American Academy of Neurology Subspecialty Strategic Plan -
Clinical Neurophysiology

I. Introduction

The subspecialty of Clinical Neurophysiology involves the measurement and assessment of function of the central nervous system, peripheral nervous system and skeletal muscle for the purpose of diagnosing and treating neurological disorders. Clinical neurophysiological procedures commonly used in diagnosing and treating neurological disorders include EEG, MEG, EMG, evoked potentials, polysomnography, epilepsy monitoring, intraoperative monitoring, movement monitoring (including electronystagmography), and autonomic nervous system testing. EEG, MEG, EMG, and evoked potentials directly measure spontaneous or evoked electrical or magnetic fields generated by the nervous system or muscle. In contrast, respiratory effort, airflow, oxygen saturation, blood pressure, body motion, secretion, and behavioral monitoring are measured using chemical and mechanical techniques. Electrical, magnetic, mechanical and chemical based tests are used in varying combinations in clinical neurophysiology for epilepsy monitoring, polysomnography, movement analysis, neonatal EEG recording, and autonomic nervous system testing.

The proper selection and application of clinical neurophysiology procedures requires a thorough understanding of clinical neurology, normal neurophysiology, and the abnormal findings that occur in the various neurological disorders being tested. Although the field of clinical neurophysiology encompasses many neurological disorders, those that are most commonly evaluated and treated include: polyneuropathies, motor neuron disease, radiculopathies and plexopathies, mononeuropathies, myopathies, neuromuscular transmission disorders, epilepsy, sleep disorders, cerebrovascular disease, dementia, metabolic/toxic encephalopathies, demyelinating disorders (including multiple sclerosis), developmental and inherited disorders of infancy and childhood, spinal cord disorders, Parkinson’s disease (and other movement disorders), brain tumors and other mass lesions, encephalitis, meningitis, traumatic disorders, orthostatic hypotension and other autonomic disorders. In addition, clinical neurophysiological procedures are typically used to guide the surgeon during vascular, orthopedic and neurosurgical procedures.

The creation this strategic plan is an opportunity for us as a section and as neurologists with a common interest in clinical neurophysiology to review the history of our section and its technology, to outline the current status of our subspecialty, to define both short and long-term goals for our section, as well as identify opportunities and challenges. Key AAN committees will use these plans in developing programs and activities, thus ensuring input regarding our special interests into Academy functions and decision-making. It will also allow these committees to understand the issues of our section and subspecialty so that they can better address our needs and represent our interests.

Mission Statement - The Clinical Neurophysiology Section of the American Academy of Neurology is a professional association dedicated to fostering excellence in clinical neurophysiology and furthering the understanding of central and peripheral nervous system functions in health and disease through education, research, and the provision of a forum for discussion and interaction in order to improve the care of patients afflicted with neurological illnesses.
II. Background/History of Subspecialty or Section

Electroencephalography and the American Clinical Neurophysiology Society (ACNS)

The first American reports in 1935 regarding the recording of human EEG rapidly attracted increasing numbers of academic and clinical investigators who were interested in brain physiology. By the end of World War II, informal communications among those working with EEG spoke of the desirability of forming a professional society dedicated to its applications. In 1946, representatives from several interested groups, including the American Medical Association, the American Physiological Society, and the American Neurological Association, organized the American EEG Society. Pro tem officers were: Herbert H. Jasper, President; Frederic A. Gibbs, Vice-President; Robert S. Schwab, Secretary; and Mary A.B. Brazier, Treasurer. Forty-four established experimental and clinical electroencephalographers joined them as charter members of the Society. The first Annual Meeting was held in Atlantic City NJ in June 1947. The pro tem officers were re-elected for a second term, and 25 new members were added. In 1948, the Society and its members gave financial aid to the International Federation of Societies for EEG and Clinical Neurophysiology to begin publication of *Electroencephalography and Clinical Neurophysiology*, familiarly known as “The EEG Journal”. The first issue appeared in 1949. The Editor was Herbert Jasper, and many members of AEEGS were among the editorial staff.

In 1949 a five-member semi-autonomous Board of Qualification of the American EEG Society was appointed and assigned the task of developing examinations to define competence in the practice of clinical EEG. The first certificates were awarded in June, 1949. In 1962 the Board expanded to include representatives from the American Neurological Association, the American Academy of Neurology, and the American Psychiatric Association and it was incorporated as a wholly-independent body, the American Board of Qualification in Electroencephalography, Inc., familiarly known as ABQEEG. In 1986 ABQEEG was renamed the American Board of Clinical Neurophysiology (ABCN). This name change reflected in part the broader scope of central neurophysiology skills required of diplomats, such as evoked potentials. In 1997 an additional exam track certifying competence in epilepsy monitoring was added, and more recently, a third exam track certifying competence in intraoperative monitoring was created.

In 1959, the American EEG Society assisted a group of dedicated EEG technologists, who at that time could only be subscribing members of the society, in establishing an independent professional group, the American Society of EEG Technologists (ASET). In 1964, AEEGS and ASET collaborated in forming the American Board of Registration of EEG Technologists (ABRET), which became the nationally-accepted accreditation for EEG technologists.

The *Journal of Clinical Neurophysiology* was initiated as the official publication of the AEEGS in 1984. It was to be a dedicated and authoritative source of critical review and commentary on topics related to clinical applications of neurophysiology. Cosimo Ajmone-Marsan was the first editor-in-chief. Hans Luders succeeded him in 1990 and added original research articles to the journal, in addition to reviews. In 1994, the Journal became bimonthly. John Ebersole assumed the editor-in-chief position in 1998.

In 1995, the Society changed its name to the “American Clinical Neurophysiology Society” (ACNS) to reflect a broader scope of diagnostic medicine than simply EEG. 1996 marked the Fiftieth Anniversary of the Society. Twenty-two of those who had held the office of President attended the annual meeting that year in Boston. In 2007, the American Academy of Clinical
Neurophysiology (AACN) merged with the ACNS. This union marked a change in the Society’s areas of interest from principally central to central and peripheral clinical neurophysiology.

Now into its second half-century, with a membership of over 1200, the American Clinical Neurophysiology Society continues to establish and maintain standards of professional excellence in the clinical applications of neurophysiology. Its Courses and Scientific Meeting provide an annual forum for the exchange of new information about the electrical activities of the central and peripheral nervous system and its disorders.

Electromyography and the American Association of Neuromuscular and Electodiagnostics Medicine (AANEM)

The American Association of Electromyography and Electrodiagnosis (AAEE) was conceived at an advisability meeting held in Denver in September 1951, under the chairmanship of Dr. James G. Golseth. Twenty-three physicians attended this meeting. A formal organizational meeting was held in August 1953 in Chicago also under the chairmanship of Dr. Golseth. Twenty-one physicians attended this meeting, adopted a constitution, elected officers and a council, and made plans for future meetings. The AAEE was incorporated in 1959 in Rochester, Minnesota, as a nonprofit organization. Its stated goal at that time was to increase and extend, as widely as possible, the knowledge of electromyography and electrodiagnosis and to promote the professional association of those physicians and surgeons most interested in these procedures. Its name changed to the American Association of Electrodiagnostic Medicine (AAEM) in 1989 and to its current name, the American Association of Neuromuscular and Electrodiagnostic Medicine (AANEM), in 2004.

Gisela Wiederholt served as the association’s first Executive Secretary in 1976. By 1979 there were 807 society members. Ella M. VanLaningham replaced her and her title was changed to Executive Director in 1984. Shirlyn A. Adkins, J.D. succeeded her in 1995. The membership then totaled 3750. The AANEM Board authorized the Executive Director to purchase land and build an office for the AANEM, which was completed in October 2006.

The first annual scientific session was held in September 1954 in Washington, DC, with Dr. Golseth as president. The first continuing education course was held in October 1978. Workshops were initiated in May 1984 and dinner seminars were added in September 1991. A special symposium has been held periodically in conjunction with the meeting. In 1982, 1988 and 1993, a joint symposium was held in conjunction with a back-to-back meeting with the American Electocencephalographic Society. The minimonograph series was begun in 1976, case reports in 1980, and the educational videotape library in 1984. The association published its first set of guidelines in 1979, its first glossary in 1980, and its first Practice Guidelines in 1989. Podcasts were added to the AANEM’s educational offerings in 2007.


The first newsletter of the association was mailed to members in February 1955 with Y.T. Oester as president. The first continuing education course was held in October 1978. Workshops were initiated in May 1984 and dinner seminars were added in September 1991. A special symposium has been held periodically in conjunction with the meeting. In 1982, 1988 and 1993, a joint symposium was held in conjunction with a back-to-back meeting with the American Electroencephalographic Society. The minimonograph series was begun in 1976, case reports in 1980, and the educational videotape library in 1984. The association published its first set of guidelines in 1979, its first glossary in 1980, and its first Practice Guidelines in 1989. Podcasts were added to the AANEM’s educational offerings in 2007.

The first newsletter of the association was mailed to members in February 1955 with Y.T. Oester as Editor. In 1982 it was incorporated into Muscle & Nerve as a regular feature titled, News and Comments. In September 1993, the association established the newsletter, Positive Waves, with John C. Kincaid as Editor. Peter A. Grant became Editor in 1998. Foundation Notes was created in 1997 to provide updates on the AANEM’s Foundation for Research and Education. An advocacy based newsletter, Practice Topics, was introduced in November 2000. In January 2008,
the AANEM launched AANEM News. This newsletter combined all the newsletters into one and added science and marketing information.

The concept of an examination in EMG was discussed as early as 1963 and the first examination was administered on a trial basis in 1967 to a group of 26 candidates. The committee that organized the effort was chaired by Joseph Goodgold. The association perceived the examination as being primarily an educational experience for candidates and identified successful candidates as being active members by examination. At the 1987 Annual Business Meeting, members approved the establishment of the American Board of Electrodiagnostic Medicine (ABEM) as an independent credentialing body in electrodiagnostic medicine. Although organized and operated as a committee of the AANEM for administrative purposes, the ABEM was structured as a self-perpetuating Board to be completely autonomous for purposes of credentialing criteria and procedures. Austin J. Sumner was selected as the first Board Chair and the ABEM held its first examination in April 1989.

In 1997, several former leaders of AAEM urged its Board to consider expanding the scope of the organization and changing its name. They pointed to the maturing of clinical neurophysiology as a discipline and the organization’s dependency on one technology as reasons for their concern. With membership approval, the Board changed and broadened the mission statement of the association in 2000. Four years later in 2004 the Board voted for a name change to the American Association of Neuromuscular & Electrodiagnostic Medicine (AANEM). Board members believed that a new name including the term “neuromuscular medicine” would best position the organization for the future and would encompass the broad spectrum of current and future members’ practices – musculoskeletal evaluation, muscle biopsy, ultrasound, gene therapy, rehabilitation, imaging, and more. The membership approved a new name at the annual meeting that same year.

III. Current State of the Subspecialty or Section

A. Patient Care/Practice

EEG

Most neurologists supervise and interpret EEG recordings. These studies are performed both on an inpatient and outpatient basis. There are no major competitors in this field; neurologists have practically the full market share of EEG diagnostic testing. There is also essentially no role for mid-level providers. Unlike some other diagnostic services, there is no major issue regarding ethical conflict of interest or legal restriction in the ownership of EEG testing facilities. EEG, as a diagnostic test, is essentially consultative. EEGs are interpreted by physicians for their own practice and for referring neurologists or non-neurologists who request EEG studies. The American Academy of Neurology should assume the role of a major advocate and stakeholder and work collaboratively with the American Clinical Neurophysiology Society and the American Epilepsy Society in determining practice guidelines for EEG testing. Epileptology is the neurological disease-oriented subspecialty most closely associated with EEG. EEG is essential in providing epilepsy care. The clinical neurophysiology of EEG recording is well integrated into the general neurology community. In fact, as previous surveys have shown, most neurologists conduct and interpret EEG studies. There is little physician dissatisfaction with the practice of EEG per se; however, there is the worrisome constant threat of reduced reimbursement for the procedure, which is already cost intensive, given the requirements for technologists and equipment. Additionally, there is an increasing demand or expectation for after-hours, “emergency” EEG procedures that puts a strain on resources and lifestyle.
Evoked Potentials

Many neurologists, but perhaps a minority, supervise and interpret evoked potential recordings. Evoked potentials are performed in both inpatient and outpatient settings. There is an increasing use of somatosensory evoked potentials in the ICU for prognostication. Evoked potentials already have an established role in the intraoperative monitoring. Most of evoked potential studies are interpreted by neurologists and performed by electro-neurodiagnostic technologists. Audiologists perform and interpret about 30-50% of brain auditory evoked potential (AEP) studies. These are principally conducted in the nurseries for hearing screening of newborns. There is currently no significant role for mid-level providers in performing or interpreting these studies. Most evoked potential studies are performed in hospital laboratories. A few neurologists offer EP testing in their private offices. As with other clinical neurophysiologic testing, the service is more consultative. Here too, the American Academy of Neurology should assume the role of a major advocate and work collaboratively with the American Clinical Neurophysiology Society (ACNS) and the American Association of Neuromuscular and Electrodiagnostic Medicine (AANEM). The ACNS has published guidelines for performing and in interpreting EP studies. The American Board of Clinical Neurophysiology (ABCN) and the American Board of Psychiatry and Neurology (ABPN) have board examinations that include evoked potentials. Neurologists who specialize in epilepsy, neuromuscular disease, multiple sclerosis, and critical care use evoked potential studies more than others; however, none of these subspecialties consider EPs essential to their practice. General neurologists are generally familiar with evoked potentials but most do not have the training to interpret them. There has been a reduction in the number of routine EPs performed, given the development of MRI in visualizing lesions. Few training programs offer experience in interpreting EPs. The practice of evoked potentials is at a crossroad. Although outpatient EPs have fallen, inpatient ICU and, in particular, intraoperative studies have risen remarkably. Both have the potential for significant growth. Without adequate training in EPs, neurologists are currently performing a minority of intraoperative monitoring studies. Non-physician practitioners have become a dominant factor. The AAN should support an enhanced effort to train neurologists in this area so that it can remain a “practice of medicine”.

Video-EEG Monitoring

A smaller number of neurologists, who are usually both clinical neurophysiologists and epileptologists, supervise and interpret video-EEG recordings. This testing is mostly performed in inpatient epilepsy monitoring units (EMU) and intensive care units (ICU). Non-neurologist intensivists occasionally interpret or bill for monitoring procedures. Otherwise, neurologists essentially fill the market share position. There is no role for mid-level providers. Some large group practices have their own EMU’s, but usually these are owned by hospitals. In the EMU setting, video-EEG monitoring usually is associated with principal care, however, in the ICU setting, it could be consultative also. The AAN should assume a major role in working collaboratively with the American Clinical Neurophysiology Society. The ACNS has established guidelines for video-EEG monitoring in the EMU. Guidelines or parameters for such monitoring of obtunded patients in the ICU, who may be in nonconvulsive status epilepticus, need to be developed. There is currently little information on the cost vs. benefit of the procedure, and recent surveys have shown that the methodology varies among hospitals. ICU monitoring is a costly procedure which is often performed in populations with capitated or DRG-based reimbursements. In the last few years, the number of hospitals that provide video-EEG monitoring have progressively increased. In general, non-capitated and non DRG-based reimbursement is good. However, EEG monitoring in any setting is a very time-consuming procedure. Because the monitoring nearly always involves some risk of status epilepticus, the
obligation of providing the service or on-going record interpretation on an urgent basis may be expected by ordering physicians. This expectation impacts on life-style of both physicians and technologists. Also, there has been some concern about safety of patients undergoing epilepsy monitoring. The rare occurrence of death in the EMU raises the issue of requiring continuously attended monitoring.

*Intraoperative Monitoring*

Neurologists are performing only a small minority of neurophysiologic intraoperative monitoring (NIOM) interpretations. Technologists acquire the data in the operating room, and the neurologist views it real time in the OR or remotely. In reality, most studies are interpreted by technologists in consultation with the surgeon who is operating (not allowable for billing by Medicare). Many studies are either acquired and/or interpreted by non-physician providers, including but not limited to audiologists. This diagnostic service is obviously all inpatient based. As noted above, non-physician providers are the major competitors. These are MA and PhD level individuals who may or may not have a medical background. Regardless, they are not licensed practitioners. They generally contract with hospitals for their services or bill under the surgeons’ license (not allowed by Medicare). There is essentially no role at present for mid-level providers. With adequate training there may potentially be a role. Currently there is no training program for NPs/PAs that teaches NIOM. Most neurologists who provide this service have privileges (employees, faculty or consulting) at the hospital where the studies are performed. The technologists are either employees of the hospital or contract workers that are employed by a company that does NIOM. Such companies can often provide “interpreters” as well, who are usually non-physicians. Some NIOM companies may contract with neurologists and use them to interpret the data. When neurologists do NIOM, they can either bill for their services or have a contractual agreement whereby they are paid per hour. In the OR setting, neurologists are always consultative. The principle care is provided by the surgeon. The AAN should assume the role of a major advocate and stakeholder in working collaboratively with the American Clinical Neurophysiology Society. The ACNS has published guidelines for performing and interpreting these studies. The American Board of Clinical Neurophysiology (ABCN) has an examination in NIOM, and the ABPN Added Qualification in CNP Exam has questions about NIOM. Other organizations, such as the American Society for Neurophysiologic Monitoring (ASNM) and the American Board Neurophysiologic Monitoring, are non-physician led organizations that espouse and test non-physician providers of NIOM. ABRET, in partnership with ACNS, AANEM, ABCN and ASET, has created a board which will accredit hospital based (physician led) NIOM labs that abide by national laws and regulations. Both central and peripheral neurophysiologists participate in NIOM, but it is a small group from either discipline. Most neurophysiologists do not participate with NIOM. Intraoperative monitoring is not well integrated into general neurology practice. Most neurologists lack training in EPs and believe they cannot interpret NIOM. Some unfortunately “interpret” studies after the surgery has been completed. There are many misconceptions about how NIOM is done and whether the neurologist has to be physically present in the OR during the whole procedure. Educational opportunities for neurologists in intraoperative monitoring are very limited and most residencies do not offer rotations in NIOM. However, reimbursements have remained stable for NIOM. The ability to interpret more than one case at a time helps with this. There are evolving regulations concerning when, why and how NIOM can be performed that make it a challenging field. Aggressive marketing efforts by non-physician providers may take these procedures away from neurologists, which would represent a significant loss of revenue. Surgeons who use NIOM have generally supported non-physician providers because they are able to fill gaps in services secondary to insufficient trained neurologists.
EMG practice in the United States is performed primarily by two specialties, Neurology and Physical Medicine & Rehabilitation. Approximately equal numbers of neurologists and physiatrists practice EMG. A relatively small number of specialists in other fields also practice clinical EMG. These include urologists and gynecologists who practice the subspecialty of neuro-urology, and they limit their practice to EMG of the pelvic floor and its innervation. In recent years there has been a trend for physicians in primary care and internal medicine to purchase and use EMG equipment that is designed to be used by untrained individuals. In addition to physicians, some states allow non-physician practitioners, including chiropractors, podiatrists, and physical therapists to perform EMG. The majority of EMG studies are done in the outpatient setting. Approximately 10% of EMG studies are performed on hospitalized inpatients. The major competitor for neurologists are physiatrists, as noted above. Neurologists have approximately a 50% market share. In most states, mid-level providers do not perform EMG studies. The exception would be the states that allow EMG to be done by chiropractors, podiatrists, and physical therapists. Many neurologists employ technicians to assist with the performance of their studies. Efforts are being made currently to provide certification for technicians that will assure a minimum level of competence. Neurologists who do EMG typically own their own EMG equipment. Some neurologists are hospital or other institutional-based, and they typically utilize EMG equipment and technicians provided by the institution on a contract basis. The EMG study is a diagnostic test that is performed on referral. The study is done to address a specific referral question or diagnosis, and data are collected and interpreted for the referring physician. There is a trend for EMG physicians to perform a more extensive “electrodiagnostic consultation”. In this case, the patient encounter may include a focused history and physical examination, the EMG data, and a diagnosis/conclusion that will contain treatment recommendations. In either case, the EMG encounter is purely consultative. The AAN has cooperated with the American Association of Neuromuscular and Electrodiagnostic Medicine (AANEM) and the American Academy of Physical Medicine and Rehabilitation (AAPMR) to develop practice guidelines and practice parameters. This is an ongoing process, and several such documents are either in preparation or are being considered for publication. Members of the Clinical Neurophysiology (CNP) section are also often members of the Neuromuscular Diseases section of the AAN. This reflects the overlapping content areas of the two sections. Currently, there are two ABPN board certifications available for this subspecialty, namely Added Qualification in Clinical Neurophysiology and the newly created Neuromuscular Diseases certification. Given the realities of cost and effort involved in obtaining board certification and recertification, we can anticipate that neurologists will in the future opt to obtain one, but not both, certifications. It is unclear what effect this will have on clinical neurophysiology as a subspecialty and on our section membership. The majority of neurologist electromyographers are general neurologists who practice EMG as part of their total clinical effort. In the academic arena, electromyographers are also generally neuromuscular subspecialists. Most neurologists who practice EMG do so, because, as a procedure, it provides a remunerative supplement to the more cognitive parts of their practices. In general, the practice of EMG is viewed as a positive part of a practice, since one can define a circumscribed set of problems. EMG, in its purest sense, can be viewed as an extension of the clinical history and examination. The challenge for the AAN, in cooperation with such other organizations as AANEM and AAPMR, is to insure that quality electrodiagnostic studies continue to be done.
B. Research

Research in clinical neurophysiology (CNP) has expanded enormously over the past decade with advances in technology and enhanced understanding of diseases at the clinical and molecular level. Major focus areas have included the use of mathematical and engineering tools for EEG analysis, increased availability of intracranially recorded data from traditional macro and depth electrodes as well as microelectrodes, magnetoencephalography, and transcranial magnetic stimulation. These tools have driven basic neuroscience research on topics such as induced or event-related potentials and late responses in cognitive performance and processing, and clinically oriented research in the areas of seizure localization, detection and prediction.

Enhancements in research have brought improvements to patient care at the clinical level as well. Transcranial stimulation has been developed for use in diagnostic motor tract monitoring, and has also been studied for the treatment of patients with depression, stroke, and movement disorders. It is currently used to treat refractory depression and focal status epilepticus in selected patients. Single fiber electromyography as well as motor unit number estimates are now used to follow patients systematically during treatment of motor neuron disease. Analysis of sudomotor responses has contributed to the evaluation and study of patients with autonomic disease.

There are numerous journals dedicated to reporting results of investigator research in neurophysiology at the basic and the clinical level. These include Brain, Neurology, Epilepsia, Electroencephalography and Clinical Neurophysiology, Journal of Clinical Neurophysiology, Muscle and Nerve, Annals of Neurology, Journal of Physiology, and European Journal of Neuroscience among numerous others.

As research in CNP has become increasingly technical, it is often facilitated by partnerships between CNP clinical investigators and neuroscientists, biomedical engineers, computer scientists and physicists. This same technical migration, however, has somewhat limited the representation of CNP basic science research in clinically oriented meetings and journals. In tandem with this development and, perhaps also in consequence, journals such as IEEE Transactions in Biomedical Engineering and Physica have become active forums for CNP research.

Sources of funding for CNP include NIH/NINDS, CURE, the AAN Foundation, and the Epilepsy Foundation. Some institutions may also have internal grant sources. Overall, however, foundation support for CNP research, particularly in the basic sciences, is limited, while NIH funds are becoming increasingly difficult to obtain. Private concerns, particularly biomedical engineering enterprises, can play a significant role in funding research. Current areas of commercial interest include seizure prediction and detection, limb prostheses, and neurostimulation for seizure control.

As clinical neurophysiology is increasingly relied upon for much of the financial support of academic neurology departments, CNP clinicians may find it difficult to set aside sufficient time to engage in research. It is important to continue to provide support for ongoing CNP research through fellowship opportunities in the several CNP subspecialties (epilepsy, EEG, neuromuscular disease, electromyography, intraoperative monitoring) as well as extramural funding sources and commercial-academic partnerships. This will facilitate continued growth in neurophysiology research and result in continued improvements in patient quality and care well into the future.
C. Education

Clinical neurophysiology as a subspecialty of neurology receives variable and sometimes little exposure in medical school curricula. In those institutions with mandatory rotations for students in neurology, students commonly observe EEGs being interpreted and EMGs being performed and interpreted. Resident education in neurology, however, typically includes formal exposure to clinical neurophysiology by means of mandatory rotations of several weeks to several months duration usually during the second or third year. Unfortunately there has been some pressure of late for training programs to reduce the number of mandatory subspecialty rotations in favor of elective time. This has in general reduced the length of training that many residents receive in clinical neurophysiology. In 2000, the Clinical Neurophysiology Section published a study guide and recommended curriculum for neurology residents in this subspecialty.

The role of the Section in continuing education for neurologists is an important one since many practicing neurologists have had limited CNP education. The Section is actively involved in overseeing and promoting educational opportunities for neurologists in clinical neurophysiology and related topics at the AAN Annual Meeting. Section representatives participate in two Topic Workgroups, EEG/Epilepsy and EMG/Neuromuscular. Typically during the scientific sessions there is one platform presentation session and two poster presentation sessions devoted to clinical neurophysiology. The annual courses also contain a number of opportunities for continuing education in this area. These include half day and full day courses, as well as skills workshops, covering basic and advanced topics. At the 2008 meeting, for example, there were 14 offerings related to EEG/Epilepsy and 16 related to EMG/Neuromuscular. Members of the CNP section are also actively engaged in teaching through symposia and courses of other national societies, such as the ACNS and AANEM.

Fellowships in clinical neurophysiology were among the original post-residency training programs for neurologists. Similarly, the Added Qualifications in Clinical Neurophysiology was one of the original subspecialty board certifications approved by the ABPN. In the academic year 2007-08, there were 85 ACGME-accredited fellowship programs in clinical neurophysiology training a total of 213 fellows. In 2000, a study guide and core curriculum for clinical neurophysiology fellows was prepared by the Section. Recently, additional training programs related to or containing aspects of clinical neurophysiology have been developed with ABPN approval and ACGME accreditation. These include Neuromuscular and Sleep Medicine fellowships. Board certifications and examinations are forthcoming. The creation of these new training programs and board certifications and the potential for separate Epilepsy fellowships will likely reduce the number of neurology residents applying for a clinical neurophysiology fellowship. It is our hope that these programs will not dilute the quantity and quality of clinical neurophysiology training received by future practitioners in neuromuscular disease, sleep medicine, and epilepsy.

D. Medical Economics

The practice of clinical neurophysiology is based upon procedures, although the interpretation of procedure results involves a major cognitive component. Unlike medicine as practiced in other parts of the globe, few physicians in the United States practice only clinical neurophysiology. Rather, it is typically a part-time effort in addition to E&M activity. However, in most private practices, as well as in academic settings, clinical neurophysiology procedure billings and collections represent a significant part of overall revenues.
The Section along with the AANEM, ACNS, and American Board of Physical Medicine and Rehabilitation have been actively involved in developing guidelines for the appropriate use of clinical neurophysiology testing and the proper coding for tests performed. In a group effort, we have been working to develop new CPT codes as needed. Additional efforts have included discussions with governmental and private insurers regarding policy coverage development.

E. Legislative Issues

The Clinical Neurophysiology Section is being particularly vigilant regarding the continuing growth and legislative aggressiveness of the American Society of Neurophysiological Monitoring (ASNM) and its offshoots the American Board of Neurophysiological Monitoring (ABNM) and the newly formed American Board of Accreditation for Intraoperative Neuromonitoring Programs (ABNMP). For the most part, these are organizations of non-physicians, principally PhD’s, masters level individuals and EP technologists, who independently practice intra-operative monitoring. A fundamental belief of these groups is that non-physician “neurophysiologists” can and should interpret OR monitoring data for the surgeon without physician supervision or involvement. Recently, these same organizations have sought endorsement of their operations and standards from our section, the ACNS and AANEM. To endorse is to grant legitimacy, and this we and our colleagues at ACNS and AANEM have not done. Regardless these groups are carrying their arguments directly to state legislatures in an attempt to get their activities officially “approved”. The AAN, through its delegation to the AMA and with the urging of Clinical Neurophysiology Section, has introduced or supported resolutions which strive to assure that the practice of clinical neurophysiology, including intraoperative monitoring, is defined as the “practice of medicine”, and, as such, it must be performed or supervised by physicians. These resolutions have received the support of AMA delegates from both the ACNS and AANEM.

The other political concern relates to performance of EMG by non-physicians, including chiropractors, podiatrists, and physical therapists. Privileges for non-physicians vary by state. Continued legislative effort is needed to limit EMG practice to physicians.

IV. SWOT Analysis of Clinical Neurophysiology

Patient Care

Strengths – Clinical neurophysiology (CNP) is a mature subspecialty of neurology. Standards for diagnostic testing and patient care for most of its areas have been developed and have been in place for decades. Professional organizations and societies fostering both central and peripheral neurophysiology are among the oldest in neurology. CNP was one of the original neurology subspecialties to be recognized with its own board(s) and certification exams. As a subspecialty, CNP has a well-established knowledge base. Its procedures provide objective and quantitative measures to supplement the clinical neurological exam. Many clinical neurophysiologists not only provide diagnostic testing, but also patient care of the disorders they evaluate.

Weaknesses – General neurologists without any specialty training can practice clinical neurophysiology. Thus, patients are exposed to mixed skill levels among practitioners. Specialty certification means little in practical terms and provides no major advantage for those with fellowship training. Some CNP testing is very complicated and few hospitals have such
subspecialists. Developing areas of CNP, such as intraoperative monitoring and magnetoencephalography (MEG), do not yet have standards of practice. Furthermore, in these and other areas of CNP there needs to be more documentation that the diagnostic testing affects patient outcomes. Regardless, patients currently have limited access to promising new procedures, such as MEG and EEG source modeling, because it is either not covered by private insurers or not recognized by Medicare. Currently, there are also no professional boards to certify competence in ICU monitoring and MEG. Although remunerative, costs for setting up and maintaining a CNP laboratory are substantial.

**Opportunities** - There remain tremendous opportunities to apply new and traditional CNP diagnostic tools to additional neurological diseases, such as trauma, movement, autonomic, and neurobehavioral disorders. There is an increasing demand and appreciation for CNP monitoring in the ICU and OR. With expanded training opportunities for clinical neurophysiologists, these represent significant growth areas. Continuing advances in electrophysiological recording and data analysis will expand scope of CNP practice, provide new and more accurate diagnoses, and reduce the number of invasive studies.

**Threats** – Threats to the subspecialty of CNP come from both within and outside of neurology. There are currently no restrictions on poorly or untrained physicians from practicing and billing for CNP procedures. This includes non-neurologists. Additionally, non-physicians are increasingly encroaching on CNP practice. This is particularly evident in intraoperative monitoring and sleep laboratories. Shoddy work by inadequately trained practitioners threatens the welfare of our patients and sullies the reputation of CNP in general. Some areas of CNP, such as standard evoked potential testing, have seen decreasing demand secondary to improved imaging, genetic and laboratory testing. Continuing reduction in reimbursement for CNP procedures will reduce the incentive to provide these services.

**AAN Input** - AAN should advocate for expanded education and training of neurologists to qualify them for specialized CNP studies, such as intraoperative and ICU neurophysiological monitoring. Additionally, AAN should support the standards of practice established by existing physician-based clinical neurophysiological societies, namely AANEM and ACNS. Additional practice parameters, as necessary, should be developed by the AAN in collaboration with the CNP Section and these professional societies. AAN should take the position that the performance, interpretation, and billing of CNP studies be limited to qualified, preferably board-certified, physicians only.

Research

**Strengths** – Clinical neurophysiology, as a subspecialty of neurology, has a long and distinguished history of basic and applied clinical research. This research is actively ongoing. There have been significant advances in technology underlying diagnostic procedures and in understanding diseases that are evaluated at both the clinical and molecular level. Increased collaborative efforts with biomedical and electrical engineers, computer scientists, and neuroscientists have yielded new insights and methods. Developing research areas include non-invasive source localization, seizure prediction, and brain-computer interfaces. New diagnostic and therapeutic modalities include magnetoencephalography, transcranial stimulation, and implanted neurostimulators. Publications of CNP research continue to be high in quality and robust in numbers. There are at least six major national and international journals devoted mainly to CNP, not including clinical journals such as *Epilepsia* and *Muscle & Nerve* that also regularly contain CNP-related studies. CNP research is a natural extension of clinical practice, and
accordingly it can often be done without substantial additional outlays for equipment and supplies.

**Weaknesses** - Funding for studies involving clinical neurophysiology, even if they are innovative, is difficult to obtain. Sources of grant funding outside of NIH are becoming scarce. Whereas basic scientists previously investigated the electrophysiology of the intact nervous system, the unfortunate current trend is to focus on isolated cellular and molecular mechanisms and genomics. Relevance to human neurological disease is often tenuous. This contraction of NIH grant support is particularly evident in clinical trials research. Cross-institutional or departmental collaborations may find roadblocks at the institutional or foundation grant level. Less research, basic and clinical, is currently being done by MDs because of increasing demands in academia for clinical revenues. Departments that over-emphasized basic research, including that of non-physicians, are exerting significant pressure on clinicians, particularly clinical neurophysiologists, to make up the income deficit from lost grants. Regardless, those involved in research must improve previous anecdotal methodology to provide fresh outcome studies with Class I or II evidence supporting the usefulness of traditional and new CNP procedures.

**Opportunities** – The diagnostic approaches of many areas of CNP have remained unchanged for decades except for the analog to digital conversion of the measuring instrumentation. This is true for evoked potentials, EMG, nerve conduction testing, and to a lesser extent EEG. Interpretations continue to be based on signal amplitude and latency from a few sensors, with little appreciation for the spatio-temporal complexity of the data. MEG and recently EEG have advanced from simple pattern recognition to topographic mapping and source modeling. A similar application of advanced signal analysis to clinical EMG, NCT, and EP could provide fresh perspectives and fertile ground for research. Emerging techniques such as ultrasound of peripheral nerves and optical spectroscopy of cerebral cortex also hold the potential for extending the frontiers of CNP. Many of these new ventures will require an increase in cross-specialty collaboration, especially the partnering electrophysiological techniques with imaging modalities.

**Threats** – Major threats to CNP research are a lack of funding and a lack of physician time to pursue scientific investigations. As noted previously, government and private funding is constricting and continues to favor more basic research. Likewise, emphasis in many academic medicine centers is on increasing clinical revenues from neurophysiology procedures. This can be a positive force, as it may encourage the clinical use of new technologies, but it also reduces the availability of clinicians to participate in research. However, the lack of reimbursement by private insurers for new technology, such as magnetoencephalography, fMRI, and TMS, further dampens clinical research in these areas, particularly needed prospective studies.

**AAN Input** - AAN advocacy and promotion of CNP-related research with NIH and other funding agencies would be instrumental in improving both basic and clinical research opportunities for neurologists. Also important would be an increase of AAN research fellowships that would give young physicians the support needed to obtain proper research training early in their careers. AAN needs to be an advocate of expanded applied clinical research for which MDs are more likely to have time, given that it is in the same area as their clinical practice. AAN should investigate and perhaps propose a reform of the NIH grant review and award process that is currently dominated by non-physicians. MDs should comprise a majority of individuals on study sections of grants with research purporting to have an impact on human health. In order for this to happen, physicians and/or their departments need to be reimbursed for clinical revenues lost during the grant review process. Likewise, an overhead payment to universities in grants for
clinical research and trials equivalent to that paid for basic research would encourage universities to seek and support clinical neurology faculty.

Education

Strengths – Many educational programs in traditional CNP are available through AAN courses and CME review symposia across the country. Likewise, there is a well established ACGME-accredited fellowship program and curriculum in clinical neurophysiology in most academic centers that lead a number of neurologists to ABPN subspecialty certification in CNP.

Weaknesses – Although strong in traditional CNP, there are few courses or opportunities for training in new procedures or analysis techniques, especially in emerging and potential growth areas of CNP, such as advanced EEG, MEG, intraoperative and ICU monitoring. This leads to an insufficiency of MDs experienced in these areas, which in turn provides the perfect opportunity for inroads by PhD’s and other non-physicians who want to undertake the clinical practice of CNP. Government, private, and even industry support to sponsor workshops or symposia is now very limited, which may seriously hamper our ability to provide continuing medical education to our membership. The curricula of CNP fellowships need re-evaluation. Multiple areas of specialization may be too broad for one person to master in a year or conversely the official one year CNP fellowship may be too brief. Given the current financial pressures, progressively fewer CNP fellows are entering academics as compared to private practice. Also many neurology residency programs have minimized mandatory CNP training in favor of elective time supposedly to make their residencies more appealing, only to learn that the last thing graduating neurology residents do is to seek the clinically useful CNP training that they did not get. Finally, without any practical advantage from subspecialty certification, few neurologists maintain CME in clinical neurophysiology or seek recertification.

Opportunities – As one of neurology’s technology-based subspecialties, large numbers of practitioners and neurology residents continue to be interested in CNP. With renewed effort, timely CME programs regarding new and traditional procedures can be developed, and with appropriate partnering with disease-oriented clinical specialties, meaningful multi-year fellowships that provide state-of-the-art expertise can be created.

Threats – Unlike in Europe and many parts of the world, clinical neurophysiologists in the U.S. are seldom solely diagnosticians, but rather they also typically provide specialty clinical care. This is indeed admirable, but it also poses a threat to CNP itself. Disease-oriented specialties, such as epilepsy and neuromuscular disease, have become dominant in neurology, and they will progressively drain future fellows from CNP. ABPN-approved subspecialty boards in sleep and neuromuscular disease, and the imminent creation of an epilepsy board certification will have a major negative impact on CNP. Our fear is not only for CNP, but that there may be future generations of disease-oriented specialists with inadequate CNP training who no longer know how to read an EEG or do an EMG. A decrease in academic clinical neurophysiologists means too few individuals to train neurologists for even potential CNP growth areas.

AAN Input – Clearly, AAN support is needed to expand and increase non-traditional CNP courses and venues where these are offered. Additionally, AAN needs to advocate a rational and responsible creation of subspecialties and division of future neurologists into non-competitive fellowship training programs. AAN needs to be cognizant of the impact that the creation of new specialty boards will have on existing subspecialties and convey this concern to the ABPN. The new sleep medicine board is a prime example. Its creation disenfranchised neurologists seeking
sleep training through CNP fellowships and essentially forced them to enroll in sleep medicine fellowships that are often directed by pulmonary medicine.

Economics

Strengths – CNP diagnostic testing is relatively well reimbursed by insurers, and accordingly it is commonly a major source of revenue in both academia and private practice.

Weaknesses – Unfortunately, reimbursement is decreasing while time commitment remains substantial and costs are rising. Unlike radiological diagnostics, for example, the performance of many CNP tests, such as EMG and intra-operative monitoring, requires full time physician involvement and cannot be relegated to technologists. In many neurology departments, financial viability is dependent upon the revenue generated by CNP procedures (e.g. mainly EMG, EEG, video-EEG monitoring, polysomnography). Reduction in reimbursement for CNP testing will have serious and deleterious consequences on neurological academia, as well as private practice. Economic interests limit the amount of time neurologists can spend with an individual patient. Furthermore, limitations on insurance coverage commonly do not allow the complete evaluation of a patient, particularly if procedures requiring new technology are indicated.

Opportunities – Collective bargaining as a group is the key. The CNP section with full AAN support should work with the AMA and through it with insurers and Medicare to ensure the maintenance of reasonable fees for CNP procedures.

Threats – Threats to the economic viability of CNP also come not only from the outside but also from within medicine. Certainly, as noted above, the ever tightening control by insurance companies of patient coverage and procedure reimbursement poses a challenge. Also as reviewed previously, competing groups of non-neurologists and non-physicians have made significant inroads into traditional and new CNP practice areas. This threatens the quality of care delivered to patients in addition to our economic underpinning. Unfortunately, patients seldom have the background to appreciate the quality of a study performed by a physician as opposed to that of a non-physician, and hospital administrations tend to put economics ahead of quality when contracting for the often cheaper services of non-physician groups.

AAN Input – As noted above, the AAN should seek from the AMA its support of the principles that CNP procedures are the practice of medicine, that they should only be performed by appropriately trained physicians (preferably neurologists), and that only those physicians can bill and receive payment for these services. Furthermore, the AAN should look within itself and consider whether billing reforms should be recommended. Currently there is little practical and economic incentive for neurologists to obtain advanced training, certification, and even recertification in CNP. Any neurologist, and for that matter non-neurologist, can perform and bill for CNP procedures, regardless of training. Lessons might be learned from the practices of radiology and sleep medicine where only physicians with specialized training can bill for services in that area.

Legislative

Strengths – A number of federal and state regulations are in place that define and protect medical practices by neurologists. Through the auspices of AAN, AANEM and ACNS, a few dedicated
neurologists have continued to advise legislative groups and to monitor their activities to ensure that the interests of neurologists are considered.

**Weaknesses** – Practicing clinical neurophysiologists seldom have the time to devote to legislative efforts. We are indebted to those noted above who take this time. Although at least one lobbyist firm is working with CNP societies to maintain awareness of our goals, mission, concerns, and needs, additional full-time monitoring of legislative activity would be worthwhile.

**Opportunities** – There continues to be national sentiment for improving health care and standards. We should use this as an opportunity to educate lawmakers, Medicare and Medicaid committees whenever possible concerning CNP-related issues. Some of this work can and should be done through the AMA, but regardless it will require commitment on the part of societies, sections, and individuals to see that it happens.

**Threats** – Non-physician groups are lobbying state legislatures to revise current medical practice laws to include them as qualified providers, particularly in the areas of EMG and intraoperative monitoring. There is considerable negative public opinion about excessive health care costs. Provided with a lack of accurate information by the media, there is a common misperception that the principal cause is exorbitant physician pay, rather than rising hospital, pharmaceutical, and administrative expenses. Without full understanding, this public pressure may engender inappropriate legislative reform from congress and their committees.

**AAN Input** – As noted previously, the AAN should commit as a society to protect the interests of its constituent sections, including CNP. This includes support for maintained, if not increased, reimbursement for CNP procedures and efforts to expedite the evaluation and subsequent reimbursement for new tests. Advocating a restriction of specialty billing to appropriately trained physicians will allow CNP to survive and thrive. In the case of non-physicians and even non-neurologists, this support should be rapid and whole-hearted. The case against neurology generalists may be more difficult to pursue, but it should at minimum be evaluated and discussed. We would like to see the AAN also at the forefront in supporting malpractice insurance reform in cooperation with AMA and state legislatures.

V. **Goals and Objectives for the Clinical Neurophysiology Section**

**Specific Goals and Targets**

**Practice of CNP and Patient Care**

Ensure the highest standards in the practice of clinical neurophysiology.

Enhance the roles for CNP in the care of patients with neurological diseases.

Achieve appropriate recognition for the training and expertise associated with board certifications in CNP from both the neurological and general medical community.

Determine substantive ways to reward neurologists for obtaining subspecialty training and board certification in CNP and for providing a higher level of service to their patients.
Ensure that emerging growth areas of CNP, such as intraoperative and ICU monitoring, are recognized and accepted as subspecialty areas of neurology.

Obtain adequate reimbursement for all CNP services provided, but in particular newly developed procedures that are clinically useful, but not now adequately reimbursed.

Increase the number of neurologists trained in CNP in order to support physician oversight in emerging areas of CNP practice.

Maintain vigilance regarding the actions of non-physician and non-neurologist groups who seek to usurp CNP practices. Have appropriate governmental restrictions placed on any CNP activity that does not have neurologist supervision.

Research

Enhance opportunities for clinical neurophysiology research within academic neurology and collaboratively with related biomedical and engineering fields and industry.

Enhance funding for clinically relevant and thus truly translational CNP investigations.

Increase the percentage of CNP research performed by MDs, who understand better the implications of the disease process under study and the clinically relevant questions to ask.

Increase the number of MDs involved in the grant review and awarding process for neurophysiological investigations purporting medical relevance.

Increase the number and quality of CNP investigations that are outcome-oriented and provide evidence-based conclusions, particularly for new technologies.

Education

Make available an increased number of courses and training opportunities in CNP, in particular those involving growth areas that are currently underserved by neurologists.

Develop emerging areas of CNP with same exacting level of care. This includes creating standards, adding new material to training programs, and modifying certification exams accordingly.

Ensure the adequacy of resident and fellow training in CNP. Maintain CNP training as a requirement for residency programs.

Institute a CNP fellowship reform regarding subspecialty areas required and fellowship duration. Develop multi-year programs in partnership with disease-oriented fellowships in which the importance of CNP is maintained.

Economics and Legislative
Maintain reasonable and appropriate fees for CNP procedures that are essential for the viability of both neurological academia and practice.

Have AMA, other national medical societies, and, in turn, state and national legislative committees support the assertion that CNP procedures are the practice of medicine.

Educate lawmakers and Medicare/Medicaid committees regarding the importance of CNP in healthcare, particularly when performed by trained physicians.

Operational Strategies for Achieving Goals

Obtain recognition from AAN leadership that CNP is a uniquely important element of its programs, particularly considering its widespread importance to members in their practices.

Enhance the relationship of the CNP section to AAN educational and scientific program committees to ensure that CNP priorities are included.

Take full advantage of our liaisons with CNP-related professional societies. Maintain advocacy activities with ACNS, AANEM & AAPMR. Build partnerships with other CNP stakeholders, including CNP technologist groups.

Ensure that AAN, and in particular CNP, members are in key decision-making roles with certifying boards and appropriate subcommittees, AMA CPT panels, state-based Medicare committees, carrier advisory committees, etc.

Align the CNP section with related disease-oriented sections without losing the identity of CNP.

Work with AAN leadership and key committees to consider substantive ways to reward neurologists for obtaining subspecialty training in CNP and providing a higher level of patient care.

Lobby ACGME, RRC, and other appropriate organizations to update training and board certification requirements for CNP subspecialties to reflect present day realities.

Encourage the investigation of new CNP applications and procedures as well as improved ways to measure and analyze traditional CNP data. Support cross-fertilization with the basic sciences.

Specific Action Items

Communicate on a regular basis the concerns and desires of constituents of the CNP section to AAN leadership and key committees.

Advocate in writing and via personal communications for:

An Academy affirmation that the performance, interpretation, and billing of CNP studies should be limited to qualified, preferably board-certified, physicians.
Expanded educational and training opportunities for neurologists to qualify them for specialized CNP studies, particularly in growth areas that are currently underserved.

Promotion of clinically relevant CNP-related research with NIH and other funding agencies, particularly regarding new CNP technology.

A reappraisal of CNP fellowship training requirements and the relation of CNP fellowships to newly created and envisioned disease-oriented fellowships.

Provide advice and feedback to the educational and scientific program committees frequently. Lobby for more annual meeting courses, workshops, and scientific sessions related to CNP.

Actively work with TTA and practice guideline committees to set standards for diagnostic procedures and treatments that are related to CNP.

Develop and support a committee of individuals within the section who are interested in governmental affairs, regulations, and payments to serve as a “watchdog” for legislative inquiries and initiatives and the actions of non-physician and non-neurologist groups.

Maintain and enhance the section’s relationships with related professional societies with common goals, such as the ACNS and AANEM.

Improve the section’s relationships with CNP technologist societies.

Role of the AAN in Achieving Goals

The AAN, as a society and through the actions of its leadership, key committees, and liaisons, should:

Maintain a top notch neurology delegation to the AMA and participate in AMA lobbying efforts in support of neurology in general and CNP in particular.

Place a physician advocate and/or liaison in each state to work with its legislative organizations toward our stated goals.

Act as a spokesperson for neurology and CNP concerns with state and national agencies whenever necessary.

Support and lobby for the position that the performance, interpretation, and billing of CNP studies should be limited to qualified, preferably board-certified, neurologists.

Maintain close relationships with like-interested professional associations.

Maintain and enhance communication with the media to improve public education on health policy issues related to CNP.

Satisfy the needs of clinical neurophysiologists to make the AAN Annual Meeting a major event for them.
Improve practitioner skill levels by increasing the number of CNP courses and workshops, particularly in emerging areas such as intraoperative and ICU monitoring, and by appropriately including CNP-related topics in plenary and scientific sessions.

Continue to develop standards pertinent to CNP. Work with related societies, such as ACNS and AANEM, to update and provide clear practice parameters relevant to CNP subspecialties.

Explore with CNP section representatives reimbursement modifications or restrictions that would provide a substantive reward for those neurologists attaining board-certification(s) in CNP.

Advocate for a review of the requirements and structure of CNP fellowships and certification process. Assist graduate medical education organizations, such as the ACGME and ABPN, with revisions, if found appropriate.

Work with NIH to make the grant review and award process more accountable to clinical needs and goals.

Benefit to the AAN and CNP in Achieving Goals

Survival and, in fact, a prospering of the CNP subspecialty of neurology.

Ensuring that practice, education, and research in clinical neurophysiology are of the highest quality for the benefit of our patients.

Increased attendance and participation of CNP section members at the Annual Meeting and in AAN activities.

Prevention of progressive incursion by non-neurologists and non-physicians into the practice of CNP.

Achieving adequate and appropriate recognition and reimbursement for CNP activities will sustain both academic and private practice neurology.

Methods for Assessing Success or Failure of Goals

Tracking periodically the following numbers will assess the general health of CNP:

- Membership in the CNP and related disease-oriented sections of AAN.
- Membership in ACNS, AANEM, and disease-oriented societies, such as AES.
- Physicians taking various CNP-related board examinations and re-certifying.
- CNP fellowship training positions available versus filled.
- CNP-related educational programs at and abstracts submitted to Annual Meetings.
CNP procedures conducted annually.

Relative proportion of studies performed by neurologists by analyzing third party payor data regarding who is billing CNP codes.

VI. Summary/Concluding Statement

The Clinical Neurophysiology Section of the American Academy of Neurology is dedicated to fostering excellence in clinical neurophysiology and to furthering our understanding of the physiology of central and peripheral nervous system functions in health and disease. Clinical neurophysiology (CNP) is a mature subspecialty of neurology. Its professional organizations and societies were formed sixty or more years ago and are among the oldest in neurology. CNP was one of the original neurology subspecialties to be recognized with its own board(s) and certification exams. As a subspecialty, CNP has a well-established knowledge base, and standards for diagnostic testing and patient care for most of its areas have been in place for decades. CNP procedures provide objective and quantitative measures to supplement the clinical neurological exam. Most clinical neurophysiologists not only provide diagnostic testing, but also patient care of the disorders they evaluate. CNP also continues to grow and evolve. New areas of practice are developing as a direct result of continued clinical research. However, like every subspecialty of neurology, CNP has areas of weakness, as well as strength. Physician education is one such area. We need to ensure the adequacy of resident and fellow training in CNP. In addition, more practicing neurologists should be better trained in CNP, particularly in growth areas where there are insufficient physicians to meet the need. These growth areas, such as intraoperative and ICU monitoring, represent significant opportunities for the continuing health of CNP. Threats to the subspecialty come from both within and outside of neurology. There are currently no restrictions on poorly or untrained physicians, including non-neurologists, from practicing and billing for CNP procedures. Additionally, non-physicians are increasingly encroaching on CNP practice. AAN leadership, at the urging of the Section, should advocate for expanded education and training of neurologists to qualify them to practice CNP at the highest standards. Additionally, AAN should support the standards of practice established by associated physician-based clinical neurophysiological societies, namely AANEM and ACNS, and develop additional practice parameters, as necessary, in collaboration with the CNP Section and these professional societies. AAN should take the position that the performance, interpretation, and billing of CNP studies be limited to qualified, preferably board-certified, physicians only. AAN must maintain a top notch neurology delegation to the AMA to support lobbying efforts in support of neurology in general and CNP in particular. There should be physician advocates and/or liaisons of AAN to work with state and national agencies and legislative organizations to act as a spokesperson for neurology and CNP concerns. Additionally, the AAN should urge government agencies to support enhanced funding for clinically relevant and thus truly translational CNP investigations for the benefit of the many patients afflicted with neurological diseases.
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