AAEM PRACTICE TOPIC IN ELECTRODIAGNOSTIC MEDICINE

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ABSTRACT: Over the last two decades, several diagnostic devices have been developed to assess patients with suspected carpal tunnel syndrome (CTS). One such device is the Nervepace Digital Electroneurometer (NDE). At this time, however, the AAEM concludes that the current literature does not support the substitution of the NDE for standard electrodiagnostic studies in the clinical evaluation of patients with CTS.

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LITERATURE REVIEW: NERVEPACE DIGITAL ELECTRONEUROMETER IN THE DIAGNOSIS OF CARPAL TUNNEL SYNDROME

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Conventional electrodiagnostic studies, including needle electromyography (EMG) and nerve conduction testing, have a proven and long established place in the diagnosis and treatment of disorders of nerve and muscle including carpal tunnel syndrome (CTS).[1,2] Over the last two decades, other diagnostic devices have been developed to assess CTS. One such device is the *Nervepace Digital Electroneurometer* (NDE). Because of the differences between the NDE and more conventional electrodiagnostic techniques, in April 1992, the American Association of Electrodiagnostic Medicine (AAEM) undertook a literature review (published in 1997[5]) to offer the AAEM's opinion regarding what the current literature reveals with respect to the clinical utility of the NDE in the diagnosis and treatment of CTS.

In September 2000, the authors were charged with updating the review. Several drafts of the review were circulated among the authors until they believed that this review accurately reflected the current state of the literature. The article was also circulated among members of the AAEM Practice Issue Review Panel for input, prior to review and approval by the AAEM Board. No clinical tests or trials were performed by the AAEM; the AAEM's opinion is based solely on a review of the literature.

This article was prepared and reviewed by the AAEM and did not undergo the separate review process of *Muscle & Nerve.*

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NERVEPACE DIGITAL ELECTRONEUROMETER

The NDE, designed by Rosier and Blair,[12] is a compact battery-powered instrument that purports to measure the distal motor latency in peripheral nerves. Recording electrodes are placed over the hand muscles, and surface stimulation electrodes are placed distally on a peripheral nerve. Stimulation is achieved through use of a 20-V battery, which produces a variable output (from 0 V to 300 V) with a pulse duration of approximately 0.5 ms. Stimulator intensity is gradually increased until muscle contraction is observed.

A liquid crystal diode (LCD) screen displays the delay numerically in milliseconds between the initiation of the impulse to the onset of motor response. In one of the two models available (the S-200), a built-in printer generates a printout of this numerical latency value. An average of multiple latency values can be obtained.

A newer portable device called the Neurosentinel (NS) (Health South O.P.D., Inc., Haddonfield, New Jersey)[11] is designed to measure sensory latencies. The machine delivers 100 V to 300 V, 0.07-ms duration stimuli through pediatric electrocardiogram electrodes affixed to the distal forearm. Recordings are taken from the third finger at a distance of 140 mm from the stimulus site. The device records response curves and calculates stimulus onset to peak

response times. A response is recorded only after four stimuli produce results with less than 10% variation.

Although the original report of the NDE[12] described measurements of distal motor latencies for both median and ulnar nerves, only median distal motor latency values have been studied in all subsequent clinical reports.[3–13] Similarly, in later studies, the NS has been used to provide absolute distal sensory latency values of only the median nerve. In these studies, prolongation of the NDE-measured median motor latency or the NS-generated median sensory latency have been used to diagnose median nerve entrapment at the wrist. The NDE- and NS-obtained values have been compared with those from standard nerve conduction studies (NCSs). Based on these comparisons, the articles reviewed report the NDE and NS to be sensitive and specific measures for diagnosing CTS. The reports also state that the NDE and NS are inexpensive, quick, relatively painless, and require no special expertise, and therefore have these advantages over NCSs.

LITERATURE SEARCH

At the time of the original review[5] five reports, all dealing with the NDE's usefulness in diagnosing CTS, were available for review. In the present updated review, an expanded literature search was performed using PubMed and the dates 1966 to 2001. The search for literature included only articles written in English. The following search terms were used: "electroneurometer," "NervePace," and "Nervepace Digital Electroneurometer." This repeat search generated seven additional articles not included in the original review. One article was rejected as it principally dealt with evaluation of a different novel technique, employing the NDE only as a minor adjunct, without specific assessment of the utility of the NDE. An analysis of the remaining six articles was incorporated into the original review, which forms the content of this literature review. An additional search was conducted in July 2002 using PubMed (1966 to 2002) utilizing the original search terms and adding the search term "neurosentinel." No new articles were identified. All reports were evaluated by the authors utilizing the six criteria for classification of CTS literature used by the AAEM, American Academy of Neurology, and American Academy of Physical Medicine and Rehabilitation in developing a Practice Parameter related to the electrodiagnosis of CTS. The criteria are:

1. Prospective study.
2. Clinical diagnosis of CTS independent of the results of electrodiagnostic studies.
3. Sufficiently detailed description of the stimulating and recording methods to permit duplication of the studies.
4. Limb temperature monitored and reported.
5. Reference values:
   a. obtained either with concomitant studies of a reference population, or
   b. obtained with previous but identical studies of a reference population in the same laboratory, and
   c. reported in the article.
6. The cited article mentioned the criteria of abnormality obtained from the reference population and the article defined this in statistical terms such as mean, standard deviation, and/or range.

Table 1 lists the articles reviewed in the document, the number of literature selection criteria met, and which criteria were met.

REVIEW OF LITERATURE

First Report. The first paper describing the NDE was presented by Rosier and Blair[12] at the 21st annual Rocky Mountain Bioengineering Symposium and 21st ISA Biomedical Sciences Instrumentation Symposium in 1984 in Boulder, Colorado. The report met two of the six criteria (1 and 3). Twenty patients with symptoms of median or ulnar nerve compression at the wrist were studied at an orthopedic clinic. Distal motor latencies obtained by the NDE in 38 median and 20 ulnar nerves were compared to latencies obtained by "standard nerve conduction" tests. The conclusion of this paper was that the correlation between the NDE's data and standard NCS data was "excellent."

No details are given about the clinical evaluations or the final clinical diagnoses. The stimulating and

Table 1. Literature reviewed and criteria met.

Criteria met		
Total	Specific	Reference
6	N/A	None
5	N/A	None
4	1, 2, 3, 6	Grant and colleagues[9]
4	1, 2, 3, 5	Atroshi and Johnsson[3]
3	1, 2, 5	Steinberg et al.[13]
3	1, 3, 4	Pransky and colleagues[11]
2	1, 3	Rosier and Blair[12]
2	1, 3	Feierstein[8]
2	1, 2	Osterman and colleagues[10]
2	1, 3	Beckenbaugh and Simonian[4]
2	3, 5	Cherniack and colleagues[6]
1	1	Dunne and colleagues[7]

recording methods are ambiguously described: placement sites of recording electrodes are not precisely defined, and stimulation intensity was adjusted so as to obtain a vigorous muscle twitch. The report states that the "neurometer is not powerful enough to reliably allow stimulation of the palm segment." If this is the case, however, the present authors wonder how supramaximal stimulation can be ensured reliably even in the wrist segment.

Limb temperature was not monitored. Control values were based on results of standard NCSs, not on values obtained from the NDE in a control population. Even though all patients were symptomatic, 20 NDE values (15 median and 5 ulnar nerves) were called normal and the rest abnormal, based on the results of standard NCSs; 2 nerves with abnormal standard NCSs were designated as normal for reasons that are unclear. Although comparable numbers of nerves with these arbitrarily defined normal and abnormal values were tested by the NDE and standard NCSs, the range of these values varied greatly. For example, the mean abnormal value for the ulnar nerve was 4.10 ms by the standard NCS method, but 8.12 ms by the NDE; one measurement taken by the NDE was 17 ms, but none obtained by corresponding NCSs exceeded 5.5 ms.

Subsequent Reports. ***Feierstein, 1988.*** A paper presented by Feierstein[8] in 1988 met two of the six criteria (1 and 3). The study evaluated 15 patients whose CTS had failed to respond to conservative management and who were undergoing surgical release of transverse carpal ligament, and were studied by the NDE preoperatively and postoperatively. The author concluded that the latency values of 11 patients improved postoperatively.

The time between preoperative and postoperative studies varied from 2 weeks to almost 1 year. The value assigned as the upper limit of normal for the latency value was taken from a previous study from a different laboratory that averaged 10 responses, whereas this study averaged only 5 such responses. Since the test–retest reliability of the NDE has not yet been determined, these changes raise questions about the choice of the normative data. The bases for clinical diagnoses are not given, limb temperature was not monitored, and comparisons to standard techniques are not documented.

Osterman and Colleagues, 1989. A scientific exhibit by Osterman and colleagues[10] met two of the six criteria (1 and 2). Thirty-five patients were evaluated by NCSs and by the NDE to determine the concordance rate of diagnoses of CTS between these two methods of study. The patients were divided into two groups: those with and those without clinical symptoms of CTS. There was no control population, and the abnormal value used was arbitrarily based on the "suggestion of Nervepace Electroneurometer manufacturers." The patients were divided into groups with mild, moderate, and severe CTS based on the arbitrarily chosen NDE values. Interestingly, one patient with clinically severe CTS had normal NDE values, whereas two who did not have CTS had NDE values in the moderately severe range. Eighteen more patients with CTS were studied postoperatively and reductions in NDE values reported, but standard median NCSs were not performed postoperatively. Limb temperature was not monitored.

This study was not designed to provide sufficient information on the patient population, control values, and techniques used. In addition, the study was based in part on the incorrect assumption that a prolonged distal motor latency is the "most frequently used" electrodiagnostic measure for confirming the diagnosis of CTS.

Steinberg and Colleagues, 1992. Steinberg and colleagues[13] studied the utility of the NDE for patients with CTS. The article met three of the six criteria (1, 2, and 5). NDE studies of 51 hands of 28 patients with symptomatic CTS were compared to standard NCSs of 18 hands of 10 control subjects. A close relationship was observed between the two modes of testing (correlation coefficient of 0.93); however, nine patients with a clinical diagnosis of CTS tested normal on the NDE (sensitivity of 69%). Interestingly, a number of patients were excluded from the sensitivity calculations because no readings could be obtained from them by the NDE. In three patients (one with peripheral neuropathy, one with gout, and one with radius fracture), no recordings could be obtained by NDE, although the response was clearly present as shown by standard NCSs. Control measurements were presented; however, the reasons for identifying a measurement as abnormal are not made clear. Room temperature was defined, but skin temperature was not monitored.

Grant and Colleagues, 1992. A paper authored by Grant and colleagues[9] met four of the six criteria (1, 2, 3, and 6). Two hundred fifty-two hands of 132 female individuals were assessed, and divided into several groups. Twenty-two patients (32 hands) with physician-diagnosed CTS (confirmed by conventional NCSs), 63 plant workers (126 hands) with and without symptoms of CTS, and 47 healthy asymptomatic controls (94 hands) were studied. This study was prospective and included the generation of refer-

ence values from a control population expressed in terms of means and standard deviations. The authors concluded that while the mean values for the four groups differed "significantly," a high false-negative rate limited the usefulness of NDE as a screening procedure for CTS.

Room temperature was recorded but limb temperatures were not monitored in this study. The conventional NCS procedures employed were not described in detail. It is unclear whether studies were performed by multiple operators. Although attempts were made to establish a clinical diagnosis independent of electrodiagnostic studies, it is unclear if this assessment was limited to the use of a hand diagram, or included other findings on physical examination. Although mean values between the groups "differed significantly" (3.6 ms for controls, 3.9 ms for asymptomatic plant workers, 4.2 ms for symptomatic plant workers, 4.4 for physician-diagnosed CTS patients), the standard deviations were sufficiently large to result in a substantial overlap of the values for each group, making it difficult to assess the significance of any single value in an individual patient. Among CTS patients (diagnosed clinically by physicians with confirmatory NCSs), 47% fell within two standard deviations of the control mean, reflecting a high false-negative rate. This high false-negative rate suggests that conventional NCSs represent a more sensitive method for diagnosing CTS than NDE.

Beckenbaugh and Simonian, 1995. A paper by Beckenbaugh and Simonian[4] met two of six criteria (1 and 3). Seventy-two median nerves in 45 patients with suspected CTS were studied by the NDE, and compared with "standard EMG" performed on 64 of these nerves. The NDE data were also compared to "actual nerve compression observed at surgery in 23 cases," and to 4 physical tests (Phalen's, Tinel's, two-point discrimination, and a "median nerve compression test"). The article concluded that NDE assessment gave a more "accurate prediction of CTS" than physical examination, with a high degree of sensitivity (85.7%) and specificity (87.5%). NDE results were found to "correlate positively" with results from "routine electromyography."

Although this study attempted to correlate NDE and NCS data, the article provided no description of the conventional nerve conduction study techniques employed ("EMG values were obtained in the standard fashion"). Additionally, NDE and NCS data were not obtained on the same day (average 12.2 days between assessments). Temperature was not controlled. Normative data for the NDE technique were not generated on a control population. Criteria for abnormality were not defined in statistical terms (mean, standard deviation, range); an NDE latency determination of >3.9 ms was arbitrarily chosen as abnormal in order to "maximize both sensitivity and specificity." The diagnosis of CTS was not established by clinical criteria, independent of electrophysiologic techniques. Rather, an "EMG value >4.5 ms" (presumably representing the median distal motor latency) was considered a "positive screening value for CTS." Although the article noted that the "complete EMG examination" included "sensory latency values and comparison to ulnar latency values," no NCS data were reported apart from distal motor latencies. In the 23 surgical cases, all with evidence of "nerve compression" at surgery, the article noted a sensitivity of 87% for NDE and 63.6% for EMG. However, the NCS sensitivity was again based on an absolute median distal motor latency value of >4.5ms, rather than other NCS parameters that have been shown to be more sensitive (e.g., median to ulnar palmar mixed nerve study comparisons).[2]

Cherniack and Colleagues, 1996. The article by Cherniack and colleagues[6] met two of six criteria (3 and 5). The study represented a prospective evaluation of 19 patients (98 hands) referred to a hospital-based EMG laboratory. The article did not specify whether all of the patients were referred for a CTS evaluation. A subset of 29 individuals (58 hands) were referred following an occupational medicine consultation with a clinical diagnosis of CTS and an associated "index of certainty." A control group consisted of 10 hospital workers (20 hands). All of these patients underwent median and ulnar motor and sensory nerve conduction studies, with an effort to control temperature, and utilizing anatomical sites for stimulation and recording without distance measurements. The authors do not comment on exactly where the ulnar sensory responses were recorded, but stimulation was at the wrist. They compared these results to normal values from their laboratory but comment that no adjustments were made for age or sex. Special techniques such as palmar conduction studies were not performed. The authors used the manufacturer's recommendations regarding normal values for the NDE which apparently were not adjusted for age or sex. (When looking at these three groups, there were significant differences in age). The results indicated that standard nerve conduction studies surpassed the NDE in diagnosing CTS. However, results of the NDE correlated well with formal NCS results in patients who were defined to have CTS both clinically and on stan-

dard NCSs. The authors comment on the controversy regarding normal values for the NDE. Apparently three different limits of normal have been proposed by the manufacturer and other authors. In some patients, they conclude that using the most stringent normal values would result in false-positive tests exceeding true positives. The authors comment that the normal cut-off value supplied by the manufacturer did not bear any relationship to their own normal control results. The value derived by the authors was considerably higher. In using their own normal values, the NDE became a relatively insensitive instrument.

All of these considerations were summarized by the authors in concluding that: (1) the NDE is clearly less discriminating than NCSs for CTS; (2) there is a high proportion of false-positive NDE tests, suggesting that patients should be screened clinically and then directly referred for NCSs without the intermediate screening step with the NDE; (3) that before screening studies such as the NDE can be applied for the evaluation of common entrapment disorders, more extensive observation will be needed; and (4) that despite the technical accomplishments of the NDE, these advances will not compensate for the many underlying uncertainties that surround the testing.

Dunne and Colleagues, 1996. An article by Dunne and colleagues[7] met one of the six criteria (1). This study represented a prospective study of 25 patients referred consecutively to a hospital-based EMG laboratory with a clinical diagnosis of CTS. The authors performed conventional NCSs, measuring motor and sensory latencies bilaterally as well as obtaining NDE measurements bilaterally. Concerning the methodology, the authors did not comment on controlling for temperature, nor did they describe precisely the routine NCS methods (i.e., specific identification of sites of stimulation and recording). The values obtained from the two techniques were compared statistically. The NCS distal motor latencies and the NDE results reportedly correlated well, particularly when the same criterion of abnormality (i.e., a motor latency of >4 ms) was used for both techniques. The authors did not identify a "normal value" for the NDE from their own experience or from citing normal values from the literature. They note that NCS-derived sensory latencies did not correlate well with the NDE findings.

The authors concluded that NCS-generated sensory latencies are more useful in diagnosing CTS, though the sensory latency data do not correlate well with the NDE results. They also note that the NDE does not produce a visual waveform to interpret, which compromises the validity of the interpretation. The authors also comment that NDE cannot be adapted to more sensitive methodology such as comparing median and ulnar values. Lastly, they note that patients who have underlying problems such as a polyneuropathy may not be suitable for NDE studies. They conclude that NDE provides a highly specific but relatively insensitive tool for studying CTS.

Atroshi and Johnsson, 1996. An article by Atroshi and Johnsson[3] met four of the six criteria (1, 2, 3, and 5). This study prospectively addressed the sensitivity and specificity of the NDE in the diagnosis of CTS in patients undergoing surgical release. A "new model" of the NDE (presumably the NS), capable of measuring both distal motor and distal sensory latencies, was employed. The recorded sensory latency represented an absolute value obtained from an antidromic digital technique). Preoperative NDE distal motor and sensory latencies of the median nerve were obtained in 43 hands with CTS (assessed by history, signs, and postsurgical relief of symptoms), and in 60 hands of 30 asymptomatic volunteers. Sensitivity was reported at 58% for distal motor latencies and 65% for distal sensory latencies, with sensitivities of 87% and 92%, respectively.

Room temperature was recorded but limb temperatures were not monitored. Distances utilized for the motor and sensory latency determinations were not specified. The initial criteria of abnormality were not obtained using the NDE or from the reference population, but instead were drawn from prior studies employing conventional NCS techniques. The authors did, however, express the normative data from the 60 control hands in terms of means with standard deviations, and did suggest a change in criteria to optimize sensitivity and specificity. Sensory responses were unobtainable in 19 of 43 cases; an "absent" sensory response was considered confirmatory evidence for CTS, and these data were factored into the sensitivity determinations. An "absent" response, however, cannot be used to confirm the presence of a localized entrapment.

Finally, the patients preselected for this study were all refractory to "non-operative treatments" (not specified), and thus may have reflected a more severely affected group of patients. The absent sensory responses in 19 patients supports this suggestion. As such, the sensitivity and specificity of the NDE and NS in patients with milder cases of CTS could not be assessed. This study did not compare the NDE to conventional NCSs.

Pransky and Colleagues, 1997. A paper by Pransky and colleagues[11] met three of six criteria (1, 3, and 4). Both the NDE and NS were compared with

conventional NCSs in the workplace screening for CTS. Thirty-two working individuals without CTS were examined with NDE, NS, and NCSs, and were retested 1 week later. The testing procedures were precisely documented, and limb temperatures were controlled. Test–retest reliability was best with NCSs. Results with the NS correlated slightly better with NCSs than did the NDE results. The authors concluded that the NDE and NS devices were "unlikely to be useful in confirming early CTS," when "detailed NCSs may be necessary to detect nerve entrapment." The device was felt to have potential utility in assessing longitudinal changes in mean latency in a group, with the mean changes possibly reflecting real effects in a workplace.

The number of study subjects was small. Clinical examination was limited to Phalen's sign, Tinel's sign, and light touch sensation, without inclusion of pin-prick sensation, two-point discrimination, or motor examination. Though 5 of the 32 subjects gave a history of "some symptoms suggestive of CTS," these individuals were not separated out in the analysis. Only antidromic digital sensory responses were recorded; no palmar studies were performed, and no median to ulnar comparisons made. The protocol described "stimulus onset to peak response" measurements for both motor and sensory responses; this would not represent a typical method for measuring a distal motor latency, which is usually defined by the interval between stimulus onset and the initial negative deflection of the compound muscle action potential. Not all digital sensory responses obtained with conventional NCSs were performed at the designated distance of 140 mm (used for the NS). To correct for this, the authors made an adjustment using "a ratio of the test distance to 140 mm" so that results from NCSs and the NS would be comparable. It is unclear how this "adjustment" would impact the results. The authors concluded that "a single NDE or NS screening test result in an individual may not accurately predict an NCS's result or the presence of CTS." Both NDE and NS produce a single latency value, thus yielding less information than conventional NCSs. False-positive and false-negative rates were felt to be high. The authors commented that more complete NCS testing, including inching and median to ulnar comparisons, may be more useful than NDE or NS in the detection of early or mild CTS. However, this study did not evaluate patients with CTS.

CRITIQUE OF THE TECHNOLOGY

The advantages of the NDE and NS are that they are compact, lightweight (approximate weight of the NDE S-100 model is 12 oz; the NDE S-200 model is 5 lbs), portable, and relatively quick and easy to use on a large scale in an industrial facility. However, in the opinion of the AAEM, these machines cannot compare to standard electrodiagnostic test equipment, as they fail to provide several important features essential to an electrodiagnostic evaluation:

1. No waveforms are displayed by the NDE. It is difficult to be certain that the recording is from the motor point of the stimulated muscle. Therefore, for example, if fibers of the adjacent ulnar nerve are stimulated, the values obtained by the NDE may be misleading.
2. This is a *blind* method of latency determination, requiring the action potential to rise before the counter is stopped; thus, the latency is measured *near*, not *at*, the onset of depolarization. If the rise time of the waveform is long, or if there is an initial positive deflection or movement artifact, then latency measurements will not provide accurate diagnostic information.
3. NDE latency abnormalities are based on measures of the fastest motor fibers and require a supramaximal stimulation, which cannot be ensured by simply visualizing a vigorous twitch of the muscle.
4. Physiological variables, such as temperature, distance from stimulating to recording point, and age of the patient, and pathological variables, such as conduction block, dispersion of the waveform, and axonal loss, may all affect latency values. These techniques offer no control values that take physiological variables into account, and no means of assessing pathological findings. An absent response, therefore, may be subject to several different interpretations, including a failure of the NDE or NS to deliver a supramaximal stimulation.
5. Associated conditions, such as a generalized neuropathy, radiculopathies, or more proximal nerve entrapments, may be missed if the examiner relies solely on these techniques. Furthermore, the lack of EMG examination, a standard part of a routine electrodiagnostic evaluation, is a serious limitation. Therefore, there is no way to determine whether there is motor axonal loss, acute or chronic. This information often influences treatment decisions and prognosis.
6. Some reports about the NDE and NS[3–13] declare them to be sensitive and specific tools for diagnosis of CTS. But inasmuch as distal motor latency

or an isolated median distal sensory latency value are not sensitive diagnostic criteria for CTS in standard NCSs, they cannot be so for the NDE and NS.

CONCLUSION

It is the opinion of the AAEM that all of the literature reviewed in this article and describing the NDE and NS are flawed. Limb temperature, which affects the speed of nerve conduction, was controlled in only one study. In most reports, reference populations were not studied to provide a scientifically based source for control values. Standard statistical measures of latency values (mean, standard deviation, and range) were not specified in most reports. Moreover, most studies comparing NDE and NS to standard NCSs make an incorrect assumption: that distal motor latency or an isolated digital sensory latency value are sensitive measures for diagnosing median nerve entrapment at the wrist. In fact, detailed sensory NCSs, including segmental stimulation across the palm-to-wrist segment or in comparison to adjacent sensory nerves, is by far the more sensitive technique in this regard and is probably the earliest finding in median nerve entrapment at the wrist.[1,2]

It is the opinion of the AAEM that the NDE, as well as the newer NS, are experimental and are not effective substitutes for standard electrodiagnostic studies in clinical evaluation of patients with suspected CTS.

RECOMMENDATIONS

Future research is needed to establish statistically expressed normal values and to demonstrate the sensitivity and specificity of the NDE and NS data.

1. Reference values need to be established for well characterized and representative populations. Reference values should be expressed as either mean ± a standard deviation (when values are normally distributed or so transformed) or as percentile values (providing sufficient numbers of control subjects are studied). The effects of potentially influential variables such as age and temperature should be characterized so that appropriate adjustments can be considered.
2. Reproducibility and interoperator variability of NDE and NS values need to be established and expressed statistically in control subjects and patients with CTS.
3. The sensitivity and specificity need to be established and compared to an appropriate standard (for example, by studies comparing NDE and NS data to the final diagnosis of CTS in patients and a group of healthy control subjects with a full clinical and electrodiagnostic evaluation).
4. Cost benefit analysis of NDE and NS.

DISCLAIMER

This report is provided as an educational service of the AAEM and is provided for informational purposes only. It is based on an assessment of the current scientific and clinical information. It is not intended to include all possible methods of care of a particular clinical problem, or all legitimate criteria for choosing to use a specific procedure. Neither is it intended to exclude any reasonable alternative methodologies. It addresses the use of the NDE in the diagnosis of CTS. This statement is not intended to address all uses of the NDE and in no way reflects upon the usefulness of the NDE in those areas not addressed. The AAEM recognizes that specific patient care decisions are the prerogative of the patient and his/her physician and are based on all of the circumstances involved. This document is not a substitute for the experience and judgment of a physician. This review was not written with the intent that it be used as a basis for reimbursement decisions.

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The American Association of Electrodiagnostic Medicine (AAEM) is now the American Association of Neuromuscular & Electrodiagnostic Medicine. The following document was printed in *Muscle & Nerve* before the name change. The name was therefore not updated.