Paraspinal Surface Electromyography (SEMG) to Evaluate and Monitor Back Pain

Section 2.0 Medicine

Effective Date: October 31, 2014

Description

Surface electromyography (SEMG), a noninvasive procedure that records the summation of muscle electrical activity, has been investigated as a technique to evaluate the physiologic functioning of the back. In addition, this procedure has been studied as a technique to evaluate abnormal patterns of electrical activity in the paraspinal muscles in patients with back pain symptoms, such as spasm, tenderness, limited range of motion, or postural disorders.

Related Policies

- N/A

Policy

Paraspinal surface electromyography (SEMG) is considered investigational as a technique to diagnose or monitor back pain.

Policy Guidelines

There is no specific CPT code for SEMG (other than 96002, dynamic surface electromyography, during walking or other functional activities, 1 to 12 muscles, which is part of the CPT coding for motion analysis). Existing codes for EMG (95860-95872) explicitly describe needle EMG, in which a needle is inserted into an individual muscle. Therefore, these codes do not describe surface EMG. One of the following nonspecific CPT codes might be used:

- **95999**: Unlisted neurological or neuromuscular diagnostic procedure
- **97799**: Unlisted physical medicine/rehabilitation service or procedure
- **99199**: Unlisted special service, procedure, or report

There is a HCPCS code that is specific to surface EMG:

- **S3900**: Surface electromyography (EMG)

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)) prohibit Plans from denying Food and Drug Administration (FDA) - approved technologies as investigational. In these instances, plans may have to consider the coverage eligibility of FDA-approved technologies on the basis of medical necessity alone.

**Rationale**

**Background**

Back pain is an extremely common condition, affecting most individuals at some point in their lives. Identifying the pathogenesis of back pain is a challenging task, in part due to the complex anatomy of the back, which includes vertebrae, intervertebral discs, facet joints, spinal nerve roots, and numerous muscles. For example, back pain may be related to osteoarthritis, disc disease, subluxation, or muscular pathology, such as muscle strain or spasm. Moreover, due to referred pain patterns, the location of the pain may not be anatomically related to the pathogenesis of the pain. For example, buttock or leg pain may be related to pathology in the spine. In addition to the diagnostic challenges of back pain is the natural history of acute back pain. Most cases of acute low back pain will resolve with conservative therapy, such as physical therapy, and continuing normal activities within limits permitted by the pain. Thus, initial imaging or other diagnostic testing is generally not recommended unless “red flag” warning signs are present or the pain persists for longer than 4 to 6 weeks. Red flag findings include significant trauma, history of cancer, unrelenting night pain, fevers or chills, and progressive motor or sensory deficits.

Aside from physical examination, diagnostic tests include imaging technologies, such as magnetic resonance imaging (MRI), designed to identify pathology (e.g., bulging discs) or tests such as discography to localize the abnormality by reproducing the pain syndrome. However, due to their lack of specificity, all diagnostic tests must be carefully interpreted in the context of the clinical picture. For example, 5% of asymptomatic patients will have bulging discs as identified by MRI. Therefore, the presence of a bulging disc may only be clinically significant if well correlated with symptoms. Assessment of the musculature may focus on range of motion or strength exercises.

In contrast to anatomic imaging, SEMG, which records the summation of muscle activity from groups of muscles, has been investigated as a technique to evaluate the physiologic functioning of the back. A noninvasive procedure, SEMG is contrasted with needle electromyography, an invasive procedure in which the electrical activity of individual muscles is recorded. Paraspinal SEMG, has been explored as a technique to evaluate abnormal patterns of electrical activity in the paraspinal muscles in patients with back pain symptoms such as spasm, tenderness, limited range of motion, or postural disorders. The technique is performed using 1 or an array of electrodes placed on the skin surface, with recordings made at rest, in various positions, or after a series of exercises. Recordings can also be made by using a handheld device, which is applied to the skin at different sites. Electrical activity can be assessed by computer analysis of the frequency spectrum (i.e., spectral analysis), amplitude, or root mean square of the electrical action potentials. In particular, spectral analysis that focuses on the median frequency has been used to assess paraspinal muscle fatigue during isometric endurance exercises. Paraspinal SEMG has been researched as a technique to establish the etiology of back pain and also has been used to monitor the response to therapy.
and establish physical activity limits, such as assessing capacity to lift heavy objects or ability to return to work.

Paraspinal SEMG is an office-based procedure that may be most commonly used by physiatrists or chiropractors. The following clinical applications of the paraspinal SEMG have been proposed:

- Clarification of a diagnosis (i.e., muscle, joint, or disc disease)
- Selection of a course of medical therapy
- Selection of a type of physical therapy
- Preoperative evaluation
- Postoperative rehabilitation
- Follow-up of acute low back pain
- Evaluation of exacerbation of chronic low back pain
- Evaluation of pain management treatment techniques

Regulatory Status

SEMG devices approved by FDA include those that use a single electrode or a fixed array of multiple surface electrodes.

Several FDA-approved devices combine surface EMG along the spine with other types of monitors. For example, in 2007, the Insight Discovery (Fasstech, Burlington, MA) was cleared for marketing through the 510(k) process. The device contains 6 sensor types, 1 of which is surface EMG. The indications include measuring bilateral differences in surface EMG along the spine and measuring surface EMG along the spine during functional tasks. (Earlier Insight models had fewer sensor types.) FDA product code: IKN.

Literature Review

Surface electromyography (SEMG) has been used as a research tool to evaluate the performance of paraspinal muscles in patients with back pain and to further understand the etiology of low back pain.(1-4) Preliminary research has also been performed on which SEMG parameters best differentiate between patients with and without back pain.(5,6) However, validation of its use as a clinical diagnostic technique involves a sequential 3-step procedure as follows:

1. Technical performance of a device is typically assessed by studies that compare test measurements with a criterion standard and those that compare results taken with the same device on different occasions (test-retest).

2. Diagnostic performance is evaluated by the ability of a test to accurately diagnose a clinical condition in comparison with the criterion standard. The sensitivity of a test is the ability to detect a disease when the condition is present (true positive), while specificity indicates the ability to detect patients who are suspected of disease but who do not have the condition (true negative). Evaluation of diagnostic performance, therefore, requires independent assessment by the 2 methods in a population of patients who are suspected of disease but who do not all have the disease.

3. Evidence related to improvement of clinical outcomes with use of this testing assesses the data linking use of a test to changes in health outcomes (clinical utility). While in some cases, tests can be evaluated adequately using technical and diagnostic performance, when a test identifies a new or different group of
patients with a disease; randomized trials are needed to demonstrate impact of the test on the net health outcome.

The following discussion focuses on these 3 steps as they apply to SEMG.

**Technical Performance**

Several studies using different SEMG devices have suggested that paraspinal SEMG, in general, is a reliable technique, based on coefficients of variation or test-retest studies.\(^1\)\(^,\)\(^7\) No studies were identified that compared the performance of SEMG to a criterion standard reference test.

**Diagnostic Performance**

No articles that compare the results of SEMG (which tests groups of muscles) with needle electromyography (which tests individual muscles) for diagnosing any specific muscle pathology were identified in literature searches. However, the pathology of individual muscles (i.e., radiculopathy, neuropathy) may represent a different process than the pathology of muscle groups (i.e., muscle strain, spasm), and thus SEMG may be considered by its advocates as a unique test for which there is currently no criterion standard. Nevertheless, even if one accepts this premise, there are inadequate data to evaluate the diagnostic performance of SEMG. For example, no articles were identified in the published peer-reviewed literature that established definitions of normal or abnormal SEMG. In some instances, asymmetrical electrical activity may have been used to define abnormality; results may be compared with normative data. However, there was no published literature defining what degree of asymmetry would constitute abnormality or how a normative database was established.\(^8\)

In the absence of a criterion standard diagnostic test, correlation with the clinical symptoms and physical exam is critical. De Luca published a series of studies investigating a type of SEMG called the Back Analysis System (BAS), consisting of surface electrodes and other components to measure the electrical activity of muscles during isometric exercises designed to produce muscle fatigue.\(^2\) Using physical exam and clinical history as a criterion standard, the author found that the BAS was able to accurately identify control and back pain patients 84% and 91% of the time, respectively, with the values increasing to 100% in some populations of patients. (Accuracy is the sum of true positive and true negative results.) However, these studies were not designed as a clinical diagnostic tool per se but were intended to investigate the etiology of back pain and to investigate muscular fatigue patterns in patients with and without back pain.

Hu et al in Hong Kong published 2 articles on dynamic topography, an approach to analyzing SEMG findings.\(^9\)\(^,\)\(^10\) The studies had similar protocols. Both included low back pain patients and healthy controls; all participants underwent SEMG at study enrollment and then back pain patients participated in a rehabilitation program. The first study found different dynamic topography at baseline between healthy people and people with back pain (e.g., a more symmetric pattern in healthy controls).\(^9\) After physical therapy, the dynamic topography images of back pain patients were more similar to the healthy controls on some of the parameters that were assessed. In the second study, following rehabilitation, back pain patients were classified as responders or nonresponders based on changes in back pain severity.\(^10\) Some associations were found between baseline SEMG parameters and response to rehabilitation. SEMG was not repeated following the rehabilitation program, and thus it is not clear whether there are any significant associations between continued symptoms and SEMG abnormalities. Moreover, it is not clear how SEMG analysis would affect treatment decisions for low back pain patients.
Improvement of Clinical Outcomes

Several articles describe the use of SEMG as an aid in classifying low back pain.(11-13) Much of this research has focused on the use of spectral analysis to assess muscle fatigability rather than how information from SEMG could enhance patient management. While SEMG may be used to objectively document muscle spasm or other muscular abnormalities, it is unclear how such objective documentation would supplant or enhance clinical evaluation, or how this information would be used to alter the treatment plan. In part, the difficulty in clinical interpretation is understanding the extent to which the SEMG abnormalities are primary or secondary. In addition, as noted in the Background section, no specific workup is recommended for acute low back pain without warning signs.

There are no data regarding the impact of SEMG on the final health outcome. For example, SEMG has been proposed as a technique to differentiate muscle spasm from muscle contracture, with muscle spasm treated with relaxation therapy and contracture treated with stretching exercises. However, there are no data to validate that such treatment suggested by SEMG resulted in improved outcomes.(14,15)

A literature review of spinal muscle evaluation in low back pain patients, published in 2007, indicated that the validity of SEMG remains controversial.(16) The authors note that although many studies show increased fatigability of the paraspinal muscles in patients with low back pain, it is not known whether these changes are causes or consequences of the low back pain. Also, the utility of SEMG is limited because of the inability to clearly define normal versus abnormal profiles due to factors such as a lack of normative data.

Summary of Evidence

There are inadequate data on the technical and diagnostic performance of paraspinal surface electromyography (SEMG) compared with a criterion standard reference test. Moreover, there is insufficient evidence regarding how findings from paraspinal SEMG impact patient management and/or how use of the test improves health outcomes. Thus, paraspinal surface electromyography for diagnosing and monitoring back pain is considered investigational.

Practice Guidelines and Position Statements

In a 2011 guideline from the American College of Occupational and Environmental Medicine, surface electromyography is not recommended as a technique for diagnosing low back disorders due to insufficient evidence of efficacy.(17)

U.S. Preventive Services Task Force Recommendations

Paraspinal surface electromyography is not a preventive service.

Medicare National Coverage

There is no national coverage determination (NCD). In the absence of an NCD, coverage decisions are left to the discretion of local Medicare carriers.

References

3. Jones SL, Hitt JR, Desamo MJ et al. Individuals with non-specific low back pain in an active episode demonstrate temporally altered torque responses and


**Documentation Required 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 are considered investigational and therefore not covered for any indication.

<table>
<thead>
<tr>
<th>Type</th>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>CPT®</td>
<td>See Policy Guidelines</td>
<td></td>
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<tr>
<td>HCPC</td>
<td>S3900</td>
<td>Surface electromyography (EMG)</td>
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<td>ICD-9 Procedure</td>
<td>None</td>
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<tr>
<td>ICD-10 Procedure</td>
<td>For dates of service on or after 10/01/2015</td>
<td>Measurement of Musculoskeletal Contractility, External Approach</td>
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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>
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<tbody>
<tr>
<td>9/12/2008</td>
<td>Adopted BCBSA policy MPP 2.01.35 on Paraspinal Surface EMG. Title and Scope broadened to include all Surface EMG’s. Policy Statement, literature search, coding update, and rationale added.</td>
<td>Medical Policy Committee</td>
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<tr>
<td>10/7/2011</td>
<td>Policy revision without position change</td>
<td>Medical Policy Committee</td>
</tr>
<tr>
<td>10/31/2014</td>
<td>Policy title change from Surface Electromyography Policy revision with position change</td>
<td>Medical Policy Committee</td>
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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

This service (or procedure) is considered **medically necessary** in certain instances and **investigational** in others (refer to policy for details).

For instances when the indication is **medically necessary**, clinical evidence is required to determine medical necessity.

For instances when the indication is **investigational**, you may submit additional information to the Prior Authorization Department.

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 also be directed to the Prior Authorization Department. Please call 1-800-541-6652 or visit the Provider Portal www.blueshieldca.com/provider.

The materials provided to you are guidelines used by this plan to authorize, modify, or deny care for persons with similar illness or conditions. Specific care and treatment may vary depending on individual need and the benefits covered under your contract. These Policies are subject to change as new information becomes available.