Commission on Accreditation of Allied Health Education Programs

Standards and Guidelines for the Accreditation of Educational Programs in Intraoperative Neurophysiologic Monitoring

Standards initially adopted in 2013 by the:
American Academy of Neurology
American Clinical Neurophysiology Society
ASET - The Neurodiagnostic Society
American Society of Neurophysiologic Monitoring
Committee on Accreditation for Education in Neurodiagnostic Technology
and
Commission on Accreditation of Allied Health Education Programs

The Commission on Accreditation of Allied Health Education Programs (CAAHEP) accredits programs upon the recommendation of the Committee on Accreditation for Education in Neurodiagnostic Technology (CoA-NDT).

These accreditation **Standards and Guidelines** are the minimum standards of quality used in accrediting programs that prepare individuals to enter the Intraoperative Neurophysiologic Monitoring (IONM) profession. Because we recognize the immediacy and urgency of outcomes for IONM and the importance of critical thinking skills, it is strongly encouraged that these minimum Standards and Guidelines be applied to a Bachelor's degree at a minimum. Standards are the minimum requirements to which an accredited program is held accountable. Guidelines are descriptions, examples, or recommendations that elaborate on the Standards. Guidelines are not required, but can assist with interpretation of the Standards.

Standards are printed in regular typeface in outline form. *Guidelines* are printed in italic typeface in narrative form.

Preamble

The Commission on Accreditation of Allied Health Education Programs (CAAHEP), Committee on Accreditation for Education in Neurodiagnostic Technology (CoA-NDT) and American Academy of Neurology (AAN), American Clinical Neurophysiology Society (ACNS), ASET – The Neurodiagnostic Society and American Society of Neurophysiologic Monitoring (ASNM) cooperate to establish, maintain, and promote appropriate standards of quality for educational programs in Intraoperative Neurophysiologic Monitoring (IONM) and to provide recognition for educational programs that meet or exceed the minimum standards outlined in these accreditation **Standards and Guidelines**. Lists of accredited programs are published for the information of students, employers, educational institutions and agencies, and the public.

These **Standards and Guidelines** are to be used for the development, evaluation, and self-analysis of an IONM program. On-site review teams assist in the evaluation of a program's relative compliance with the accreditation Standards.

Profession Description

Neurodiagnostics is the allied health care profession that records, monitors, and analyzes nervous system function to promote the effective treatment of pathologic conditions. IONM specialists perform these duties in the operating room. Specialists record electrical activity arising from the brain, spinal cord, peripheral nerves, somatosensory or motor nerve systems using a variety of techniques and instruments. Specialists prepare data

and documentation for interpretation by a physician. Considerable individual initiative, reasoning skill, effective communication skills, and sound judgment are all expected of the IONM professional.

IONM Professionals: are credentialed; have met a minimum education level and related educational and performance standards; meet continuing education requirements; perform within a code of ethics and defined scope of practice; are recognized by physicians, employers, the public, governmental agencies, payors and other health care professionals; form a national society whose activities include lobbying for the profession; and contribute to the advancement of knowledge in neuroscience.

I. Sponsorship

A. Sponsoring Institution

A sponsoring institution must be at least one of the following:

1. A post-secondary academic institution accredited by an institutional accrediting agency that is recognized by the U.S. Department of Education, and authorized under applicable law or other acceptable authority to provide a post-secondary program, which awards a minimum of a certificate at the completion of the program.

2. A hospital or medical center that has an articulation agreement with a baccalaureate-level post-secondary academic institution accredited by an institutional accrediting agency that is recognized by the U.S. Department of Education, and authorized under applicable law or other acceptable authority to provide a post-secondary program, which awards a minimum of a certificate at the completion of the program.

3. A branch of the United States Armed Forces, which awards a minimum of a certificate at the completion of the program.

B. Consortium Sponsor

1. A consortium sponsor is an entity consisting of two or more members that exists for the purpose of operating an educational program. In such instances, at least one of the members of the consortium must meet the requirements of a sponsoring institution as described in I.A.

2. The responsibilities of each member of the consortium must be clearly documented in a formal affiliation agreement or memorandum of understanding, which includes governance and lines of authority.

C. Responsibilities of Sponsor

1. The Sponsor must ensure that the provisions of these **Standards and Guidelines** are met.

II. Program Goals

A. Program Goals and Outcomes

There must be a written statement of the program's goals and learning domains consistent with and responsive to the demonstrated needs and expectations of the various communities of interest served by the educational program. The communities of interest that are served by the program must include, but are not limited to, students, graduates, faculty, sponsor administration, employers, physicians, and the public.

Program-specific statements of goals and learning domains provide the basis for program planning, implementation, and evaluation. Such goals and learning domains must be compatible with the mission of the sponsoring institution(s), the expectations of the communities of interest, and nationally accepted standards of roles and functions. Goals and learning domains are based upon the substantiated needs of health care providers and employers, and the educational needs of the students served by the educational program.

The program should document its strategy for monitoring community needs.

B. Appropriateness of Goals and Learning Domains

The program must regularly assess its goals and learning domains. Program personnel must identify and respond to changes in the needs and/or expectations of its communities of interest.

An advisory committee, which is representative of at least each of the communities of interest named in these **Standards**, must be designated and charged with the responsibility of meeting at least annually, to assist program and sponsor personnel in formulating and periodically revising appropriate goals and learning domains, monitoring needs and expectations, and ensuring program responsiveness to change.

C. Minimum Expectations

The program must have the following goal defining minimum expectations: "To prepare competent entry-level intraoperative neurophysiologic monitoring specialists in the cognitive (knowledge), psychomotor (skills), and affective (behavior) learning domains."

Programs adopting educational goals beyond entry-level competence must clearly delineate this intent and provide evidence that all students have achieved the basic competencies prior to entry into the field.

Nothing in this Standard restricts programs from formulating goals beyond entry-level competence.

III. Resources

A. Type and Amount

Program resources must be sufficient to ensure the achievement of the program's goals and outcomes. Resources must include, but are not limited to: faculty; clerical and support staff; curriculum; finances; offices; classroom, laboratory, and ancillary student facilities; clinical affiliates; equipment; supplies; computer resources; instructional reference materials; physician instructional interaction; and faculty/staff continuing education.

Classrooms and laboratories should be able to accommodate the assigned number of students. They should be well lit and ventilated, furnished and equipped according to the standards of an accredited educational institution, and available at times commensurate with the needs of the program and its students.

Equipment and supplies should be functional and representative of current clinical practices. The quantity and quality of equipment and supplies should meet program requirements.

Learning resources should be accessible to students outside of regular classroom hours, e.g. evenings and weekends. Instructional plans should promote student utilization of these resources.

Examples of computer resources are computer-assisted instruction materials, patient care simulations, and access to internet resources and computers.

Clinical affiliates and their laboratories should conform to professional standards of practice and standards established by nationally recognized accrediting organizations.

The purpose of physician instructional interaction and input is both to convey information and perspective, and to develop effective communication skills between physicians and students.

B. Personnel

The sponsor must appoint sufficient faculty and staff with the necessary qualifications to perform the functions identified in documented job descriptions and to achieve the program's stated goals and outcomes.

1. Required Position(s)

a. Program Director

(1) Responsibilities

The Program Director must be responsible for the continuous review, planning, development, and general effectiveness of the program and professional content.

(2) Qualifications

The Program Director must:
(a) hold active verifiable certification or registration within the IONM profession(s);
(b) possess at least a Bachelor's Degree;
(c) have a minimum of three (3) years clinical experience in IONM; and
(d) have a minimum of two (2) years teaching experience in a related field.

Teaching experience should be within the past 5 years and may be demonstrated by: preparation and/or presentation of IONM workshops, scientific sessions, or teleconferences; faculty rank at a university; preparation and presentation of lectures or in-service seminars; and authorship of exams, computer-aided instruction, course objectives or other education materials.

There should be documentation that the Program Director maintains his/her clinical and technical skills and participates regularly in continuing clinical education.

b. Medical Director

(1) Responsibilities

The Medical Director of the program must provide the input necessary to ensure that the medical components of the curriculum, both the didactic and supervised clinical practice, meet current standards of medical practice. He/she shall promote the cooperation and support of practicing physicians.

Two qualified individuals may share the responsibilities of the Medical Director as Co-Medical Directors; however, responsibilities and qualifications should be clearly delineated.

(2) Qualifications

The Medical Director must:
(a) be a neurologist or neurophysiologist licensed to practice in the United States;
(b) be credentialed in a subspecialty that includes IONM
(c) have a minimum of five (5) years experience in IONM; and
(d) have completed 300 IONM cases within the past five years, with at least 60 of the cases requiring physical presence in the operating room

Neurophysiologists include neurosurgeons, orthopedic surgeons, anesthesiologists, or IONM clinical specialists. Neurophysiologists should, by education and training, demonstrate the appropriate skills and knowledge related to IONM.

There should be documentation that the Medical Director maintains his/her clinical skills and participates in continuing medical education.

c. Faculty and Clinical Instructional Staff

(1) Responsibilities

In classrooms, laboratories, and all clinical facilities where a student is assigned, there must be a qualified individual(s) clearly designated to provide instruction, supervision, and timely assessments of the student's progress in meeting program requirements.

(2) Qualifications

Instructors must be appropriately credentialed in the field in which they teach, knowledgeable in subject matter by virtue of training and experience, and effective in teaching assigned subjects.

C. Curriculum

The curriculum must ensure the achievement of program goals and learning domains. Instruction must be an appropriate sequence of classroom, laboratory, and clinical activities. Instruction must be based on clearly written course syllabi that include course description, course objectives, methods of evaluation, topic outline, and competencies required for graduation. The curriculum must include competencies in emergency preparedness consistent with the profession.

1. CoA-NDT Approved Curriculum

The program must demonstrate by comparison that the curriculum offered meets or exceeds the content requirements of the latest edition of the CoA-NDT Graduate Competencies for Performing Intraoperative Neurophysiological Monitoring Procedures (see Appendix B).

2. Clinical Cases

Students must gain practical experience in a significant variety of surgical cases as well as be exposed to a wide variety of monitoring modalities.

D. Resource Assessment

The program must, at least annually, assess the appropriateness and effectiveness of the resources described in these **Standards**. The results of resource assessment must be the basis for ongoing planning and appropriate change. An action plan must be developed when deficiencies are identified in the program resources. Implementation of the action plan must be documented and results measured by ongoing resource assessment.

Other dimensions of the program may merit evaluation as well, such as the admission criteria and process, the curriculum design, and the purpose and productivity of the Advisory Committee.

Records of implementation of the action plan should be maintained for the program. Records should include purpose, measurements, results, analyses, and follow-up.

IV. Student and Graduate Evaluation/Assessment

A. Student Evaluation

1. Frequency and purpose

Evaluation of students must be conducted on a recurrent basis and with sufficient frequency to provide both the students and program faculty with valid and timely indications of the students' progress toward and achievement of the competencies and learning domains stated in the curriculum.

The program should be able to demonstrate inter-rater reliability among those individuals who perform evaluations.

In order to ensure their effectiveness, evaluation methods should undergo frequent reappraisal. The program should demonstrate appropriate updating and revision of the methods employed, or in the formulation of more effective methods.

2. Documentation

Records of student evaluations must be maintained in sufficient detail to document learning progress and achievements.

Records should be maintained by the institution even if a student is not successful in completing the prescribed course of instruction.

B. Outcomes

1. Outcomes Assessment

The program must periodically assess its effectiveness in achieving its stated goals and learning domains. The results of this evaluation must be reflected in the review and timely revision of the program.

Outcomes assessments must include, but are not limited to: national credentialing examination(s) performance, programmatic retention/attrition, graduate satisfaction, employer satisfaction, job (positive) placement, and programmatic summative measures. The program must meet the outcomes assessment thresholds.

"Positive placement" means that the graduate is employed full or part-time in a related field; and/or continuing his/her education; and/or serving in the military.

Program evaluation should be a continuing systematic process in consultation with employers, faculty, clinical instructors, students and graduates, involving internal and external curriculum validation.

2. Outcomes Reporting

The program must periodically submit to the CoA-NDT the program goal(s), learning domains, evaluation systems (including type, cut score, and appropriateness), outcomes, its analysis of the outcomes and an appropriate action plan based on the analysis.

Programs not meeting the established thresholds must begin a dialogue with the CoA-NDT to develop an appropriate plan of action to respond to the identified shortcomings.

Reports should be submitted to the CoA-NDT in accordance with the established policies and timetables.

V. Fair Practices

A. Publications and Disclosure

1. Announcements, catalogs, publications, and advertising must accurately reflect the program offered.
2. At least the following must be made known to all applicants and students: the sponsor's institutional and programmatic accreditation status as well as the name, mailing address, web site address, and phone number of the accrediting agencies; admissions policies and practices, including technical standards (when used); policies on advanced placement, transfer of credits, and credits for experiential learning; number of credits required for completion of the program; tuition/fees and other costs required to complete the program; policies and processes for withdrawal and for refunds of tuition/fees.
3. At least the following must be made known to all students: academic calendar; student grievance procedure; criteria for successful completion of each segment of the curriculum and graduation; and policies and processes by which students may perform clinical work while enrolled in the program.
4. The sponsor must maintain, and make available to the public, current and consistent summary information about student/graduate achievement that includes the results of one or more of the outcomes assessments required in these Standards.

The sponsor should develop a suitable means of communicating to the communities of interest the achievement of students/graduates (e.g. through a website or electronic or printed documents).

The program should document how complaints are addressed and describe how new needs are met.

B. Lawful and Non-discriminatory Practices

All activities associated with the program, including student and faculty recruitment, student admission, and faculty employment practices, must be non-discriminatory and in accord with federal and state statutes, rules, and regulations. There must be a faculty grievance procedure made known to all paid faculty.

C. Safeguards

The health and safety of patients, students, and faculty associated with the educational activities of the students must be adequately safeguarded.

All activities required in the program must be educational and students, whether compensated or not, must not be substituted for staff nor left alone with patients.

D. Student Records

Satisfactory records must be maintained for student admission, advisement, counseling, and evaluation. Grades and credits for courses must be recorded on the student transcript and permanently maintained by the sponsor in a safe and accessible location.

E. Substantive Changes

The sponsor must report substantive change(s) as described in Appendix A to CAAHEP/CoA-NDT in a timely manner. Additional substantive changes to be reported to the CoA-NDT within a reasonable period of time include:

1. faculty;
2. program delivery method (seated or distance);
3. curriculum; and
4. department, college, or hospital-wide changes that have an impact on the program and affect compliance with the Standards.

F. Agreements

There must be a formal affiliation agreement or memorandum of understanding between the sponsor and all other entities that participate in the education of the students describing the relationship, roles, and responsibilities of the sponsor and that entity.

APPENDIX A

Application, Maintenance and Administration of Accreditation

A. Program and Sponsor Responsibilities

1. Applying for Initial Accreditation

a. The chief executive officer or an officially designated representative of the sponsor completes a "Request for Accreditation Services" form and returns it electronically or by mail to:

Committee on Accreditation for Education in Neurodiagnostic Technology
1449 Hill Street
Whitinsville, MA 01588

The "Request for Accreditation Services" form can be obtained from the CAAHEP website at http://ras.caahep.org/.

Note: There is **no** CAAHEP fee when applying for accreditation services; however, individual committees on accreditation may have an application fee.

b. The program undergoes a comprehensive review, which includes a written self-study report and an on-site review.

The self-study instructions and report form are available from the Committee on Accreditation for Education in Neurodiagnostic Technology (CoA-NDT). The on-site review will be scheduled in cooperation with the program and CoA-NDT once the self-study report has been completed, submitted, and accepted by the Committee on Accreditation for Education in Neurodiagnostic Technology.

2. Applying for Continuing Accreditation

a. Upon written notice from the CoA-NDT, the chief executive officer or an officially designated representative of the sponsor completes a "Request for Accreditation Services" form, and returns it electronically or by mail to:

Committee on Accreditation for Education in Neurodiagnostic Technology
1449 Hill Street
Whitinsville, MA 01588

The "Request for Accreditation Services" form can be obtained from the CAAHEP website at http://ras.caahep.org/.

b. The program may undergo a comprehensive review in accordance with the policies and procedures of the CoA-NDT.

If it is determined that there were significant concerns with the conduct of the on-site review, the sponsor may request a second site visit with a different team.

After the on-site review team submits a report of its findings, the sponsor is-provided the opportunity to comment in writing and to correct factual errors prior to the CoA-NDT forwarding a recommendation to CAAHEP.

3. Administrative Requirements for Maintaining Accreditation

a. The program must inform the CoA-NDT and CAAHEP within a reasonable period of time (as defined by the committee on accreditation and CAAHEP policies) of changes in chief executive officer, dean of health professions or equivalent position, and required program personnel (Refer to Standard III.B.).

b. The sponsor must inform CAAHEP and the CoA-NDT of its intent to transfer program sponsorship. To begin the process for a Transfer of Sponsorship, the current sponsor must submit a letter (signed by the CEO or designated individual) to CAAHEP and the CoA-NDT that it is relinquishing its sponsorship of the program. Additionally, the new sponsor must submit a "Request for Transfer of Sponsorship Services" form. The CoA-NDT has the discretion of requesting a new self-study report with or without an on-site review. Applying for a transfer of sponsorship does not guarantee that the transfer of accreditation will be granted.

c. The sponsor must promptly inform CAAHEP and the CoA-NDT of any adverse decision affecting its accreditation by recognized institutional accrediting agencies and/or state agencies (or their equivalent).

d. Comprehensive reviews are scheduled by the CoA-NDT in accordance with its policies and procedures. The time between comprehensive reviews is determined by the CoA-NDT and based on the program's on-going compliance with the Standards, however, all programs must undergo a comprehensive review at least once every ten years.

e. The program and the sponsor must pay CoA-NDT and CAAHEP fees within a reasonable period of time, as determined by the CoA-NDT and CAAHEP respectively.

f. The sponsor must file all reports in a timely manner (self-study report, progress reports, probation reports, annual reports, etc.) in accordance with CoA-NDT policy.

g. The sponsor must agree to a reasonable on-site review date that provides sufficient time for CAAHEP to act on a CoA-NDT accreditation recommendation prior to the "next comprehensive review" period, which was designated by CAAHEP at the time of its last accreditation action, or a reasonable date otherwise designated by the CoA-NDT.

Failure to meet any of the aforementioned administrative requirements may lead to administrative probation and ultimately to the withdrawal of accreditation. CAAHEP will immediately rescind administrative probation once all administrative deficiencies have been rectified.

4. Voluntary Withdrawal of a CAAHEP- Accredited Program

Notification of voluntary withdrawal of accreditation from CAAHEP must be made by the Chief Executive Officer or an officially designated representative of the sponsor by writing to CAAHEP indicating: the desired effective date of the voluntary withdrawal, and the location where all records will be kept for students who have completed the program.

5. Requesting Inactive Status of a CAAHEP- Accredited Program

Inactive status for any accredited program may be requested from CAAHEP at any time by the Chief Executive Officer or an officially designated representative of the sponsor writing to CAAHEP indicating the desired date to become inactive. No students can be enrolled or matriculated in the program at any time during the time period in which the program is on inactive status. The maximum period for inactive status is two years. The sponsor must continue to pay all required fees to the CoA-NDT and CAAHEP to maintain its accreditation status.

To reactivate the program the Chief Executive Officer or an officially designated representative of the sponsor must provide notice of its intent to do so in writing to both CAAHEP and the CoA-NDT. The sponsor will be notified by the CoA-NDT of additional requirements, if any, that must be met to restore active status.

If the sponsor has not notified CAAHEP of its intent to re-activate a program by the end of the two-year period, CAAHEP will consider this a "Voluntary Withdrawal of Accreditation."

B. CAAHEP and Committee on Accreditation Responsibilities – Accreditation Recommendation Process

1. After a program has had the opportunity to comment in writing and to correct factual errors on the on-site review report, the CoA-NDT forwards a status of public recognition recommendation to the CAAHEP Board of Directors. The recommendation may be for any of the following statuses: initial accreditation, continuing accreditation, transfer of sponsorship, probationary accreditation, withhold of accreditation, or withdrawal of accreditation.

The decision of the CAAHEP Board of Directors is provided in writing to the sponsor immediately following the CAAHEP meeting at which the program was reviewed and voted upon.

2. Before the CoA-NDT forwards a recommendation to CAAHEP that a program be placed on probationary accreditation, the sponsor must have the opportunity to request reconsideration of that recommendation or to request voluntary withdrawal of accreditation. The CoA-NDT's reconsideration of a recommendation for probationary accreditation must be based on conditions existing both when the committee arrived at its recommendation as well as on subsequent documented evidence of corrected deficiencies provided by the sponsor.

The CAAHEP Board of Directors' decision to confer probationary accreditation is not subject to appeal.

3. Before the CoA-NDT forwards a recommendation to CAAHEP that a program's accreditation be withdrawn or that accreditation be withheld, the sponsor must have the opportunity to request reconsideration of the recommendation, or to request voluntary withdrawal of accreditation or withdrawal of the accreditation application, whichever is applicable. The CoA-NDT's reconsideration of a recommendation of withdraw or withhold accreditation must be based on conditions existing both when the CoA-NDT arrived at its recommendation as well as on subsequent documented evidence of corrected deficiencies provided by the sponsor.

The CAAHEP Board of Directors' decision to withdraw or withhold accreditation may be appealed. A copy of the CAAHEP "Appeal of Adverse Accreditation Actions" is enclosed with the CAAHEP letter notifying the sponsor of either of these actions.

At the completion of due process, when accreditation is withheld or withdrawn, the sponsor's Chief Executive Officer is provided with a statement of each deficiency. Programs are eligible to re-apply for accreditation once the sponsor believes that the program is in compliance with the accreditation Standards.

Note: Any student who completes a program that was accredited by CAAHEP at any time during his/her matriculation is deemed by CAAHEP to be a graduate of a CAAHEP-accredited program.

APPENDIX B
GRADUATE COMPETENCIES FOR PERFORMING INTRAOPERATIVE NEUROPHYSIOLOGIC MONITORING (IONM)

The following competencies for performing Intraoperative Neurophysiologic Monitoring (IONM) are required for the education of postsecondary students in IONM programs.

Programs should award a minimum of a Bachelor's degree at the completion of the program.

The curriculum should ensure graduates understand that IONM is a rapidly changing field which may, from time to time, involve new intraoperative recording modalities. The graduate should be familiar with these modalities and be able to apply them in the operating room. In addition, graduates should understand commonly accepted professional standards and guidelines in the field.

I. GENERAL COMPETENCIES FOR IONM (NOTE: INDIVIDUAL TESTING PROCEDURES FOLLOW)

A. Upon completion of the program, the graduate will have observed operating room conduct by:

1. following standard (Universal) precautions and transmission-based precautions, observing hospital policies surrounding clothing, caps, shoe covers and masks;
1. avoiding contamination of sterile drapes, personnel, instruments, etc. and having an understanding of the sterile field;
2. following patient confidentiality standards as set by the Health Insurance Portability and Accountability Act (HIPAA);
3. passing sterile electrodes to the surgical personnel in an approved sterile manner;
4. placing bloody or contaminated items in biohazard containers and sharps in a sharps container;
5. following hazardous material management guidelines; and
6. complying with operating room protocols for emergency and disaster situations.

B. Upon completion of the program, the graduate will have provided a safe recording environment by:

1. verifying identity of patient according to the National Patient Safety Standards of The Joint Commission;
2. obtain sterile electrodes before procedure and clean or dispose of electrodes after each procedure;
3. attending to patient needs appropriately;
4. recognizing/responding to life-threatening situations;
5. being certified to perform CPR;
6. following and documenting operating room (OR) protocols for sedation;
7. maintaining instrument/equipment in good working order;
8. taking appropriate precautions to ensure electrical safety;
9. understanding the underlying disease and formulating a recording strategy based on the patient's needs during his/her responsibilities, in conjunction with a supervisor;
10. having all equipment checked for safety annually or more frequently as indicated by written policy;
11. maintaining individual equipment logs (safety checks, break downs, repairs, and such) as required;
12. using general safety precautions in arranging cables and equipment to prevent injury; and
13. always making sure a ground electrode is appropriately placed.

C. Upon completion of the program, the graduate will have prepared a basic patient information sheet that includes critical thinking regarding:

1. patient information (name, age, ID number, doctor, etc.);
2. the name of the surgical procedure that is being performed;
3. recording time, date, and graduate's name or initials;
4. noting current pertinent patient history and familial medical history; and clinical findings specific to the modality studied and/or surgical procedure;
5. listing current medications/sedation and time of last dosage especially prior to and during surgical procedure;
6. noting contraindications to recording modalities specifying the patient's mental, behavioral, and consciousness states;
7. diagramming skull defects or physical anomalies, if any, as related to stimulating for motor cortex and/or scalp;
8. identifying any modifications in electrode placement during OR procedure;

9. results of relevant studies i.e. in patient history; and
10. communicating possible contra-indications to monitoring to the surgical team.

D. Upon completion of the program, the graduate will have demonstrated the following (conducted before the patient enters the Operating Room and/or during intubation and prepping):

1. collecting patient history information (from patient, surgeon, or patient's chart as appropriate) prior to induction of the patient;
2. establishing a monitoring plan based upon history and exam documentation and understanding patient's conditions that may affect monitoring;
3. following protocol based on surgical procedure and maintaining respect and patient confidentiality according to Health Information Portability and Accountability Act (HIPAA);
4. verifying ID bracelet, patient name, birth date, type and level of procedure prior to induction of patient;
5. accommodating monitoring techniques for disabilities and/or special needs;
6. discussing anesthetic recommendations for monitoring per established department protocols, in a cordial manner, with anesthesia staff (this should include a discussion of the effects different types of anesthetics have on the planned monitoring);
7. referring potential conflict between the planned anesthesia and the monitoring to the appropriate personnel;
8. documenting all communications related to these discussions;
9. confirming with surgeon and appropriate personnel which structures are at risk and modalities to be monitored prior to surgery;
10. confirming with the surgeon his/her understanding of what is involved with the surgery, relaying any changes as appropriate, and documenting conversation(s) prior to induction of the patient;
11. explaining all IONM test procedures and explains electrode application if patient is awake and signing consent per hospital policy;
12. setting up equipment and performing calibration appropriate for equipment type prior to induction of the patient;
13. testing equipment and checking integrity of electrodes by checking and documenting impedances;
14. arranging head box, cables and electrodes for minimization of artifacts, and to prevent electrodes from being dislodged, dried or contaminated with fluids;
15. recognizing and correcting malfunctions seen in calibrations;
16. applying electrodes according to standards in E. below;
17. discussing the need for soft padding to be placed in the mouth to prevent injury from stimulation and reaching an agreement about who will be responsible for this (graduate or anesthesiologist) per department protocols;
18. double checking bite block prior to obtaining baselines and intermittently throughout procedure as appropriate per established department protocols;
19. obtaining baseline recordings after induction and prior to intubation and/or positioning, and then again after positioning of the patient and/or prior to skin incision per established department protocols;
20. reporting baseline findings;
21. documenting vital signs present at time of baseline; and
22. assuring there is reliable communication with the supervising neurophysiologist and when remote monitoring is used, connects on-line to remote monitoring work station and assures computer dialog with appropriate personnel.

E. Upon completion of the program, the graduate will have demonstrated an electrode application method that includes:

1. measuring, marking and applying electrodes according to commonly accepted national and international standards;
2. cleaning and prepping patient's skin prior to electrode application;
3. applying electrodes (primary and backup) and securing placement, and cleaning or disposing properly after each use;
4. using appropriate electrodes based on stimulus or recording sites;
5. adjusting electrode placement for anatomical defects or anomalies, documenting changes as appropriate for the recording or stimulation of neurophysiological data; and
6. applying electrodes with a method appropriate to type, site and purpose and verifying electrode impedances within the range of normal.

F. Upon completion of the program, the graduate will have reported and documented the following during the procedure:

1. appropriate bite blocks are in place following positioning;
2. montage, filters, paper speed, & sensitivity setting changes;
3. surgical maneuvers and events;
4. levels of inhaled anesthetics, infusion rates of IV anesthetics, dosage of other IV medications administered, and use of muscle relaxants;
5. blood pressure, temperature and other physiologic parameters as appropriate per department protocols;
6. surgical events which may impact the results;
7. any special stimulation or assessment procedures;
8. routine communications with appropriate personnel;
9. changes in the monitored signals and communicates with the surgeon and supervising neurophysiologist regarding the changes, according to documented policy and procedure alarm criteria;
10. unexpected interruptions of monitoring for technical reasons (machine shutdowns, anesthetic levels too high, continuous use of electrocautery, artifact from C-arm, etc);
11. all changes noted in the records including information related to the cause (technical, anesthetic, physiological, etc);
12. ALL WARNINGS TO ATTENDING SURGEON, SURGEON REPLIES, AND CORRECTIVE ACTION TAKEN;
13. critical communications with anesthesia team or other OR personnel;
14. all waveform tracings (printed and/or electronically archived - if “waterfall” display is used, each waveform must be fully visible);
15. exact time, peak labels, latencies and amplitudes for all printed traces as dictated by department or service policies;
16. technical details of the monitoring according to department protocols; and
17. input and assistance of others, per established department protocols.

G. Upon completion of the program, the graduate will have obtained an IONM recording that includes:

1. a pre-incision anesthetized baseline;
2. additional baselines as may be necessary related to positioning or preintubation;
3. continuous monitoring during the surgical procedure;
4. periodic checks of electrode impedance;
5. reliably interpretable waveforms which are relatively artifact free and exhibit good replication;
6. use of appropriate recording and stimulus parameters; and
7. obligate EP waveforms displayed according to recommended standard or policy.

H. Upon completion of the program, the graduate will have identified and eliminated/reduced artifacts contaminating the waveforms by:

1. checking the quality of the raw signal regularly or whenever needed;
2. understanding the meaning and significance of artifact rejection;
3. understanding and enhancing the relationship of signal to noise ratio by various means including but not limited to increasing the number of sweeps, changing the repetition rate etc;
4. recognizing whether the artifact is physiologic or non-physiologic;
5. identifying source of the artifact (poor electrode application, malfunctioning stimulator, or positioning of cables) and correcting it accordingly;
6. calculating frequency in Hz of rhythmic artifacts and understanding the effects of aliasing;
7. proper grounding of the patient and equipment; and
8. identifying and documents extraphysiological artifacts, ie. recording of EMG activity during IONM procedure if required.

I. Upon completion of the program, the graduate will have demonstrated customization of the recording procedure by:

1. evaluating initial observed waveforms to assess any protocol modifications required;
2. additional electrode derivations and other techniques as needed to enhance or clarify the waveforms as a result of changes occurring during the recording process;
3. selecting montages appropriate for abnormalities seen and/or expected;
4. selecting appropriate instrument settings; and
5. applying additional electrodes to localize abnormal amplitude and frequency of activity.

J. Upon completion of the program, the graduate will have demonstrated the following at the end of the procedure:

1. discarding disposable supplies, especially sharps and contaminated items, in an approved manner;

2. cleaning and disinfecting equipment, cables, etc.;
3. checking patient for burns, skin breakdown under electrode site/tape, and documenting incidents according to hospital policy and procedures;
4. appropriately cleaning patient's scalp, hair, and skin to remove paste or materials left from the procedure;
5. completing the detailed test data worksheet that may include, but is not limited to:
   a. montage;
   b. time and voltage calibration scales;
   c. filter settings;
   d. side stimulated;
   e. stimulus parameters-type, (polarity, rate, duration, delay, and, intensity);
   f. number of trials averaged;
   g. polarity convention;
   h. other modality-specific relevant information such as hearing thresholds, limb length and height;
   i. sedation/anesthesia and dosage; and
   j. obligate peaks with latencies and amplitudes.
6. preparing hard copy of the waveforms if required by lab policy; and
7. storing information on electronic media according to department policy.

II. KNOWLEDGE BASE FOR PERFORMING IONM

A. Upon completion of the program, the graduate will have explained:

1. functional anatomy and physiology as pertains to the underlying disease process and surgical procedure being performed;
2. medication effects on the IONM background and waveforms;
3. medical terminology and appropriate abbreviations;
4. signs, symptoms, and IONM correlates for common medical and surgical disorders;
5. signs, symptoms, and IONM correlates for intraoperative neurological complications;
6. seizure manifestations, classifications, and IONM correlates;
7. psychiatric and psychological disorders; and
8. the availability of standards and guidelines of the ACNS, AAN or other pertinent professional organization.

B. Upon completion of the program, the graduate performing intraoperative neurophysiologic monitoring will have explained:

1. the optimal anesthetics for the modalities being monitored and preferences to be communicated effectively to the anesthesiologist documenting all communications related to these discussions;
2. the importance of effective communication among all involved personnel concerning what is involved in the surgery, what structures are at risk and documenting and appropriate communication with the supervising neurophysiologist;
3. vital signs and other physiologic factors, and their potential effects upon the monitoring being performed;
4. the international system of electrode measurement and placement, and can demonstrate proficiency in this skill;
5. the value of preoperative testing EPs, EEG and EMG for these patients;
6. surgical procedure being performed;
7. critical periods during the surgery where monitoring is most crucial;
8. structures at risk and times of greatest risk;
9. unique surgical instrumentation and implants and their potential effects;
10. impact of preoperative deficits and intraoperative injuries on post-operative outcomes;
11. waveform changes generated by:
    a) ischemia;
    b) changes in blood pressure;
    c) oxygen saturation;
    d) temperature, core and limb;
    e) technical factors and artifacts; and
    f) anesthesia.
12. the principles of modern anesthetic techniques:
    a) how specific anesthetic agents affect central and peripheral nerve functioning;
    b) how muscle relaxants change responses, and how to monitor the level of neuromuscular blockade using a "train of four" technique;

c) how specific anesthetics change ongoing EEG;
d) how specific anesthetics change the latencies and amplitudes of evoked potentials; and
e) how the method of delivering anesthetics (inhalation, infusion, bolus injection, low flow inhalation) affects EEG and evoked potentials.

13. inhaled anesthetic volatility and related Minimal Alveolar Concentration (MAC) values;
14. effects of changes in concentration of volatile agents (MAC) on patient and on monitoring;
15. interactions between nitrous oxide and other volatile anesthetics;
16. any unstable physiological factors such as changes in CO2 and hematocrit;
17. the operating room environment:
    a) Operating room etiquette;
    b) The use of collodion, acetone or other flammable materials;
    c) Potentially biohazardous material; and
    d) Sharp electrodes.
18. electrical safety issues related to:
    a) Types of recording and stimulating electrodes;
    b) Cautery units and return grounding pads;
    c) Other instruments that are connected to the patient;
    d) Multiple grounds; and
    e) Use of new equipment in the OR (bio-med checks at individual hospitals).
19. infection Control and Safety issues surrounding correct protocols for reusable electrode/probe sterilization requirements;
20. effects of other equipment (blood warmers, OR table, patient warmers, electrocautery units, microscopes, etc.), on the quality of the intraoperative recording;
21. troubleshooting; and
22. understands general roles, responsibilities and limitations appropriate to his/her credentials.

C. Upon completion of the program, the graduate will have demonstrated an understanding of how knowledge and skills are maintained and improved by:

1. participating in hospital in-service programs, especially post-operative review of monitored surgical cases;
2. reviewing IONM tracings with interpreting neurophysiologist on a regular basis;
3. reading books and journal articles related to the field of IONM;
4. attending professional meetings and seminars;
5. attending continuing education courses in electroneurodiagnostics and intraoperative monitoring;
6. obtaining required continuing education credits to maintain all related current credentials in the field;
7. pursuing opportunities to participate in outcomes studies and/or other research activities; and
8. pursuing opportunities to participate in professional organizations.

D. Upon completion of the program, the graduate will have demonstrated a basic historic knowledge of analog NDT technology including:

1. differential amplifier input concepts;
2. understanding the “grid” concept with respect to anode and cathode designation; and
3. applying positive/negative and near/far field potentials to the grid concept.

E. Upon completion of the program, the graduate will have demonstrated application of the current digital principles of electronics and mathematics to a recording by:

1. knowing how differential amplifiers work;
1. determining the amplitude, latency and frequency of waveforms;
2. calculating the duration of waveforms;
3. understanding the polarity of the waveforms;
4. understanding impedance; and
5. understanding analog to digital conversion and the effects of the sampling rate theory.

F. Upon completion of the program, the graduate will have recognized that digital IONM systems have preset acquisition templates and therefore will have verified the integrity of the recording system by:

1. verifying amplifier function;
2. verifying appropriate filter settings;
3. verifying sensitivity settings; and
4. correcting or reporting malfunctions or deviations as appropriate.

G. Upon completion of the program, the graduate will have stated how waveform displays are affected by:

1. amplifier and preamplifier integrity;
2. filter settings;
3. amplifier gain/display gain;
4. referential and bipolar montages;
5. digital filters;
6. electrode types and electrode material composition; and
7. malfunctioning equipment.

H. Upon completion of the program, the graduate will have demonstrated recognition of:

1. normal, abnormal and unobtainable waveforms as related to clinical symptoms and/or diagnosis;
2. variations of waveforms specific for each age range;
3. IONM patterns for levels of consciousness; and
4. subclinical seizure patterns.

I. Upon completion of the program, the graduate will have demonstrated the following core competencies of allied health professionalism:

1. ***Patient care*** that is compassionate, appropriate, and effective for the treatment and promotion of health;
2. ***Principles of professionalism*** as manifested through a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to patients of diverse backgrounds;
3. ***Interpersonal and communication skills*** that result in the effective exchange of information and collaboration with patients, their families, and other health professionals; and
4. ***Systems-based practice*** as manifested by actions that demonstrate an awareness of and responsiveness to the larger context and system of health care, including relevant state and carrier regulations, medical regulatory terminology, malpractice risks, statutory scopes of practice, The Joint Commission requirements, and legal restrictions on health care practice.

III. PERFORMANCE OF NEURODIAGNOSTIC (NDT) IONM

A. Upon completion of the program, the graduate will have stated the requirements for monitoring any surgical case based upon details obtained in Section One above.

B. Upon completion of the program, the graduate will have stated and followed technical criteria:

1. recognizing, documenting and correcting all artifacts;
2. recommending criteria for assessing IONM abnormalities and maturation of components;
3. concerning the aspects, electrical hazards, & recording techniques unique to hostile environments (OR, interventional neuroradiology suites);
4. properly grounding the patient and equipment;
5. including IONM normative data; and
6. including other knowledge as detailed in the ABRET NDT Technology Practice Analyses.

C. Upon graduation, the graduate will have applied the principles and concepts of NDT instrumentation to the recording by:

1. signal averaging and noise reduction;
2. analog to digital conversion including amplitude resolution, sampling rate, analysis time, sampling interval (dwell time), and Nyquist frequency;
3. the function of differential amplifiers including input impedance, common mode rejection, polarity convention, and gain;
4. effects of stimulus & recording parameters on IONM waveforms;
5. the meaning and significance of artifact rejection;
6. electrode impedance and its importance; and

7. basic electricity and electronics concepts and electrical safety.

D. Upon graduation, the graduate will have obtained technically satisfactory recordings in each modality by:

1. discussing anesthetic recommendations for monitoring per established department protocols, in a definitive but cordial manner, with anesthesia staff (this should include a discussion of the effects different types of anesthetics have on the planned monitoring);
2. documenting all communications related to these discussions;
3. understanding anatomy of IONM systems and generators of IONM components;
4. understanding IONM correlates of certain clinical conditions such as neurologic, orthopedic, neurosurgical, and audiologic disorders;
5. understanding pathologic and non-pathologic factors affecting IONMs;
6. understanding the principles of stimulation and accurate placement of recording electrodes;
7. ensuring that the averager and stimulators are correctly synchronized;
8. establishing and documenting that stimulating parameters are within safe limits as per established department protocols;
9. ensuring that all stimulators are correctly delivering expected stimuli to the selected side;
10. choosing the appropriate stimulus rate and adjust as needed to reduce time-locked artifacts;
11. obtaining clearly resolved IONM waveforms and obligate components according to recommended standard or department policy;
12. recording at least two replications demonstrating consistency of latency and amplitude measurements;
13. recognizing, documenting, identifying the source of, and correcting all artifacts;
14. recognizing whether the artifact is physiologic or non-physiologic;
15. calculating frequency in Hz of rhythmic artifacts and understanding the effects of aliasing;
16. enhancing the signal to noise ratio by increasing the number of sweeps;
17. applies additional electrode derivations and other techniques as needed to enhance or clarify abnormalities;
18. checks the quality of the raw signal regularly or whenever needed;
19. establishing baseline values prior to induction of anesthesia and positioning of the patient, if appropriate (as in cases of unstable cervical spine) and according to department protocols;
20. monitoring continuously throughout the procedure - documenting evoked potential tracings at frequent intervals as directed by policy and procedure manuals; and
21. performing other duties as detailed in Section One, General Competencies for IONM.

E. Upon completion of the program, the graduate will have differentiated artifacts from NDT waveforms by:

1. recognizing possible artifactual waveforms;
2. documenting (on the recording) patient movements;
3. applying/recording leads for eye potentials or other physiological potentials (ie. respiration, EMG); applying/recording leads for ECG;
4. replacing electrodes exhibiting questionable activity or contact; and
5. troubleshooting for possible electrical interference;

F. Upon completion of the program, the graduate will have obtained a technically adequate IONM EEG by:

1. recognizing and documenting all EEG patterns that may be seen during the monitoring, and being able to explain their relevance to the performance of IONM;
2. establishing a preoperative, pre-anesthetic baseline if needed per department protocol;
3. establishing a post-anesthetic baseline prior to incision and reestablishing that baseline if necessary due to anesthetic effects, prior to clamping as per department protocols;
4. documenting blood pressure at frequent intervals and whenever there is a significant event;
5. documenting all stages of surgery;
6. the graduate understands and follows technical criteria for:
   a. recording neonatal and pediatric IONM EEG;
   b. procedures associated with cardiovascular surgery; and
   c. procedures associated with sonography.
7. establishing electrocorticography (EcoG) and subdural/depth electrode placement/recording by:
   a. understanding placement of electrodes and sterile method of transfer of connector cables from surgeon or to scrub nurse or coordinator;
   b. connecting cables and creating or identifying montages to record field;

c. adjusting sensitivity parameters appropriately;
d. identifying and troubleshooting artifacts encountered during the recording;
e. recognizing and describing EEG waveforms consistent with epileptogenic foci in surgical field;
f. explaining cortical stimulation procedures;
g. correlating epileptogenic foci with neuroanatomy and clinical behaviors; and
h. completing procedure/paperwork and following infection control standards for electrode connector cables and other IONM equipment.

8. completing Wada test and other radiographic/EEG procedures:
   a. preparing equipment and supplies needed for recording in the special procedure;
   b. applying electrodes using the International 10/20 System of electrode placement based on ACNS guidelines;
   c. running a 10-minute baseline with appropriate montage and filter settings;
   d. understanding angiographic procedures prior to beginning Wada test;
   e. understanding need for prior placement of EEG scalp electrodes before procedure;
   f. understanding anesthetic injection and CNS reaction on EEG brainwaves;
   g. describing brainwave changes as neurologist or other qualified professional establishes clinical behaviors associated with memory, speech, and other neurological testing procedures;
   h. documenting clinical behaviors on EEG recording during Wada testing of left and right hemispheres;
   i. establishing baseline recordings post-Wada procedure; and
   j. completing procedure/paperwork and removing electrodes.
9. performing other duties as detailed in Section I.

G. Upon completion of the program, the graduate will have recognized that Visual Evoked Potentials are not normally recorded in the operating room and obtained a technically adequate VEP if needed by:

1. obtaining relevant ophthalmologic and neurologic history;
2. using a montage that records responses from both hemispheres;
3. assessing the patient's ERG;
4. using LED goggle stimuli in selected patients as may be appropriate;
5. explaining the limitations of use of flash and LED stimuli; and
6. performing other duties as detailed in Section One, General Competencies for IONM.

H. Upon completion of the program, the graduate has recorded technically adequate BAEPs by:

1. obtaining relevant audiologic, neurologic, and/or neurosurgical history, hearing loss, ear infections, dizziness, tinnitus, etc.;
2. assessing the patient's ear canals;
3. noting the results of prior hearing evaluations;
4. documenting any existing hearing loss or condition of ear structures;
5. using molded ear speakers or insert transducers to avoid contamination of the surgical field;
6. using waterproof adhesive tape and/or bone wax to protect the ear speaker and ear canal from blood or fluids;
7. choosing the appropriate montage, timebase, number of stimuli, sensitivity and band pass settings per department protocols;
8. choosing the appropriate click polarity, rate and intensity;
9. establishing hearing thresholds;
10. correlating elevations in thresholds with any existing hearing loss or conditions of ear structures;
11. expressing click intensity measures in equivalent units of dBSL, dBHL or dBSPL;
12. 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;
13. using alternating click polarity to minimize stimulus artifact, or rarefaction or condensation clicks to obtain best response as appropriate;
14. using an appropriate stimulus intensity per department protocols;
15. using an appropriate stimulus rate to resolve the most important BAEP components and maintaining the same rate throughout;
16. obtaining adequate resolution of obligate waves I, III and V;
17. measuring and calculating the absolute latencies, amplitudes, and interpeak intervals of obligate peaks at baseline and throughout monitoring and adjusting the baselines as necessary due to anesthetic and other physiologic changes;
18. masking the contralateral ear with appropriate intensity, when applicable;
19. continuously monitoring the ear ipsilateral to surgical intervention (contralateral ear monitoring is also appropriate for large posterior fossa tumors, or as a control); and

20. performing a latency intensity series for auditory assessment in infants & other patients whenever indicated.

I. Upon completion of the program, the graduate has demonstrated an understanding of how to record direct nerve action potentials from the 8th cranial nerve simultaneously with the BAEPs during certain posterior fossa procedures by:

1. providing the scrub nurse or coordinator for the surgeon with a sterile direct nerve electrode for placement on the exposed 8th nerve;
2. using the same auditory clicks to stimulate the ipsilateral ear at the same intensity and stimulus rate as that used with the BAEPs;
3. using a montage referencing the direct nerve electrode to the ipsilateral ear; and
4. selecting appropriate time base and recording sensitivity to record these high amplitude responses according to department protocols.

J. Upon completion of the program, the graduate has recorded technically adequate SEP data by:

1. obtaining relevant neurologic, orthopedic, and/or neurosurgical history or any other relevant pathway specific information such as the presence of peripheral neuropathy;
2. selecting appropriate timebase, sensitivity and bandpass settings;
3. maintaining stimulating electrode impedance equal and below 5000 ohms to assure proper stimulation and to decrease stimulus artifact;
4. selecting current of sufficient intensity and duration to elicit a motor twitch from the appropriate areas of stimulation;
5. using a montage that records obligate peak responses from peripheral nerve, spinal cord, sub-cortical structures and the cerebral cortex as appropriate (for example, sub-cortical responses can be used for monitoring spinal cord function, but cortical responses would be required in monitoring an aneurysm clipping) as per department protocols;
6. recording from electrodes overlying the scalp surface, peripheral sites and from electrodes placed in the spinous process or epidural spaces, as per department protocols;
7. calculating peripheral nerve conduction velocity;
8. marking waveforms and calculating the absolute latencies, amplitudes and interpeak intervals at baseline and throughout the monitoring procedure as per department protocols;
9. recording from additional electrode derivations in case of technical problems in order to allow continuous recording as per department protocols; and
10. delivering unilateral alternating stimulation of left and right-sided nerves or on special occasions from bilateral stimulation (e.g., infants) per established protocols.

K. Upon completion of the program, the graduate has recorded technically adequate MEP data by:

1. obtaining relevant neurologic, orthopedic, and/or neurosurgical history or any other relevant pathway specific information such as the presence of myelopathy;
2. selecting appropriate timebase, sensitivity and bandpass settings;
3. placing electrodes appropriately on the scalp and maintaining stimulating electrode impedance equal and below 5000 ohms to assure proper stimulation and to decrease stimulus artifact;
4. selecting current of sufficient intensity and duration to elicit a compound muscle action potential from relevant muscle groups;
5. adjusting stimulus parameters such as train, interstimulus interval, voltage and/or current to obtain best possible responses;
6. using a montage that records responses from selected muscle groups appropriate for the operative levels per department protocols;
7. marking waveforms at baseline, documenting latency and/or amplitude of response per department protocols; and
8. marking waveforms throughout the monitoring procedure as per department protocols.

L. Upon completion of the program, the graduate has assisted with specialized training in the localization of "sensorimotor" cortex by:

1. Obtaining a pre-incision baseline with surface electrodes to confirm function of the somatosensory pathway and approximate latency of the N20 peak;
2. Selecting appropriate timebase, sensitivity and band pass settings per department protocols;
3. Selecting the appropriate stimulation site (normally, contralateral median nerve);
4. Recording from appropriate strip or grid electrodes as placed by the surgeon;
5. Preparing stimulus site to reduce stimulating electrode impedance;

6. Monitoring sub-cortical peripheral nerve site to verify stimulus effect;
7. Using a referential montage that records direct cortical responses and produces a physiologic “phase reversal”;
8. Obtaining adequate resolution of the obligate components;
9. Recording from multiple cortical sites in order to obtain adequate localization;
10. Printing out a hard copy of simultaneous or sequentially recorded responses for the purpose of studying the amplitude gradient and polarity of the responses in relation to the location of the gyri; and
11. Performing other duties as detailed in Section I.

M. Upon completion of the program, the graduate has obtained a technically adequate EMG, Evoked EMG/CMAP or Peripheral NAP by:

1. measuring waveforms and distances used in routine nerve conduction studies;
2. choosing the appropriate stimulator type (and recording electrode type) to be used in the sterile field if Evoked EMG/NAP responses will be utilized, based upon established department protocols: for direct peripheral nerve action potentials, this includes the use of a tripolar (+ - +) stimulating electrode, with a single ground between the tripolar stimulator and a (bipolar) recording electrode;
3. correctly passing sterile stimulator (and reference electrode if needed) and/or recording electrodes onto field at the beginning of the procedure, and connecting it/them correctly to the monitoring equipment;
4. choosing the appropriate muscles/nerves to be monitored based on the surgical procedure being performed per department protocols;
5. securely applying recording electrodes that have low and balanced impedance to ensure proper recording of the muscle activity;
6. choosing the appropriate stimulation parameters including intensity, duration, and frequency of stimulation delivery per department protocols;
7. monitoring the ongoing EMG through a loud speaker that provides continuous auditory feedback to the surgical team per department protocols;
8. recognizing appropriate alarm criterion and reporting and documenting alerts per department protocols;
9. verifying the level of neuromuscular blockade through ""TOF"" monitoring throughout monitored portion of the procedure per department protocols;
10. recognizing pedicle screw stimulation thresholds and reporting them per department protocols; and
11. ensuring the neuromuscular blockade is used in a limited manner consistent with policies and procedures.

N. Upon completion of the program, the graduate has obtained a technically adequate Motor Cranial Nerve recording by:

1. applying needle, sticky pads or hook wire recording electrodes to the appropriate muscles to record spontaneous and evoked EMG responses from the specific nerves. Impedance and recording function must be tested prior to prepping and draping;
2. ensuring the neuromuscular blockade is used in a limited manner consistent with policies and procedures;
3. monitoring the ongoing EMG through a loud speaker that provides continuous auditory feedback to the surgical team per department protocols;
4. providing a sterile stimulating probe of monopolar or bipolar concentric type per department protocols, when needed;
5. selecting appropriate current intensity and duration to produce a moderate muscle twitch of the muscles from the cranial nerve being stimulated being cognizant of patient safety issues, and following established department protocols; and
6. recording spontaneous free-running EMG and evoked CMAPs.

O. Upon completion of the program, the graduate has obtained technically adequate waveforms by:

1. checking for pre-existing experiences medical conditions (i.e., indwelling devices such as pacemakers and stimulators, seizure disorder, stroke, significant head injury, intracranial metal objects such as aneurysm clips and metal plating devices, previous spinal instrumentation and motor deficits) and notifying appropriate individuals prior to obtaining baselines when these risk factors are present, per established department protocols;
2. choosing the appropriate stimulation sites by measuring the head using the international 10/20 system of electrode placement and placing electrodes specified per department protocols;
3. choosing the appropriate muscles to be monitored based on the surgical procedure being performed, per established department protocols;

4. securely applying stimulating and recording electrodes that are below 5000 ohms and balanced to ensure proper recording of the muscle activity;
5. choosing the appropriate stimulation parameters including, intensity, duration and frequency of stimulation delivery within ranges specified in approved policy and procedure manual; and
6. ensuring the neuromuscular blockade is used in a limited manner consistent with policies and procedures.