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# Neurophysiologic Intraoperative Monitoring

*Ad Hoc Committee on Advances in Clinical Practice*

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## About This Document

This was prepared by the American Speech-Language-Hearing Association (ASHA) Ad Hoc Committee on Advances in Clinical Practice: Donald E. Morgan, chair; Carol M. Frattali, ex officio; Zilpha T. Bosone; David G. Cyr; Deborah Hayes; Krzysztof Izdebski; Paul Kileny; Neil T. Shepard; Barbara C. Sonies; Jaclyn B. Spitzer; and Frank B. Wilson. Diane L. Eger, 1991–1993 vice president for professional practices, and Teris K. Schery, 1988–1990 vice president for clinical affairs, served as monitoring vice presidents. The contributions of the Executive Board, and select and widespread peer reviewers are gratefully acknowledged. The Legislative Council approved the document as official policy of the Association at its November 1991 meeting (LC 51F-91).

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## I. Introduction

Speech-language pathology and audiology are dynamic and expanding professions with constantly developing technological and clinical advances. Before conducting procedures involving such advances, practitioners must have acquired the knowledge, skills, education, and experience necessary to perform them competently. This policy statement is one of seven documents<sup>1</sup> developed by the Ad Hoc Committee on Advances in Clinical Practice. Each statement expresses the position of the American Speech-Language-Hearing Association (ASHA) concerning specific clinical procedures within the scope of practice of speech-language pathology or audiology, most of which have developed only within the last few years. Each statement further provides guidelines for practitioners performing these procedures. The guidelines consider the knowledge and skills normally associated with the required competencies, the clinical settings recommended for the procedure, and the appropriate involvement of personnel from other disciplines.

Clinical certification by ASHA ensures that practitioners have met the education, knowledge, and experience requirements established by the Association for providing basic clinical services in the professions of speech-language pathology or audiology. Certification in the appropriate profession is necessary, but not sufficient to perform the specific clinical procedure(s) discussed in this statement. The procedure(s) addressed in this document requires the practitioner to obtain education and training beyond that necessary for ASHA certification. Practitioners are bound by the ASHA Code of Ethics to maintain high standards of professional competence. Therefore, practitioners should engage only in those aspects of the professions that are within the scope of their competence, considering their level of education, training, and experience.

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<sup>1</sup> The documents include position statements and guidelines for balance system assessment, electrical stimulation for cochlear implant selection and rehabilitation, evaluation and treatment for tracheoesophageal fistulization/puncture, external auditory canal examination and cerumen management, instrumental diagnostic procedures for swallowing, neurophysiologic intraoperative monitoring, vocal tract visualization and imaging.

## II. Background

In promulgating this policy statement, there is no intention to imply that the practitioner holding ASHA Certification is prepared to conduct the procedure(s); nor is it incumbent on any certified professional to provide the procedure(s) merely because the practitioner holds certification.

The following document is intended as guidelines for the practitioner to ensure the quality of care, welfare, safety, and comfort of those served by our professions.

Neurophysiologic intraoperative monitoring involves continuous direct or indirect electrophysiologic measurement and interpretation of myogenic and neural responses to intraoperative events or modality-specific, controlled stimulation in the course of surgery on or in the vicinity of those structures. An important aspect of intraoperative monitoring is the on-line, moment-to-moment correlation between changes in neurophysiologic responses and intraoperative events. The purpose of intraoperative monitoring is to facilitate the maintenance of the functional and structural integrity of neural structures, at risk for iatrogenic injury.

The principal objectives of neurophysiologic intraoperative monitoring are: (a) to avoid intraoperative injury to neural structures; (b) to facilitate specific stages of the surgical procedure; (c) to reduce the risk of permanent postoperative neurological injury; and (d) to assist the surgeon in identifying specific neural structures.

As this clinical procedure has developed over the past several years, a variety of disciplines have been involved in its development and practice. Prominently figuring among such disciplines as neurology, neurophysiology, anesthesiology, and others is the profession of audiology. Therefore, in many clinical settings, audiologists deliver or are expected to deliver this clinical service.

It is important to note that neurophysiologic intraoperative monitoring is an interactive process involving close collaboration and interaction between the surgical and the monitoring team. Therefore, it is only effective if both parties are knowledgeable and in agreement about the limitations and goals of intraoperative monitoring.

## III. Purpose

The purpose of this position statement is to assist audiologists who are involved in, and those who plan to be involved in, intraoperative monitoring. Specifically, the purposes are: (a) to inform audiologists that performing neurophysiologic intraoperative monitoring is within the scope of practice of audiology; (b) to define the procedure known as neurophysiologic intraoperative monitoring; (c) to advise audiologists of the education, training, circumstances, and precautions that should be considered prior to undertaking this clinical activity; (d) to provide guidance for audiologists as to the knowledge and skills required to perform neurophysiologic intraoperative monitoring; and (e) to educate health care professionals, consumers, and the general public of the services offered by audiologists as qualified health care providers.

## IV. Scope of Practice

It is the position of the American Speech-Language-Hearing Association (ASHA) that neurophysiologic intraoperative monitoring is within the scope of practice of audiologists with the appropriate knowledge base and skills. The purpose of

neurophysiologic intraoperative monitoring is to assist surgeons to minimize or avoid altogether the occurrence of intraoperative injury to neural structures at risk due to the nature of the pathology and their proximity to the surgical field. The practice of neurophysiologic intraoperative monitoring by an audiologist requires knowledge in neuroanatomy and neurophysiology, with special emphasis in neurodiagnostic techniques and their intraoperative applications. In addition, familiarity with the surgical procedure, effects of surgical manipulations and pharmacologic agents on neurophysiologic events, and the ability to recognize those events also is required.

If practitioners choose to perform these procedures, indicators should be developed, as part of a continuous quality improvement process, to monitor and evaluate the appropriateness, efficacy, and safety of the procedure conducted.

## V. Education and Training

Appropriate education and training are the cornerstones of involvement in intraoperative monitoring by audiologists. These should include relevant and appropriate academic training, followed by extensive clinical training in a setting providing the opportunity to be involved in a sufficient number of cases, under the supervision of experienced and competent professionals. It is the practitioner's responsibility to determine whether he/she has obtained the appropriate type and sufficient degree of education and training to be competent in the performance of neurophysiologic intraoperative monitoring. The specific education and training may vary for each type and modality of intraoperative monitoring. For instance, appropriate background and experience in monitoring posterior cranial fossa surgical procedures does not automatically ensure competence in the monitoring of somatosensory evoked potentials during spinal-cord surgery.

## VI. Precautions

Each practitioner should consider the following precautions or circumstances prior to undertaking intraoperative monitoring:

1. Inform institutional and/or regulatory bodies, such as state licensure boards, about these procedures as within the scope of practice;
2. Check with appropriate state licensure boards to ensure that there is no limitation imposed on the scope of audiology practice that restricts the performance of neurophysiologic intraoperative monitoring;
3. Check professional liability insurance to ensure that there is no exclusion applicable to this procedure;
4. Follow the universal precautions to prevent the risk of disease from blood-borne pathogens contained in the Centers for Disease Control *Morbidity and Mortality Weekly Report* (June 24, 1988, *Perspective in Disease Prevention and Health Promotion*, 37 (24), 377–388 or ASHA's AIDS/HIV Update (Asha, 1990);
5. Know whom to contact in the event of a medical emergency;
6. Obtain the informed consent of the patient/client, and maintain complete, and adequate documentation.

## VII. Roles and Definitions

The audiologist has the responsibility of preoperative patient preparation, including placement and securing recording electrodes and stimulators or transducers to avoid interfering with or being dislodged during the surgical procedure. If subdermal needle electrodes are used for recording or stimulus purposes, their placement may be the responsibility of the audiologist or of a

surgeon, as dictated by each institution's policies and procedures. The audiologist is responsible for determining, prior to sterile draping, that the recording electrodes have adequate low impedances and that the stimulators or transducers are delivering the appropriate stimuli in an undisturbed fashion.

The audiologist is also responsible for operating the electrophysiological equipment used in intraoperative monitoring, including its proper maintenance, function, and calibration. The selection of appropriate recording and stimulus parameters is also the responsibility of the audiologist, including safe stimulation, whether or not stimulus modality is acoustic or electric. The audiologist is also responsible for providing safe, effective, high-quality, artifact-free, interpretable recordings.

The on-line intraoperative interpretation of the recorded neurophysiologic responses or events and their correlation with relevant intraoperative surgical events is also the responsibility of the audiologist. This needs to be carried out by means of close interaction and collaboration with the surgical and anesthesia team. The audiologist must apply knowledge of the effects of anesthetics and other intraoperatively administered pharmacologic agents and the knowledge of the surgical procedure to carry out this responsibility, which involves the capability of making on-line distinctions between relevant and irrelevant neurophysiologic changes and, with a good understanding of the limitations imposed by the surgical procedure, to communicate this information to the surgical team in anticipation of steps taken by the surgeon to correct the problem. The audiologist also needs to communicate to the surgical team when a potential problem has been corrected so that surgery may proceed at an optimal pace.

At times, neurophysiologic monitoring involves direct electrical stimulation of the neural or surrounding tissue for the purposes of identification and the determination of morphology, topography, and functional status. The electrical current stimulus may be delivered by means of a hand-held probe by the surgeon or by previously attached surface electrodes. It is the audiologist's responsibility to ascertain that appropriate, safe current levels are being delivered. This implies that the level has to be adjusted to be effective but not potentially damaging.

### **VIII. Knowledge and Skills**

In order to be effective in the performance of intraoperative monitoring, audiologists should have the following knowledge base and skills:

1. Fundamental knowledge in basic and applied neuroanatomy and neurophysiology;
2. Fundamental and applied knowledge in the measurement of bioelectric signals;
3. Fundamental and practical knowledge in electronic instrumentation used in clinical neurophysiology applications;
4. A practical working knowledge of clinical neurophysiology/neurodiagnostic procedures, including technical and interpretive/diagnostic aspects, particularly those related to the neural systems to be monitored in the operating room;
5. A basic knowledge of medical and surgical considerations as they pertain to the procedures to be monitored. The audiologist needs to have a good theoretical knowledge of the specific surgical procedure, anatomical structures encountered, and risk factors specified to the particular surgical procedures;

6. A fundamental understanding of anesthesia and the effects of pharmacological agents used in the operating room on the electrophysiologic events and responses monitored during surgery:
7. A solid understanding of the biological mechanism involved in the electrical stimulation of neural tissue, safe limits of stimulation, and the identification of false-positive and false-negative outcome resulting from electrical stimulation. When the electric stimulus is applied manually by the surgeon by means of a handheld monopolar or bipolar probe, it is the audiologist's responsibility to control the stimulus delivery, including rate and intensity.
8. Direct supervised experience in neurophysiologic intraoperative monitoring, prior to independently monitoring surgical procedures, is necessary. The audiologist should also have a thorough understanding of operating room conditions, sterile fields, and general operating room etiquette.

## References

- American Speech-Language-Hearing Association. (1990, December). Report update. AIDS/HIV: Implications for speech-language pathologists and audiologists. *Asha*, 32, 46-48.
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