system
- Printing EEG from stored computer data
- Assisting with cortical stimulation and mapping
- Selecting appropriate recording parameters and customizing these parameters based on the case
- Reviewing, analyzing, and extracting clinical events from recorded data
- Adjusting video recording system and troubleshooting problems
- Using safety precautions when caring for patients having seizures
- Assisting in the care and transfer of patients
- Transporting recording equipment as needed.

The LTME technologist understands various types of electrodes.

- Scalp – disk
- Scalp – needle
- Sphenoidal
- Monitoring electrodes [eye movement, EMG, respiratory, etc.]
- Intracranial electrodes
- Subdural strips, grids, cylinders
- Epidural strips, grids
- Depth electrodes
- Different electrode metals and their effects on EEG recording.

Section II: Competencies Needed in LTME

The LTME technologist interacts with the patient to obtain a quality, interpretable LTME recording that will yield information about neuronal activity of the brain. The following statements involve action procedures.

The LTME technologist verifies the integrity of LTME equipment by:

- Calibrating with a square wave electrical pulse of appropriate amplitude and using parameters that will be used during the recording
- Demonstrating biological calibration
- Recognizing and correcting all malfunctions seen with calibration of EEG amplifiers and synchronized video recording
- Having all equipment checked for safety per facility policy and procedures
- Ensuring audio/video equipment is working properly
- Ensuring that peripheral equipment [e.g., cortical stimulator] is properly calibrated, synchronized, and functionally safe
- Maintaining individual logs on equipment malfunctions.

The LTME technologist acquires information and evaluates the patient and his/her needs prior to the procedure by:

- Reading medical records
- Interviewing patient

- Interviewing family/friends
- Discussing with referring physician
- Viewing previously recorded data
- Determining and accommodating the patient's age-specific needs [i.e., mental age, state, comprehension level, disability, and/or other special needs]
- Providing appropriate patient education including expectations and guidelines while in the monitoring unit and explanation of technical procedures, such as limitation of movement, use of event signal devices, continuous audio/video recording, and some loss of privacy
- Answering questions relating to the LTME monitoring procedure
- Answering questions [education/ information] related to subsequent testing procedures, Wada, PET, SPECT, psychological testing, etc.

The LTME technologist prepares a basic data sheet that includes:

- Patient demographic information [name, age, ID number, referring MD, etc.]
- Procedure information: number, recording time, date, technologist's initials
- Significant relevant medical history and clinical findings specific to procedure
- Seizure or event types, duration, frequency, first and last event
- Patient's mental, behavioral, consciousness and neuroassessment baseline states
- All patient medications, drug levels if available
- Results of studies relevant to LTME [PET, MRI, neuropsychology, SPECT].

The LTME technologist follows a method of electrode application that includes:

- Identifying appropriate method of electrode application
- Checking supplies, number of electrode headboxes, interconnector cables, and amplifiers for each patient
- Determining set-up and recording protocols including montage derivations appropriate for the patient
- Using standard precautions for infection control during patient preparation
- Using physician-ordered placement of additional electrodes
- Ensuring security and integrity of electrodes for an extended period of time
- Measuring the patient's head according to the International 10–20 System or modified 10–10 system
- Cleaning patient's scalp and skin prior to electrode application
- Maintaining sterility of incision and implant site
- Discarding or autoclaving electrodes that come in contact with body fluids
- Providing sterile indwelling electrodes [i.e., sphenoidal, etc.]
- Placing appropriate recording reference and ground electrodes in digital recording systems and using spares whenever possible
- Assessing the patient's potential for skin breakdown and taking steps to minimize such a risk.

The LTME technologist obtains a baseline recording from all intracranial electrodes:

- Verifies electrode recording
- Uses appropriate recording and stimulus parameters
- Is able to reformat recording, adding electrode derivations and montages, or other techniques that enhance or clarify the EEG abnormality
- Uses sequential montage arrangement going from left to right, central to temporal, anterior to posterior, superior to inferior
- Verifies accuracy of input connections
- Determines adequacy of scalp site used for recording reference location

- Documents and verifies electrode input descriptors, placement and equipment associations [which electrode name from what anatomical area, plugged into which jack input]
- Follows all recording standards set by ACNS Guidelines for LTME.

The LTME technologist identifies and eliminates or reduces artifacts contaminating the recording of EEG and video:

- Checks the quality of the signal
- Sets equipment gain factors and amplifier parameters appropriately
- Recognizes artifact as physiologic or non-physiologic
- Identifies source of artifact and corrects or eliminates
- Secures headbox/transmitter system to protect against disconnection during seizures or patient events
- Ensures proper grounding of patient and equipment
- Under certain circumstances reviews with medical staff the need for sedatives, relaxants, anesthetics, as appropriate to reduce excessive muscle artifact
- Has knowledge of the instrumentation schematics and can articulate this set-up for troubleshooting purposes
- Recognizes artifacts related to networking and loss of connectivity
- Is able to quickly resolve computer hang-ups or "freezes" and knows data recovery tools.

The LTME technologist is skilled in bedside testing of patients during and after seizures:

- Performs baseline testing appropriate to patient's age and level of development
- Carefully assesses patient's language function by having patient read standardized phrases or name pictures during ictal and post-ictal states and compares results to baseline testing
- Gives patients simple and complex commands during LTME procedures
- Tests memory and cognitive function relative to LTME
- Notifies physician and nursing staff of significant patient events.

The LTME technologist acquires, reviews, and presents selected data to clinical neurophysiologist:

- Sets up seizure detection computer selecting appropriate montage and other parameters, such as alarm level, event detection threshold, sensitivity of detection, etc.
- Reviews complete data from monitoring period by some form of fast review method or reviews data extracted by a computerized automatic event detection system
- Extracts portions of electrographic data for interictal [both wake and sleep] and ictal samples
- Identifies and accurately describes the chronology of clinical correlates during an event
- Selects 2 to 3 minutes of baseline recording before and after an event
- Documents seizure/event clinical behavior, time, and date
- Documents neuroassessment completion and time
- Scores event as "real" or artifactual and selects these for physician review and interpretation
- Documents LTME review on technical worksheet including:
  1. Patient identification
  2. Recording parameters and system integrity check

3. Electrode placement including additional electrodes, input descriptors
4. Diagram of implanted electrodes
5. Patient room and equipment used
6. Any system malfunction and troubleshooting steps
7. Mapping parameters and findings
8. Medication dosages and when anticonvulsants were tapered off or any other changes
9. Clinical events, times, behavioral correlates, patient assessment

- Transfers data between local and network drives from acquisition to review station for data review and permanent storage
- Archives selected portions, such as patient events, for permanent storage
- Prepares a master tape of video and electrographic data
- Prints out and labels all events based on facility policy and procedures
- Prepares a "monitoring report" [shift report] for review by staff taking care of patient during the course of the LTME, summarizing number of events, types of events, special studies needed, precautions necessary, and any other relevant information
- Reviews daily chart notes regarding patient
- Interviews patient or relatives daily to determine if events occurred and any unusual clinical behavior to confirm sensitivity of event detection system.

When the LTME procedure is completed, the LTME technologist:

- Disconnects patient from monitoring equipment, removes scalp electrodes from patient, and cleans scalp noting and taking care of any skin breakdown
- Cleans electrodes and patient equipment
- Replenishes and maintains adequacy of supplies for LTME procedure
- Stores equipment, making it ready for the next procedure.

Section III: Other Associated LTME Practice Statements

Bedside or Intraoperative Localization of Language and Sensorimotor Cortex:

- Assists the physician during motor mapping to identify specific areas of motor function
- Observes the patient carefully and documents movement or sensation during cortical mapping
- Identifies and reports the presence of after-discharges during cortical stimulation
- Assists in accurate localization of the language and sensorimotor cortex or memory areas
- Prepares the equipment for cortical mapping:
    1. Selects and verifies current intensities for mapping
    2. Documents intensities used and results of stimulation
    3. Notes thresholds for after-discharges
    4. Calibrates EEG equipment prior to recording
    5. Selects appropriate timebase, sensitivity and bandpass setting to record after-discharges.

Cortical Recording in the Operating Room [ECoG]:

- Prepares patient for electrocorticography [ECoG] by explaining recording procedure and applying appropriate reference/ground electrodes

- Calibrates and sets up EEG recording equipment using appropriate filters and sensitivity settings
- Selects montages based on electrodes applied to cortex by the neurosurgeon before and during resection
- Identifies and troubleshoots artifacts encountered during the recording
- Maintains and ensures completeness of supplies used for ECoG
- Documents electrographic findings during the recording, completing paperwork for submission to the clinical neurophysiologist.

The Wada Test:

- Prepares equipment and supplies needed for recording in the special procedure;
- Applies electrodes using the International 10–20 System or modified 10–10 system of electrode placement based on ACNS guidelines
- Runs a 10-minute baseline with appropriate montage and filter settings
- Makes notations on the recording as to the time of the injection of medicine, behavioral correlates and any other changes observed during the procedure
- Informs the neuroscience team of the initial change on EEG with injection of medicine, and the return to baseline
- Completes all paperwork associated with the Wada testing procedure.

Home Ambulatory 24-hour EEG:

- Prepares equipment
- Prepares and educates patient on procedure:
    1. Applies electrodes with collodion technique
    2. Explains take-home diary, event button, and computer
    3. Wraps head or has patient bring hat, scarf for travel home
    4. Explains safety precautions
- Upon patient's return to the laboratory:
    1. Removes electrodes and cleans scalp
    2. Correlates patient diary and verbal 24-hr history with acquired data
    3. Identifies events detected and those signaled by patient
    4. Identifies artifacts.
    5. Prints events and transfers event data for review and interpretation by clinical neurophysiologist.

SPECT Scan:

[Understands radiation safety]

- Informs staff assigned to inject radioisotope that a seizure is occurring
- Documents injection of radioisotope
- Disconnects equipment so patient can have the SPECT procedure
- Reconnects EEG recording equipment after SPECT scan.

* Critical test results – any values/interpretations where delays in reporting may result in serious adverse outcomes for patients. MA Coalition for Prevention of Medical Errors; www.macoalition.org/document/CTRPractices.pdf

-- Approved by ASET Board of Trustees April 2011