Dynamic Posturography

Policy Number: 2.01.02   Last Review: 7/2017
Origination: 7/1994   Next Review: 7/2018

Policy
Blue Cross and Blue Shield of Kansas City (Blue KC) will not provide coverage for dynamic posturography. This is considered investigational.

When Policy Topic is covered
Not Applicable

When Policy Topic is not covered
Dynamic posturography is considered investigational.

Description of Procedure or Service

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Dynamic posturography tests a patient’s balance control in situations intended to isolate factors that affect balance in everyday experiences. Posturography provides quantitative information on the degree of imbalance present but is not intended to diagnosis specific types of balance disorders.

For individuals with suspected balance disorders who receive dynamic posturography, the evidence for dynamic posturography includes technical performance studies, cross-sectional comparisons of results in patients with balance disorders and healthy controls, and retrospective case series reporting outcomes for patients assessed with dynamic posturography as part of clinical care. Relevant outcomes are test accuracy and validity, symptoms, and morbid events. There are no generally accepted reference standards for dynamic posturography, which makes it difficult to determine how testing results can be applied in clinical care. There is a lack of evidence on test performance characteristics for clinically important conditions, such as identifying patients who are at risk of falls. There are no studies demonstrating the clinical utility of the test that would lead to changes in management that improve outcomes (eg,
symptoms, function). The evidence is insufficient to determine the effects of the technology on health outcomes.

**Background**

Complaints of imbalance are common in older adults and contribute to the risk of falling in this population. Falls are an important cause of death and disability in this population in the United States. Maintenance of balance is a complex physiologic process, requiring interaction of the vestibular, visual, and proprioceptive/somatosensory system, and central reflex mechanisms. Balance is also influenced by the general health of the patient (ie, muscle tone, strength, range of motion). Therefore, identifying and treating the underlying balance disorder can be difficult. Commonly used balance function tests (eg, electronystagmography, rotational chair tests) attempt to measure the extent and site of a vestibular lesion but do not assess the functional ability to maintain balance.

Dynamic posturography aims to provide quantitative information on a patient's functional ability to maintain balance. The patient, wearing a harness to prevent falls, stands on an enclosed platform surrounded by a visual field. By altering the angle of the platform or shifting the visual field, the test assesses movement coordination and the sensory organization of visual, somatosensory, and vestibular information relevant to postural control. The patient undergoes 6 different testing situations designed to evaluate the vestibular, visual, and proprioceptive/somatosensory components of balance. In general terms, the test measures an individual's balance (as measured by a force platform to calculate the movement of the patient’s center of mass) while visual and somatosensory cues are altered. These tests vary by whether eyes are open or closed, the platform is fixed or sway-referenced, and whether the visual surround is fixed or sway-referenced. Sway-referencing involves making instantaneous computer-aided alterations to the platform or visual surround to coincide with changes in body position produced by sway. The purpose of sway-referencing is to cancel out accurate feedback from somatosensory or visual systems that are normally involved in maintaining balance. In the first 3 components of the test, the support surface is stable, and visual cues are either present, absent, or sway-referenced. In tests 4 to 6, the support surface is sway-referenced to the individual, and visual cues are either present, absent, or sway-referenced. In tests 5 and 6, the only accurate sensory cues available for balance are vestibular cues. Results of computerized dynamic posturography have been used to determine what type of information (ie, visual, vestibular, proprioceptive) can and cannot be used to maintain balance. Dynamic posturography cannot be used to localize the site of a lesion.

Posturography tests a patient’s balance control in situations intended to isolate factors that affect balance in everyday experiences. Balance can be rapidly assessed qualitatively by asking the patient to maintain a steady stance on a flat or compressible surface (ie, foam pads) with the eyes open or closed. By closing the eyes, the visual input into balance is eliminated. Use of foam pads eliminates
the sensory and proprioceptive cues. Therefore, only vestibular input is available when standing on a foam pad with eyes closed.

**Regulatory Status**
In 1985, the NeuroCom EquiTest® (NeuroCom International, Portland, OR; now Clackamas, OR), a dynamic posturography device, was cleared for marketing by the U.S. Food and Drug Administration (FDA) through the 510(k) process. Other dynamic posturography device makers include Vestibular Technologies (Cheyenne, WY) and Medicapteurs (Balma, France). Companies that previously manufactured dynamic posturography devices include Metitur (Jyvaskyla, Finland) and Micromedical Technology (Chatham, IL).

**Rationale**
This evidence review was originally created in December 1995 and has been updated regularly with searches of the MEDLINE database, most recently through December 21, 2016. This review was initially informed by a 1996 TEC Assessment, which concluded that the evidence was insufficient to determine whether dynamic posturography distinguished between peripheral and central vestibular dysfunction.¹

**Diagnostic Posturography**

**Clinical Context and Test Purpose**
The purpose of dynamic posturography in patients who have balance dysfunction is to inform a decision whether to pursue additional diagnostic workup (eg, imaging studies that would not have been indicated based on clinical presentation alone) or immediate treatment.

**Patients**
The relevant population(s) of interest are patients presenting with balance dysfunction or dizziness. It would be expected that these patients will have had an initial basic evaluation directed by symptoms that will have included a clinical examination and history, with appropriate vital signs and orthostatic blood pressure measurements, and may have had basic evaluations as directed by their symptoms (eg, electrocardiogram).

**Interventions**
The intervention in this case includes a class of dynamic posturography tests. A number of tests have clearance from the Food and Drug Administration. The specific maneuvers may be operator dependent.

**Comparators**
Depending on the clinical presentation, patients with balance dysfunction may be managed with clinical evaluation alone or with more intensive evaluations including vestibular function testing, which can be used to localize the cause of the dysfunction.
Outcomes
The general outcomes of interest are test accuracy and validity, along with symptoms and morbid events. The ultimate goal of evaluation is to correctly diagnose and treat the underlying condition.

Time
The time frame of interest is months to approximately a year.

Setting
Patients with balance dysfunction being evaluated with dynamic posturography are generally seen in the outpatient setting. Testing may be conducted by audiologists, physical therapists, or technologists under the supervision of physicians.

Technical Performance
Technical performance of a posturography device is typically assessed with 2 types of studies: those that compare test measurements with a criterion standard and those that compare results taken with the same device on different occasions (test-retest).

The published literature on dynamic posturography has addressed the optimal way to conduct or analyze test findings. For example, Pang et al (2011) in Hong Kong evaluated a modified version of the Sensory Organization Test (SOT) that included a head movement component designed to improve the ability of dynamic posturography in assessing balance. In addition, a 2010 study by Visser et al compared results of the commonly used pooled mean response of a series of trials to an analysis using only findings of the first unpracticed trial.

In 2016, Izquierdo-Renau et al reported on the technical performance of testing 1 pressure platform, the S-Plate platform, in a group of 40 healthy subjects. However, that study analyzed plantar pressure, not posturography. There were generally high or moderate intra- and intersession intraclass correlation coefficients.

Diagnostic Accuracy
Diagnostic accuracy is evaluated by the ability of a test to accurately diagnose a clinical condition compared 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 accuracy, therefore, requires independent assessment by the 2 methods in a population of patients suspected of disease but who do not all have the disease.

We did not identify any studies that evaluated the sensitivity and specificity of dynamic posturography for diagnosing any specific balance disorder compared with commonly accepted balance tests. There is no “criterion standard” test for measuring balance, which is a physiologic parameter. Absent a criterion standard comparison, the literature search sought to identify studies that systematically
compared results of dynamic posturography and other balance tests in an appropriate patient population (ie, individuals at increased risk of falling due to balance issues).

Several studies have used both dynamic posturography and another test to assess balance. In a 2015 study, Fritz et al assessed the correlation between dynamic and static posturography and other measures of gait and balance dysfunction in 57 ambulatory patients with multiple sclerosis (MS). Two dynamic posturography parameters and 4 static posturography parameters were measured. Walking velocity (the alternative test) was measured in 2 ways: (1) in a laboratory using the Optotrak Motion Capture System and (2) using the timed 25-foot walk test. In regression analysis, demographics, one of the dynamic posturography parameters (anteroposterior sway), and one of the static posturography parameters (eyes open, feet apart) explained 95.3% of the variance in walking velocity. A higher degree of anteroposterior sway, assessed using dynamic posturography, was significantly associated with higher walking velocity. Although the study found that dynamic posturography was associated with measures of walking velocity, the utility of this information in terms of impact on patient management is unclear.

A 2015 study by Ferrazzoli et al compared dynamic posturography with the Berg Balance Scale (BBS). The BBS is a 14-item scale that assesses performance on a variety of functional tasks, each rated on a 0-to-4 scale (maximal score, 56 points). Lower scores indicate higher fall risk. The study included 29 patients with Parkinson disease (PD) not complaining of balance problems and 12 healthy controls matched for age and sex. Scores on the BBS were significantly lower in PD patients than in controls (p=0.002). Similarly, results of body sway analysis assessed by posturography differed significantly between PD patients and controls. Specifically, compared with controls, PD patients had higher standard deviation of body sway measurements in the eyes open (p=0.005) and in the eyes open counting (p=0.020) conditions. The standard deviation of PD patients was also higher than controls in posturography along the mediolateral axis in the eyes open condition (p=0.019), but results were similar in the eyes open counting condition. The authors suggested that posturography could be used to identify early balance disorders in PD patients before they develop clinical symptoms, and that rehabilitation programs could be developed to address specific balance issues. As discussed in the next section, there is a lack of prospective studies comparing health outcomes in patients managed with and without dynamic posturography.

Other published literature on dynamic posturography has assessed fall risk in older individuals and other populations. For example, Whitney et al (2006) retrospectively reviewed 100 charts of individuals referred to a balance and falls clinic with a vestibular diagnosis using dynamic posturography. Patients who reported multiple falls over 6 months had lower initial scores on the SOT than those who reported 1 or no falls.

Additional studies have used dynamic posturography as a research tool to study balance (eg, in older adults, PD patients, knee osteoarthritis patients); these studies were not designed to evaluate the technical performance or accuracy of
Dynamic posturography has also been considered a control technique in studies evaluating other novel methods of assessing balance. For example, in 2014, Alahmari et al assessed the reliability and validity of a balance rehabilitation device and compared findings with dynamic posturography using the EquiTest.

**Section Summary: Diagnostic Accuracy**

Describing the diagnostic performance of dynamic posturography in terms of sensitivity and specificity is difficult given the lack of a true criterion standard for measuring balance. The available studies comparing dynamic posturography with other types of clinical measures of measuring balance have suggested that posturography results correlate with those measures; however, whether dynamic posturography can be used as a diagnostic test is unknown.

**Improvement in Health Outcomes**

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

No randomized or nonrandomized controlled studies were identified that compared health outcomes in patients when treatment decisions were made with and without the results of dynamic posturography. One 2009 randomized controlled trial was identified, but it used dynamic posturography as an outcome measure, rather than as a tool for making treatment decisions; thus conclusions cannot be drawn from it on the impact of posturography on patient management.

Several retrospective studies have described a customized exercise program based on results of a complete medical and neuro-otologic history and physical examination that included platform posturography. However, the contribution of dynamic posturography to the overall assessment and customization of the exercise program by the Badke group is unclear. In particular, the reports did not describe how (or whether) the exercise programs were modified based on specific deficits identified by platform posturography. Customized vestibular rehabilitation programs can be devised with a standard battery of tests. These retrospective reports were also limited by selection bias and lack of follow-up. Moreover, while these studies showed that individualized therapy can improve patient outcomes, no controlled trials have assessed whether individually customized therapy programs are more effective than generic vestibular exercises.

In addition, other related studies have included the use of posturography in the assessment of patients after a clinical intervention. Examples included conducted with PD patients and assessment of patients with idiopathic normal pressure hydrocephalus before and after shunt surgery. For instance, in 2009, Nocera et al used posturography to evaluate the effectiveness of a home-based exercise program on postural control for 10 patients with PD. The 10 patients and 10...
healthy age-matched controls were assessed with dynamic posturography before and after the 10-week intervention. Dynamic posturography was not used to select patients for the intervention or to individualize the intervention.

**Section Summary: Improvement in Health Outcomes**
Direct evidence of how dynamic posturography can be used to improve outcomes is lacking. Absent direct evidence for a diagnostic test, a chain of evidence can sometimes be identified to demonstrate improvement in health outcomes. However, in the case of dynamic posturography, the chain of evidence about diagnostic performance and how the test would be used in practice is uncertain; therefore, no inferences can be made about clinical utility.

**Summary of Evidence**
For individuals with suspected balance disorders who receive dynamic posturography, the evidence for dynamic posturography includes technical performance studies, cross-sectional comparisons of results in patients with balance disorders and healthy controls, and retrospective case series reporting outcomes for patients assessed with dynamic posturography as part of clinical care. Relevant outcomes are test accuracy and validity, symptoms, and morbid events. There are no generally accepted reference standards for dynamic posturography, which makes it difficult to determine how testing results can be applied in clinical care. There is a lack of evidence on test performance characteristics for clinically important conditions, such as identifying patients who are at risk of falls. There are no studies demonstrating the clinical utility of the test that would lead to changes in management that improve outcomes (eg, symptoms, function). The evidence is insufficient to determine the effects of the technology on health outcomes.

**Supplemental Information**

**Practice Guidelines and Position Statements**
The American Academy of Otolaryngology – Head and Neck Surgery and the Academy’s Foundation have issued 2 guidelines that mention dynamic posturography:

- A position statement on the evaluation or therapy of individuals with suspected balance or dizziness disorders, revised in September 2014, listed dynamic posturography as 1 of 4 medically indicated tests or evaluation tools. ② ⑥
- In 2008, in guidelines on the management of benign paroxysmal positional vertigo, computerized posturography was listed as 1 of 18 potential tools to consider for diagnosing this condition. ②7

**U.S. Preventive Services Task Force Recommendations**
Not applicable.

**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.
Ongoing and Unpublished Clinical Trials
A search of ClinicalTrials.gov in January 2017 did not identify any ongoing or unpublished trials that would likely influence this review.

References

Billing Coding/Physician Documentation Information
92548 Computerized dynamic posturography

ICD-10 Codes
H81.01- Disorders of vestibular function code range
H81.93
H82.1- Vertiginous syndromes in diseases classified elsewhere code range
H82.9
R42 Dizziness and giddiness (includes vertigo NOS)

Additional Policy Key Words
N/A

Policy Implementation/Update Information
7/1/94 New policy. Considered to be a covered service.
7/1/00 No policy statement changes.
7/1/01 New CPT codes added to the policy (92542, 92546, 92548); no policy statement changes.
7/1/02 No policy statement changes.
7/1/03 No policy statement changes.
7/1/04 Policy reviewed and statement changed to investigational (change effective 8/1/05).
7/1/05 Codes 92542 and 92546 removed from the policy. 92548 still considered investigational.
1/1/06 No policy statement changes.
7/1/06 No policy statement changes.
1/1/07  No policy statement changes.  Title changed to: Dynamic Posturography (formerly: Computerized Dynamic Posturography)
7/1/07  No policy statement changes.
1/1/08  No policy statement changes.
8/1/08  Policy statement revised.  Previously this was considered investigational.  It is now considered not medically necessary.
7/1/09  No policy statement changes.
7/1/10  No policy statement changes.
7/1/11  Policy statement changed from not medically necessary to investigational.
7/1/12  No policy statement changes.
7/1/13  No policy statement changes.
7/1/14  No policy statement changes.
7/1/15  No policy statement changes.
7/1/16  No policy statement changes.
7/1/17  No policy statement changes.

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