2.01.39  Quantitative Sensory Testing

Original Policy Date: December 7, 2006   Effective Date: August 1, 2017
Section: 2.0 Medicine   Page: Page 1 of 13

Policy Statement

Quantitative sensory testing, including but not limited to current perception threshold testing, pressure-specified sensory device testing, vibration perception threshold testing, and thermal threshold testing, is considered investigational.

Policy Guidelines

The following CPT codes are specific to quantitative sensory testing:

- **0106T**: Quantitative sensory testing (QST), testing and interpretation per extremity; using touch pressure stimuli to assess large diameter sensation
- **0107T**: Quantitative sensory testing (QST), testing and interpretation per extremity; using vibration stimuli to assess large diameter fiber sensation
- **0108T**: Quantitative sensory testing (QST), testing and interpretation per extremity; using cooling stimuli to assess small nerve fiber sensation and hyperalgesia
- **0109T**: Quantitative sensory testing (QST), testing and interpretation per extremity; using heat-pain stimuli to assess small nerve fiber sensation and hyperalgesia
- **0110T**: Quantitative sensory testing (QST), testing and interpretation per extremity; using other stimuli to assess sensation

NOTE: This series of codes describes "psychophysical" testing of subjective feelings of sensation to assess endocrine and neurologic disorders such as neuropathies. These tests are more complex and standardized than physical examination services. Quantitative sensory testing (QST) is performed in the office or outpatient setting by physicians such as internists, geriatricians, family practitioners, neurologists, and endocrinologists. The codes are “per extremity,” so one could receive as many as 4 units per code. Previously, these tests would have been coded using 95999 (for other, unlisted neurological or neuromuscular diagnostic procedures). These stimuli are not electrical like those used in current perception threshold testing.

The following HCPCS code is specific to this test:

- **G0255**: Current perception threshold/sensory nerve conduction test, (SNCT) per limb, any nerve

Another distinction between a nerve conduction test and the current perception threshold test is that the former is performed in a laboratory setting, while the latter is performed in an office setting.

Codes 95907-95913 might be incorrectly reported for these services.

Description

Quantitative sensory testing (QST) systems are used for the noninvasive assessment and quantification of sensory nerve function in patients with symptoms of or the potential for neurologic damage or disease. Types of sensory testing include current perception threshold testing, pressure-specified sensory testing (PSST), vibration perception testing, and thermal sensory testing. Information on sensory deficits identified using QST has been used in research settings to understand neuropathic pain better. It could be used to diagnose conditions linked to nerve damage and disease, and to improve patient outcomes by impacting management strategies.
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**Related Policies**

- **Nerve Fiber Density Measurement**

**Benefit Application**

Benefit determinations should be based in all cases on the applicable contract language. To the extent there are any conflicts between these guidelines and the contract language, the contract language will control. Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.

Some state or federal mandates [e.g., Federal Employee Program (FEP)] prohibits plans from denying Food and Drug Administration (FDA)-approved technologies as investigational. In these instances, plans may have to consider the coverage eligibility of the FDA-approved technologies on the basis of medical necessity alone.

**Regulatory Status**

A number of quantitative sensory testing (QST) devices have been cleared for marketing by the U.S. Food and Drug Administration (FDA) through the 510(k) process. Examples are listed in Table 1.

**Table 1. FDA-Approved Quantitative Sensory Testing Devices**

<table>
<thead>
<tr>
<th>Device</th>
<th>Manufacturer</th>
<th>Date Cleared</th>
<th>510(k)</th>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FDA product code: LLN</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neurometer®</td>
<td>Neurotron</td>
<td>Jun 1986</td>
<td>K853608</td>
<td>Current perception threshold testing</td>
</tr>
<tr>
<td>NK Pressure-Specified Sensory Device, Model PSSD</td>
<td>NK Biotechnical Engineering</td>
<td>Aug 1994</td>
<td>K934368</td>
<td>Pressure specified sensory testing</td>
</tr>
<tr>
<td>AP-4000, Air Pulse Sensory Stimulator</td>
<td>Pentax Precision Instrument</td>
<td>Sep 1997</td>
<td>K964815</td>
<td>Pressure specified sensory testing</td>
</tr>
<tr>
<td>Neural-Scan</td>
<td>Neuro-Diagnostic Assoc.</td>
<td>Dec 1997</td>
<td>K964622</td>
<td>Current perception threshold testing</td>
</tr>
<tr>
<td>Vibration Perception Threshold (VPT) METER</td>
<td>Xilas Medical</td>
<td>Dec 2003</td>
<td>K030829</td>
<td>Vibration perception testing</td>
</tr>
<tr>
<td><strong>FDA product code: NTU</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Heat-Evoked Potential Stimulator (Cheps)</td>
<td>Medoc, Advanced Medical Systems</td>
<td>Feb 2005</td>
<td>K041908</td>
<td>Thermal sensory testing</td>
</tr>
</tbody>
</table>

FDA: Food and Drug Administration.

**Rationale**

**Background**

**Quantitative Sensory Testing**

Quantitative sensory testing (QST) systems measure and quantify the amount of physical stimuli required for sensory perception to occur. As sensory deficits increase, the perception threshold of QST will increase, which may be informative in documenting progression of neurologic damage or disease. QST has not been established for use as a sole tool for diagnosis and management but has been used with standard evaluative and management procedures (e.g., physical and neurologic examination, monofilament testing, pinprick, grip and pinch strength, Tinel sign, and Phalen and Roos test) to enhance the diagnosis and treatment-planning process.
and to confirm physical findings with quantifiable data. Stimuli used in QST includes touch, pressure, pain, thermal (warm and cold), or vibratory stimuli.

The criterion standard for evaluation of myelinated large fibers is the electromyography nerve conduction study. However, the function of smaller myelinated and unmyelinated sensory nerves, which may show pathologic changes before the involvement of the motor nerves, cannot be detected by nerve conduction studies. Small fiber neuropathy has traditionally been a diagnosis of exclusion in patients who have symptoms of distal neuropathy and a negative nerve conduction study.

Depending on the type of stimuli used, QST can assess both small and large fiber dysfunction. Touch and vibration measure the function of large myelinated A-alpha and A-beta sensory fibers. Thermal stimulation devices are used to evaluate pathology of small myelinated and unmyelinated nerve fibers; they can be used to assess heat and cold sensation, as well as thermal pain thresholds. Pressure-specified sensory devices assess large myelinated sensory nerve function by quantifying the thresholds of pressure detected with light, static, and moving touch. Finally, current perception threshold testing involves the quantification of the sensory threshold to transcutaneous electrical stimulation. In current perception threshold testing, typically 3 frequencies are tested: 5 Hz, designed to assess C fibers; 250 Hz, designed to assess A delta fibers; and 2000 Hz, designed to assess A beta fibers. Results are compared with those of a reference population.

Because QST combines the objective physical sensory stimuli with the subject-patient response, it is psychophysical in nature and requires patients who are alert, able to follow directions, and cooperative. In addition, to get reliable results, examinations need to include standardized instructions to the patients, and stimuli must be applied in a consistent manner by trained staff. Psychophysical tests have greater inherent variability, making their results more difficult to reproduce.

QST has primarily been applied in patients with conditions associated with nerve damage and neuropathic pain. There have also been preliminary investigations to identify sensory deficits associated with conditions such as autism spectrum disorder, Tourette syndrome, restless legs syndrome, musculoskeletal pain, and response to opioid treatment.

**Literature Review**

Assessment of a diagnostic technology typically focuses on 3 categories of evidence: (1) its technical performance (test-retest reliability or inter-rater reliability); (2) diagnostic accuracy (sensitivity, specificity, and positive and negative predictive value) in relevant populations of patients; and (3) clinical utility (i.e., demonstration that the diagnostic information can be used to improve patient outcomes).

The literature was reviewed on the various types of quantitative sensory testing (QST) for which there are devices approved or cleared by the U.S. Food and Drug Administration (FDA). This includes current perception threshold testing, pressure-specified sensory testing (PSST), vibration perception threshold (VPT) testing, and thermal threshold testing. The following is a summary of the key literature to date.

**Quantitative Sensory Testing**

**Clinical Context and Proposed Clinical Utility**

The proposed clinical utility of QST using current perception threshold testing, pressure-specified sensory testing (PSST), VPT testing, or thermal sensory testing is to improve the diagnosis of conditions associated with nerve damage or disease and to change patient management so that health outcomes are improved. There is a need for tests that can objectively measure sensory thresholds. Moreover, QST could aid in the early diagnosis of disease, before patients would be diagnosed clinically. In addition, although the criterion standard for evaluation of
myelinated large fibers is electromyography nerve conduction study (EMG-NCS), there are no criterion standard reference tests to diagnose small fiber dysfunction.

The question addressed in this evidence review is: In individuals with conditions associated with nerve damage or disease, does QST improve the diagnosis of patients and lead to improved patient management decisions and health outcomes?

The following PICOTS were used to select literature to inform this review. They apply to each type of QST.

**Patients**
The relevant population of interest is patients with conditions associated with nerve damage or disease.

**Interventions**
The relevant intervention of interest is QST using current perception threshold testing, PSST, VPT testing, or thermal sensory testing.

**Comparators**
The comparators of interest are standard clinical examination, other sensory threshold tests, and, for large fiber dysfunction, EMG-NCS.

**Outcomes**
The primary outcomes of interest relate to diagnostic accuracy (i.e., test accuracy and validity) and to health outcomes (i.e., symptoms, functional outcomes).

**Timing**
Diagnostic accuracy is a short-term outcome. Functional outcomes would be measured over the long term, after patients have been diagnosed and treated.

**Setting**
Patients would be tested in the primary or specialty (e.g., neurology setting).

**Current Perception Threshold Testing**

**Technical Performance**
In 1999, the American Association of Neuromuscular & Electrodiagnostic Medicine (AANEM) published a technology review of the Neurometer device.1 Much of the literature compared the results of Neurometer testing with NCSs in patients with known disease. In many instances, the testing results demonstrated more numerous or pronounced abnormalities than NCSs, a finding consistent with the hypothesis that abnormalities of small nerve fibers precede those of large nerve fibers tested using NCSs. However, this observation could also be related to the fact that the Neurometer tests multiple sites with 3 different frequencies and that any identified abnormality is considered significant. AANEM’s assessment concluded the following on the technical performance of current perception devices:

- “Reference values need to be established for well-characterized and representative populations.
- Reproducibility and interoperator variability of the Neurometer® CPT[current perception threshold] normal values need to be established and expressed statistically in control subjects and patients with specific diseases.”

In 2002, Yamashita et al evaluated current perception thresholds using the Neurometer by comparing findings from 48 patients with lumbar radiculopathy and 11 healthy controls.2 The authors reported significantly higher current perception threshold values in the affected legs of patients with lumbar radiculopathy at 2000-, 250-, and 5-hertz (Hz) frequencies than in the unaffected legs. Current perception threshold values in the affected legs were also significantly higher in control subjects at 2000- and 250-Hz frequencies but did not differ significantly at 5 Hz.
The authors concluded that current perception threshold testing may help quantify sensory nerve dysfunction in patients with radiculopathy. However, this study did not establish standardized normal values or evaluate the reproducibility of QST measurements.

**Diagnostic Accuracy**
Limited published evidence is available on diagnostic performance. Several studies have compared current perception threshold testing with other testing methods, but sensitivity and specificity have not been reported. For example, in 2012, Ziccardi et al evaluated 40 patients presenting with trigeminal nerve injuries involving the lingual branch. Patients underwent current perception threshold testing and standard clinical sensory testing. Statistically significant correlations were found between findings of electrical stimulation testing at 250 Hz and the reaction to pinprick testing (p=0.02), reaction to heat stimulation (p=0.01), and reaction to cold stimulation (p=0.004). In addition, significant correlations were found between electrical stimulation at 5 Hz and the reaction to heat stimulation (p=0.017), to cold stimulation (p=0.004), but not to pinprick testing (p=0.096).

In addition, Park et al (2001) compared current perception threshold testing with standard references for thermal sensory testing and von Frey tactile hair stimulation in a randomized, double-blind, placebo-controlled trial with 19 healthy volunteers. All current perception threshold measurements showed a higher degree of variability than thermal sensory testing and von Frey measurements but there is some evidence that similar fiber tracts can be measured, especially C-fiber tract activity at 5 Hz, with current perception threshold, thermal sensory, and von Frey testing methods. This study only included healthy volunteers.

**Clinical Utility**
No direct evidence from comparative studies evaluating the impact of current perception testing on patient management decisions or health outcomes were identified. Indirect evidence of clinical utility rests on clinical validity. Because the evidence is insufficient to demonstrate test performance for current perception threshold testing, no inferences can be made about clinical utility.

**Section Summary: Current Perception Threshold Testing**
A technology assessment and subsequent study found insufficient evidence on the reproducibility of current perception QST devices and noted a lack of standardization for what constitutes values in normal ranges. There is insufficient evidence on the accuracy of current perception threshold testing for diagnosing any condition linked with nerve damage or disease using current perception threshold testing. Several studies have compared current perception threshold testing with other testing methods, but sensitivity and specificity were not reported. No direct evidence was identified for the clinical utility of current perception testing and, since there is insufficient evidence on test performance, a chain of evidence for clinical utility cannot be constructed.

**Pressure-Specified Sensory Testing**

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**Technical Performance**
No published studies on technical performance were identified.

**Diagnostic Accuracy**
Standard evaluation and management of patients with potential nerve compression, disease, or damage consists of physical examination techniques and may include Semmes-Weinstein monofilament testing and, in more complex cases, nerve conduction velocity (NCV) testing. Several studies have compared performance of PSST devices. For example, a 2000 study by Weber et al (2000) evaluated the sensitivity and specificity of PSST and NCV testing in 79 patients, including 26 healthy controls. The NCV test had a sensitivity of 80% and a specificity of 77%; the PSST had a sensitivity of 91% and a specificity of 82%. The difference between the 2 tests was not statistically significant.
A 2010 study by Nath et al evaluated 30 patients with winged scapula and upper trunk injury and 10 healthy controls. They used the FDA-cleared PSST device by Sensory Management Services to measure the minimum perceived threshold in both arms for detecting 1-point static (1PS) and 2-point static (2PS) stimuli. The authors used a published standard reference threshold value for the dorsal hand first web (DHFW) skin and calculated threshold values for both the DHFW and the deltoid using the upper limit of the 99% normal confidence interval (CI). No published threshold values were available for the deltoid location. PSST was done on both arms of all participants, and electromyography (EMG) testing only on the affected arms of symptomatic patients. Using calculated threshold values, patients with normal EMG results had positive PSST results on 50% (8/16) of 1PS deltoid, 71% (10/14) of 2PS deltoid, 65% (11/17) of 1PS DHFW, and 87% (13/15) of 2PS DHFW tests. Study findings suggested that PSST is more sensitive than needle EMG in detecting brachial plexus upper trunk injury.

A 2013 systematic review by Hubscher et al evaluated the relation between QST and self-reported pain and disability in patients with spinal pain. Twenty-eight of 40 studies identified used PSST devices. The overall analysis found low or no correlations between pain thresholds, as assessed by QST and self-reported pain intensity or disability. For example, the pooled estimate of the correlation between pain threshold and pain was -0.15 (95% CI, -0.18 to -0.11) and between pain threshold and disability, it was -0.16 (95% CI, -0.22 to -0.10). The findings suggested that QST provides low accuracy for diagnosing patients' level of spinal pain and disability.

Clinical Utility
No direct evidence from clinical trials identified has demonstrated that use of the PSST resulted in changes in patient management or improved patient outcomes. In 2012, Suokas et al published a systematic review of studies evaluating QST for painful osteoarthritis; most studies used pressure testing. Reviewers did not report finding any studies evaluating the impact of QST on health outcomes. Indirect evidence on clinical utility rests on clinical validity. Because the evidence is insufficient to demonstrate test performance for PSST, no inferences can be made about clinical utility.

Section Summary: Pressure-Specified Sensory Testing
No studies on the technical performance of PSST were identified. The available evidence on the diagnostic accuracy of PSST for conditions linked with nerve damage or disease is limited, but those studies available report relatively low diagnostic accuracy. There is insufficient direct evidence on the clinical utility of PSST and, because there is insufficient evidence on test performance, an indirect chain of evidence for clinical utility cannot be constructed.

Vibration Perception Testing
Technical Performance
A multicenter, industry-funded study (2007) compared VPT testing (CASE IV, biothesiometer, and C64 graduated tuning fork) with standard NCSs in 195 (86% follow-up) subjects with diabetes. Tests were performed independently by trained technicians; all standard nerve conduction evaluations were sent to a central reading center. Intraclass correlation coefficients (ICCs) for the tests ranged from 0.81 to 0.95, indicating excellent to highly reproducible results. Correlation coefficients for the various vibration QST instruments were moderate at -0.55 (CASE IV vs tuning fork) to 0.61 (CASE IV vs biothesiometer). In contrast, the ICC between CASE IV and a composite score for nerve conduction was low (r=0.24). These results could indicate that VPT testing could not replace standard nerve conduction testing but suggest that it might provide a complementary outcome measure.

Diagnostic Accuracy
In 2010, a study from India evaluated 100 patients with type 2 diabetes using a VPT device (Sensitometer; Dhansai Lab). The device is not FDA-approved or cleared. The authors reported sensitivities and specificities for the device and standard NCSs. For vibration testing, a positive finding (i.e., presence of neuropathy) was defined as patients reporting no vibration sensation at a voltage of more than 15 volts. According to NCSs, 70 of 100 patients had evidence of
neuropathy. Vibration perception thresholds had a sensitivity of 86% and a specificity of 76%. Semmes-Weinstein monofilament testing, which was also done, had a higher sensitivity than vibration testing (98.5%) but a lower specificity (55%). Finally, a diabetic neuropathy symptom score, determined by responses to a patient questionnaire, had a sensitivity of 83% and a specificity of 79%. The authors commented that the simple neurologic examination score appeared to be as accurate as vibration testing. It is not known how similar the Sensitometer device is to FDA-approved vibration threshold testing devices.

In 2015, Abraham et al retrospectively reviewed the charts of 70 patients with chronic inflammatory demyelinating polyneuropathy (CIDP) who were evaluated with a VPT device (Neurothesiometer).11 Stimulus was applied to the first finger and toe on each side; the voltage was gradually increased and patients were asked to state when they first perceived vibration. The threshold for a normal test result was 5 volts or less in the fingers and 15 volts or less in the toes. Data on the results of neurologic examinations were also reviewed, including testing using semiquantitative vibration testing with a 128-Hz tuning fork. Fifty-five (79%) patients had elevated VPT values. Abnormal neurologic findings were more common in CIDP patients with elevated VPT scores (92.7%) at the toes than those without elevated VPT scores (46.7% p < 0.001). Compared with patients with normal VPT values, patients with elevated VPT values were more likely to meet European Federation of Neurological Societies and Peripheral Nerve Society electrophysiological criteria for CIPD (51% vs 13%; p = 0.01) and had significantly lower treatment response rates (54% vs 93%; p = 0.03). The authors did not report the sensitivity or specificity of the device compared with standard diagnostic tests. The Neurothesiometer is not FDA-approved or cleared.

Clinical Utility
No direct evidence from clinical trials was identified demonstrating that use of vibration testing resulted in changes in patient management or improved patient outcomes. Indirect evidence on clinical utility rests on clinical validity. Because the evidence does not demonstrate the test performance of VPT, no inferences can be made about clinical utility.

Section Summary: Vibration Perception Testing
A study evaluating the technical performance of VPT found that results were highly reproducible. A few studies have evaluated the diagnostic performance of VPT using devices not FDA-cleared. In 1 study, a neurologic examination score had similar accuracy to vibration testing and Semmes-Weinstein monofilament testing had a higher sensitivity than VPT but and lower specificity. The other study did not report sensitivity or specificity for VPT but reported that patients with elevated VPT findings were significantly more likely to meet society criteria for CIPD compared with patients with normal VPT results. No direct evidence for the clinical utility of vibration perception testing was identified and, because there is since there is insufficient evidence about test performance, an indirect chain of evidence on clinical utility cannot be constructed.

Thermal Sensory Testing
Technical Performance
A 2012 systematic review by Moloney et al examined the literature on the reliability of thermal QST.12 Twenty-one studies met reviewers' inclusion criteria (using an experimental design, assessing reliability, comparing thermal QST with other methods of assessment, testing at least twice). Reviewers used a quality appraisal checklist to evaluate the reliability of the studies identified. Only 5 of the 21 studies were considered high quality. Reviewers found considerable variation in the reliability of thermal QST; this included the 5 studies considered of high quality. They also noted several methodologic issues that could be improved in future studies, including better description of raters and their training, blinding and randomization, and standardization of test protocols.
Diagnostic Accuracy

In 2008, Devigili et al published a study on 150 patients referred for suspected sensory neuropathy and tested with a Medoc thermal perception testing device. Patients underwent (1) clinical examination, (2) a sensory and motor nerve conduction study, (3) warm and cooling thresholds assessed by QST, and (4) skin biopsy with distal intraneural nerve fiber (IENF) density. Based on the combined assessments, neuropathy was ruled out in 26 patients; 124 patients were diagnosed with sensory neuropathy and, of these, 67 patients were diagnosed with small nerve fiber neuropathy. Using a cutoff of 7.63 IENF per millimeter at the distal leg (based on the 5th percentile of controls), 59 (88%) patients were considered to have abnormal IENF (small nerve fiber) density. Only 7.5% of patients had abnormal results for all 3 examinations (clinical, QST, skin biopsy), 43% of patients had both abnormal skin biopsy and clinical findings, and 37% of patients had both abnormal skin biopsy and QST results. The combination of abnormal clinical and QST results was observed in only 12% of patients. These results indicated that most patients evaluated showed an IENF density of less than 7.63 together with either abnormal spontaneous or evoked pain (clinical examination) or abnormal thermal thresholds (QST). Study authors recommended a new diagnostic criterion standard based on the presence of at least 2 of 3 abnormal results (clinical, QST, IENF density).

In 2015, Lefaucheur et al compared 5 tests for diagnosing small fiber neuropathy (SFN), including QST using a Medoc thermal perception testing device. The QST device was used to assess the warm detection threshold and cold detection threshold. Other tests were laser-evoked potential (LEP), sympathetic skin response, electrochemical skin conductance. The study enrolled 87 consecutive patients being evaluated for definite (n=33) or possible (n=54) painful SFN. All 5 tests were conducted in a single session. Findings were compared with those for 174 healthy subjects, matched for age and sex. Results of each test were categorized as normal or abnormal, using findings in healthy subjects as the reference range for normal values. All patients with definite SFN and 70% of those with possible SFN had at least 1 abnormal test. The sensitivity and specificity of each test in the series of 87 patients are shown in Table 2.

Table 2. Sensitivity and Specificity in Lefaucheur et al14 (N=87)

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity, %</th>
<th>Specificity, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm detection threshold</td>
<td>44.8</td>
<td>91.4</td>
</tr>
<tr>
<td>Cold detection threshold</td>
<td>26.4</td>
<td>97.1</td>
</tr>
<tr>
<td>Laser-evoked potential</td>
<td>64.4</td>
<td>87.4</td>
</tr>
<tr>
<td>Sympathetic skin response</td>
<td>33.3</td>
<td>77.6</td>
</tr>
<tr>
<td>Electrochemical skin conductance</td>
<td>49.4</td>
<td>92.5</td>
</tr>
</tbody>
</table>

LEP was the most sensitive test. However, not all patients were correctly categorized with LEP. Fifteen patients with at least 1 abnormal test had normal LEP tests, but abnormal warm detection threshold or electrochemical skin conductance tests. Findings of the other 2 tests (cold detection threshold, sympathetic skin response) were redundant. As noted by the authors, a limitation of their study was the lack of a definitive criterion standard for SFN with which to compare test findings.

Clinical Utility

No direct evidence from clinical trials was identified demonstrating that use of thermal testing resulted in changes in patient management or improved patient outcomes. Indirect evidence on clinical utility rests on clinical validity. Because of limited evidence about test performance for vibration testing, no inferences can be made about clinical utility.

Section Summary: Thermal Sensory Testing

A systematic review identified 5 high-quality studies evaluating the technical performance of thermal sensory testing. Reviewers concluded that the studies had considerable variation in the reliability of thermal QST. Two additional studies evaluated the diagnostic accuracy of thermal QST using the same FDA-cleared device. Neither found a high diagnostic accuracy of thermal QST, but both found the test had potential when used in combination with other tests. The
optimal combination of tests is not well-defined. No studies reporting on the clinical utility for thermal sensory testing were identified, and, because there is insufficient evidence on test performance, an indirect chain of evidence on clinical utility cannot be constructed.

Summary of Evidence
For individuals who have conditions linked to nerve damage or disease (e.g., diabetic neuropathy, carpal tunnel syndrome) who receive current perception threshold testing, the evidence includes several studies on technical performance and diagnostic accuracy. Relevant outcomes are test accuracy and validity, symptoms, and functional outcomes. A technology assessment found insufficient evidence on the technical performance of current perception quantitative sensory testing (QST) devices (e.g., reproducibility) and there is a lack of standardization for what constitutes values in a normal range. The existing evidence does not support the accuracy of current perception threshold testing for diagnosing any condition linked with nerve damage or disease. Studies comparing current perception threshold testing with other testing methods have not reported on sensitivity or specificity. In addition, there is a lack of direct evidence on the clinical utility of current perception testing and, because there is insufficient evidence on test performance, an indirect chain of evidence on clinical utility cannot be constructed. The evidence is insufficient to determine the effects of the technology on health outcomes.

For individuals who have conditions linked to nerve damage or disease (e.g., diabetic neuropathy, carpal tunnel syndrome) who receive pressure-specified sensory testing (PSST), the evidence includes several studies on diagnostic accuracy. Relevant outcomes are test accuracy and validity, symptoms, and functional outcomes. We did not identify any studies evaluating the technical performance of PSST. Current evidence does not support the accuracy of PSST for diagnosing any condition linked with nerve damage or disease. A systematic review found that PSST had low accuracy for diagnosing spinal conditions. In addition, there is a lack of direct evidence on the clinical utility of current perception testing and, because there is insufficient evidence on test performance, an indirect chain of evidence on clinical utility cannot be constructed. The evidence is insufficient to determine the effects of the technology on health outcomes.

For individuals who have conditions linked to nerve damage or disease (e.g., diabetic neuropathy, carpal tunnel syndrome) who receive vibration perception testing, the evidence includes a study on technical performance and several studies on diagnostic accuracy. Relevant outcomes are test accuracy and validity, symptoms, and functional outcomes. A study evaluating the technical performance of vibration testing found that results were highly reproducible. A few studies have assessed the diagnostic performance of vibration testing using devices not cleared by the Food and Drug Administration. In addition, there is a lack of direct evidence on the clinical utility of vibration perception testing and, in the absence of sufficient evidence on test performance, an indirect chain of evidence on clinical utility cannot be constructed. The evidence is insufficient to determine the effects of the technology on health outcomes.

For individuals who have conditions linked to nerve damage or disease (e.g., diabetic neuropathy, carpal tunnel syndrome) who receive thermal sensory testing, the evidence includes several studies on technical performance and diagnostic accuracy. Relevant outcomes are test accuracy and validity, symptoms, and functional outcomes. A systematic review of studies on the technical performance of thermal sensory found considerable variation in the reliability of thermal QST. Two studies identified evaluated the diagnostic accuracy of thermal QST using the same Food and Drug Administration–cleared device. Neither found a high diagnostic accuracy for thermal QST, but both studies found the test had potential when used with other tests. The optimal combination of tests is currently unclear. In addition, there is a lack of direct evidence on the clinical utility of thermal sensory testing and, because there is insufficient evidence on test performance, an indirect chain of evidence on clinical utility...
cannot be constructed. The evidence is insufficient to determine the effects of the technology on health outcomes.

Supplemental Information
Clinical Input from Physician Specialty Societies and Academic Medical Centers
While the various physician specialty societies and academic medical centers may collaborate with and make recommendations during this process, through the provision of appropriate reviewers, input received does not represent an endorsement or position statement by the physician specialty societies or academic medical centers, unless otherwise noted.
In response to the requests from Blue Cross Blue Shield Association physician specialty societies and academic medical centers, input was received from 1 specialty society and 1 academic medical center on use of quantitative sensory testing (QST) in 2008. Input from both sources agreed with the policy statement that QST is considered investigational, as adopted in 2008.

Practice Guidelines and Position Statements
European Federation of Neurological Societies
In 2010, the European Federation of Neurological Societies updated its guidelines on neuropathic pain assessment. The guidelines stated:

“Quantitative sensory testing (QST) can be used in the clinic along with bedside testing to document the sensory profile. Because abnormalities have often been reported in non-NPs [neuropathic pain] as well, QST cannot be considered sufficient to separate differential diagnoses (GPP) [good practice point, i.e., consensus recommendation]. QST is helpful to quantify the effects of treatments on allodynia and hyperalgesia and may reveal a differential efficacy of treatments on different pain components (Level A).... The evaluation of pain in response to thermal stimuli is best performed using the computerized thermotest, but the task force does not recommend the systematic measure of thermal stimuli except for pathophysiological research or treatment trials. A simple and sensitive tool to quantify pain induced by thermal stimuli in clinical practice is still lacking.”

American Academy of Neurology
A 2003 report (reaffirmed 2008) from the American Academy of Neurology (AAN) concluded that quantitative sensory testing (QST) is probably (level B recommendation) an effective tool for documenting of sensory abnormalities and for documenting changes in sensory thresholds in longitudinal evaluation of patients with diabetic neuropathy. Evidence was weak or insufficient to support the use of QST in patients with other conditions (small fiber sensory neuropathy, pain syndromes, toxic neuropathies, uremic neuropathy, acquired and inherited demyelinating neuropathies, or malingering).

American Association of Neuromuscular & Electrodiagnostic Medicine
The American Association of Neuromuscular & Electrodiagnostic Medicine (AANEM) published a technology literature review on QST (light touch, vibration, thermal, pain) in 2004. The review concluded that QST is a reliable psychophysical test of large- and small-fiber sensory modalities but is highly dependent on the full patient cooperation. Abnormalities do not localize dysfunction to the central or peripheral nervous system, and no algorithm can reliably distinguish between psychogenic and organic abnormalities. The AANEM review also indicated that QST has been shown to be reasonably reproducible over a period of days or weeks in normal subjects, but, for individual patients, more studies are needed to determine the maximum allowable difference between 2 QSTs that can be attributed to experimental error.

In 2005, AANEM with AAN and American Academy of Physical Medicine & Rehabilitation developed a formal case definition of distal symmetrical polyneuropathy based on a systematic analysis of peer-reviewed literature supplemented by consensus from an expert panel. QST was not included as part of the final case definition, given that the reproducibility of QST ranged from poor to excellent, and the sensitivities and specificities of QST were found to vary widely among studies.
**Quantitative Sensory Testing**

**U.S. Preventive Services Task Force Recommendations**

Not applicable.

**Medicare National Coverage**

In 2002, Medicare announced a national noncoverage policy on sensory nerve conduction threshold testing. Medicare reconsidered its policy, but affirmed it, concluding that any use of sensory nerve conduction threshold testing to diagnose sensory neuropathies or radiculopathies is not reasonable and necessary. This decision was reaffirmed in 2004. Medicare has not addressed coverage for other types of QST.

**Ongoing and Unpublished Clinical Trials**

A search of ClinicalTrials.gov in May 2017 did not identify any ongoing or unpublished trials that would likely influence this review.

**References**

2.01.39  Quantitative Sensory Testing
Page 12 of 13


Documentation for Clinical Review

- No records required

Coding

This Policy relates only to the services or supplies described herein. Benefits may vary according to benefit design; therefore, contract language should be reviewed before applying the terms of the Policy. Inclusion or exclusion of a procedure, diagnosis or device code(s) does not constitute or imply member coverage or provider reimbursement.

IE

The following services may be considered investigational.

<table>
<thead>
<tr>
<th>Type</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPT®</td>
<td>0106T</td>
<td>Quantitative sensory testing (QST), testing and interpretation per extremity; using touch pressure stimuli to assess large diameter sensation</td>
</tr>
<tr>
<td></td>
<td>0107T</td>
<td>Quantitative sensory testing (QST), testing and interpretation per extremity; using vibration stimuli to assess large diameter fiber sensation</td>
</tr>
<tr>
<td></td>
<td>0108T</td>
<td>Quantitative sensory testing (QST), testing and interpretation per extremity; using cooling stimuli to assess small nerve fiber sensation and hyperalgesia</td>
</tr>
<tr>
<td></td>
<td>0109T</td>
<td>Quantitative sensory testing (QST), testing and interpretation per extremity; using heat-pain stimuli to assess small nerve fiber sensation and hyperalgesia</td>
</tr>
<tr>
<td></td>
<td>0110T</td>
<td>Quantitative sensory testing (QST), testing and interpretation per extremity; using other stimuli to assess sensation</td>
</tr>
<tr>
<td>HCPCS</td>
<td>G0255</td>
<td>Current perception threshold/sensory nerve conduction test, (SNCT) per limb, any nerve</td>
</tr>
<tr>
<td>ICD-10 Procedure</td>
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<td>None</td>
</tr>
</tbody>
</table>
### Policy History

This section provides a chronological history of the activities, updates and changes that have occurred with this Medical Policy.

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Action</th>
<th>Reason</th>
</tr>
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<tbody>
<tr>
<td>12/07/2006</td>
<td>Adopted BCBSA policy</td>
<td>Medical Policy Committee</td>
</tr>
<tr>
<td>10/01/2010</td>
<td>Policy revision without position change</td>
<td>Medical Policy Committee</td>
</tr>
<tr>
<td>06/30/2015</td>
<td>Coding update</td>
<td>Administrative Review</td>
</tr>
<tr>
<td>09/30/2015</td>
<td>Policy revision with position change</td>
<td>Medical Policy Committee</td>
</tr>
<tr>
<td>04/01/2016</td>
<td>Policy revision without position change</td>
<td>Medical Policy Committee</td>
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<tr>
<td>08/01/2017</td>
<td>Policy revision without position change</td>
<td>Medical Policy Committee</td>
</tr>
</tbody>
</table>

### Definitions of Decision Determinations

**Medically Necessary:** A treatment, procedure, or drug is medically necessary only when it has been established as safe and effective for the particular symptoms or diagnosis, is not investigational or experimental, is not being provided primarily for the convenience of the patient or the provider, and is provided at the most appropriate level to treat the condition.

**Investigational/Experimental:** A treatment, procedure, or drug is investigational when it has not been recognized as safe and effective for use in treating the particular condition in accordance with generally accepted professional medical standards. This includes services where approval by the federal or state governmental is required prior to use, but has not yet been granted.

**Split Evaluation:** Blue Shield of California/Blue Shield of California Life & Health Insurance Company (Blue Shield) policy review can result in a split evaluation, where a treatment, procedure, or drug will be considered to be investigational for certain indications or conditions, but will be deemed safe and effective for other indications or conditions, and therefore potentially medically necessary in those instances.

### Prior Authorization Requirements (as applicable to your plan)

Within five days before the actual date of service, the provider must confirm with Blue Shield that the member's health plan coverage is still in effect. Blue Shield reserves the right to revoke an authorization prior to services being rendered based on cancellation of the member's eligibility. Final determination of benefits will be made after review of the claim for limitations or exclusions.

Questions regarding the applicability of this policy should be directed to the Prior Authorization Department. Please call (800) 541-6652 or visit the provider portal at www.blueshieldca.com/provider.

### Disclaimer

Disclaimer: This medical policy is a guide in evaluating the medical necessity of a particular service or treatment. Blue Shield of California may consider published peer-reviewed scientific literature, national guidelines, and local standards of practice in developing its medical policy. Federal and state law, as well as contract language, including definitions and specific contract provisions/exclusions, take precedence over medical policy and must be considered first in determining covered services. Member contracts may differ in their benefits. Blue Shield reserves the right to review and update policies as appropriate.