

2.01.02

Section:	Medicine	Effective Date:	July 15, 2016
Subsection:	Medicine	Original Policy Date:	September 13, 2012
Subject:	Dynamic Posturography	Page:	1 of 8

Last Review Status/Date: June 2016

Dynamic Posturography

Description

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

Background

Dynamic posturography aims to provide quantitative information regarding 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 the 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 in 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 that are 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.

Complaints of imbalance are common in older individuals and contribute to the risk of falling in the elderly population. Falls are the most common 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, proprioceptive/somatosensory system, and central reflex mechanisms and is influenced by the general health of the patient (ie, muscle tone, strength, and range of motion). Therefore, identifying and treating the underlying balance disorder may be difficult. Commonly used

Section:	Medicine	Effective Date:	July 15, 2016
Subsection:	Medicine	Original Policy Date:	September 13, 2012
Subject:	Dynamic Posturography	Page:	2 of 8

balance function tests such as electronystagmography (ENG) and rotational chair tests attempt to measure the extent and site of a vestibular lesion but do not attempt to assess the functional ability of the patient to maintain balance. 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. The 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

The NeuroCom EquiTest® is a dynamic posturography device that received 510(k) marketing clearance from the U.S. Food and Drug Administration (FDA) originally in 1985 and full clearance in 1991. Other dynamic posturography device makers include Micromedical Technology, Metitur, and Vestibular Technologies. FDA product code: LXV

Related Policies

None

Policy

**This policy statement applies to clinical review performed for pre-service (Prior Approval, Precertification, Advanced Benefit Determination, etc.) and/or post-service claims.*

Diagnostic dynamic posturography is considered **not medically necessary**.

Rationale

The policy was initially developed using a 1996 TEC Assessment, which concluded that the evidence was insufficient to determine whether dynamic posturography distinguished between peripheral and central vestibular dysfunction. (1)

Assessment of a diagnostic technology such as dynamic posturography typically focuses on 3 parameters: 1) technical performance; 2) diagnostic performance (sensitivity and specificity) in appropriate populations of patients; and 3) demonstration that the diagnostic information can be used to improve patient outcomes (clinical utility).

Technical performance of a 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).

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 suspected of disease but who do not all have the disease.

Section:	Medicine	Effective Date:	July 15, 2016
Subsection:	Medicine	Original Policy Date:	September 13, 2012
Subject:	Dynamic Posturography	Page:	3 of 8

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). 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 impact of the test on the net health outcome.

Technical Performance

As recently as 2011, the published literature on the technical performance of dynamic posturography addressed the optimal way to conduct or analyze test findings. (2-5) For example, Pang et al 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. (3) A 2010 study by Visser et al compared results of the commonly used pooled mean response to a series of trials, to an analysis using only findings of the first unpracticed trial. (4)

Accuracy of Dynamic Posturography for Identifying Balance Disorders

Literature searches failed to 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. In the absence of 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 for assessing balance. A 2015 study by 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).(6) 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, 1 of the dynamic posturography parameters (anteroposterior sway) and 1 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).(7) 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 in 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

Section:	Medicine	Effective Date:	July 15, 2016
Subsection:	Medicine	Original Policy Date:	September 13, 2012
Subject:	Dynamic Posturography	Page:	4 of 8

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 noted that posturography can potentially 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.(8-11) For example, Whitney et al conducted a retrospective review of 100 charts of individuals referred to a balance and falls clinic with a vestibular diagnosis using dynamic posturography.(11) Patients who reported multiple falls over 6 months had lower initial scores on the SOT than those who reported 1 or no falls.

Studies identified in recent literature updates used dynamic posturography as a research tool to study balance (eg, in older individuals, PD patients, knee osteoarthritis patients); these studies were not designed to evaluate the technical performance or accuracy of dynamic posturography.(12-17) 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.(17)

Improvement in Health Outcomes

No randomized or non-randomized controlled studies were identified that compared health outcomes in patients when treatment decisions were made with and without the results of dynamic posturography. One randomized controlled trial (RCT) was identified, but this study used dynamic posturography as an outcome measure, rather than as a tool for making treatment decisions; thus conclusions cannot be drawn from this study on the impact of posturography on patient management. (18)

Several retrospective studies were published that describe a customized exercise program based on results of a complete medical and neuro-otologic history and physical examination that included platform posturography. (19, 20) However, the contribution of dynamic posturography to the overall assessment and customization of the exercise program is unclear. In particular, the reports do 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. (21) These retrospective reports are also limited by selection bias and lack of follow-up. Moreover, while these studies show 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 are studies conducted with Parkinson disease patients (22, 23) and assessment of patients with idiopathic normal pressure hydrocephalus before and after shunt surgery. (24) For instance in 2009, Nocera et al used posturography to evaluate the effectiveness of a

Section:	Medicine	Effective Date:	July 15, 2016
Subsection:	Medicine	Original Policy Date:	September 13, 2012
Subject:	Dynamic Posturography	Page:	5 of 8

home-based exercise program on postural control for 10 patients with Parkinson disease. (23) The 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.

Ongoing and Unpublished Clinical Trials

A search of ClinicalTrials.gov in January 2016 did not identify any ongoing or unpublished trials that would likely influence this review.

Practice Guidelines and Position Statements

The American Academy of Otolaryngology-Head and Neck Surgery and Foundation has issued 2 guidelines that mention dynamic posturography:

- A position statement on evaluation of individuals with suspected balance or dizziness disorders, revised in September 2014, listed dynamic posturography as 1 of 4 medically indicated tests or treatments.(25)
- In 2008, a guideline on the management of benign paroxysmal positional vertigo listed computerized posturography as 1 of 18 potential tools to consider for diagnosing this condition.(26)

U.S. Preventive Services Task Force Recommendations

Not applicable

Summary of Evidence

The evidence for dynamic posturography in individuals who have suspected balance disorders includes technical performance studies, cross-sectional comparisons of results in patients with balance disorders and healthy controls, and retrospective case series reporting outcomes of 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 the results can be applied in clinical care. There is a lack of evidence on the performance characteristics of this test 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.

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.

Section:	Medicine	Effective Date:	July 15, 2016
Subsection:	Medicine	Original Policy Date:	September 13, 2012
Subject:	Dynamic Posturography	Page:	6 of 8

References

1. Blue Cross and Blue Shield Association Technology Evaluation Center (TEC). Dynamic posturography in the assessment of vestibular dysfunction. TEC Assessments 1996;Volume 11, Tab 11.
2. Honaker J, Converse C, Shepard N. Modified head shake computerized dynamic posturography. *Am J Audiol* Dec 2009;18(2):108-113. PMID 19949235.
3. Pang MY, Lam FM, Wong GH, et al. Balance performance in head-shake computerized dynamic posturography: aging effects and test-retest reliability. *Phys Ther*. Feb 2011;91(2):246-253. PMID 21148260
4. Visser JE, Oude Nijhuis LB, Janssen L, et al. Dynamic posturography in Parkinson's disease: diagnostic utility of the "first trial effect". *Neuroscience*. 2010;168(2):387-394.
5. Whitney SL, Roche JL, Marchetti GF, et al. A comparison of accelerometry and center of pressure measures during computerized dynamic posturography: a measure of balance. *Gait Posture*. Apr 2011;33(4):594-599. PMID 21333541
6. Fritz NE, Newsome SD, Eloyan A, et al. Longitudinal relationships among posturography and gait measures in multiple sclerosis. *Neurology*. May 19 2015;84(20):2048-2056. PMID 25878185
7. Ferrazzoli D, Fasano A, Maestri R, et al. Balance dysfunction in Parkinson's disease: the role of posturography in developing a rehabilitation program. *Parkinsons Dis*. 2015;2015:520128. PMID 26504611
8. Buatois S, Gueguen R, Gauchard GC, et al. Posturography and risk of recurrent falls in healthy non-institutionalized persons aged over 65. *Gerontology*. 2006;52(6):345-352. PMID 16905886
9. Girardi M, Konrad HR, Amin M, et al. Predicting fall risks in an elderly population: computer dynamic posturography versus electronystagmography test results. *Laryngoscope*. 2001;111(9):1528-1532. PMID 11568601
10. Sinaki M, Lynn SG. Reducing the risk of falls through proprioceptive dynamic posture training in osteoporotic women with kyphotic posturing: a randomized pilot study. *Am J Phys Med Rehabil*. 2002;81(4):241-246.
11. Whitney SL, Marchetti GF, Schade AI. The relationship between falls history and computerized dynamic posturography in persons with balance and vestibular disorders. *Arch Phys Med Rehabil*. 2006;87(3):402-407.
12. Ganesan M, Pasha SA, Pal PK, et al. Direction specific preserved limits of stability in early progressive supranuclear palsy: a dynamic posturographic study. *Gait Posture*. Apr 2012;35(4):625-629. PMID 22225854
13. Lee JM, Koh SB, Chae SW, et al. Postural instability and cognitive dysfunction in early Parkinson's disease. *Can J Neurol Sci*. Jul 2012;39(4):473-482. PMID 22728854
14. Pierchala K, Lachowska M, Morawski K, et al. Sensory Organization Test outcomes in young, older and elderly healthy individuals - preliminary results. *Otolaryngol Pol*. Jul 2012;66(4):274-279. PMID 22890532
15. Biggan JR, Melton F, Horvat MA, et al. Increased load computerized dynamic posturography in prefrail and nonfrail community-dwelling older adults. *J Aging Phys Act*. Jan 2014;22(1):96-102. PMID 23416307
16. Lim KB, Lee HJ. Computerized posturographic measurement in elderly women with unilateral knee osteoarthritis. *Ann Rehabil Med*. Oct 2012;36(5):618-626. PMID 23185725
17. Alahmari KA, Marchetti GF, Sparto PJ, et al. Estimating postural control with the balance rehabilitation unit: measurement consistency, accuracy, validity, and comparison with dynamic posturography. *Arch Phys Med Rehabil*. Jan 2014;95(1):65-73. PMID 24076084

Section:	Medicine	Effective Date:	July 15, 2016
Subsection:	Medicine	Original Policy Date:	September 13, 2012
Subject:	Dynamic Posturography	Page:	7 of 8

18. Teggi R, Caldirola D, Fabiano B, et al. Rehabilitation after acute vestibular disorders. *J Laryngol Otol.* Apr 2009;123(4):397-402. PMID 18549515
19. Badke MB, Miedaner JA, Shea TA, et al. Effects of vestibular and balance rehabilitation on sensory organization and dizziness handicap. *Ann Otol Rhinol Laryngol.* Jan 2005;114(1 Pt 1):48-54. PMID 15697162
20. Badke MB, Shea TA, Miedaner JA, et al. Outcomes after rehabilitation for adults with balance dysfunction. *Arch Phys Med Rehabil.* Feb 2004;85(2):227-233. PMID 14966706
21. Brown KE, Whitney SL, Marchetti GF, et al. Physical therapy for central vestibular dysfunction. *Arch Phys Med Rehabil.* Jan 2006;87(1):76-81. PMID 16401442
22. Hirsch MA, Toole T, Maitland CG, et al. The effects of balance training and high-intensity resistance training on persons with idiopathic Parkinson's disease. *Arch Phys Med Rehabil.* Aug 2003;84(8):1109-1117. PMID 12917847
23. Nocera J, Horvat M, Ray CT. Effects of home-based exercise on postural control and sensory organization in individuals with Parkinson disease. *Parkinsonism Relat Disord.* Dec 2009;15(10):742-745. PMID 19640769
24. Lundin F, Ledin T, Wikkelso C, et al. Postural function in idiopathic normal pressure hydrocephalus before and after shunt surgery: A controlled study using computerized dynamic posturography (EquiTest). *Clin Neurol Neurosurg.* Sep 2013;115(9):1626-1631. PMID 23489444
25. American Academy of Otolaryngology-Head and Neck Surgery Foundation. Posturography. Posturography. <http://www.entnet.org/Practice/policyPosturography.cfm>. Accessed January 5, 2016.
26. Bhattacharyya N, Baugh RF, Orvidas L, et al. American Academy of Otolaryngology-Head Neck, Surgery Foundation Clinical practice guideline: benign paroxysmal positional vertigo. *Otolaryngol Head Neck Surg.* 2008;139(5 Suppl 4):S47-81.

Policy History

Date	Action	Reason
September 2012	New Policy	
March 2013	Update Policy	Policy updated with literature review. References 8-10 added; others renumbered. No change in policy statement
March 2014	Update Policy	Policy updated with literature review. References added, renumbered or removed. No change to policy statement.
June 2015	Update Policy	Policy updated with literature review. Reference 19 added. No change to policy statement.
June 2016	Update Policy	Policy updated with literature review through December 2, 2015; references 6-7 added. Policy statement unchanged.

Keywords

Computerized Dynamic Posturography
 Dynamic Posturography
 Equitest™ (See Dynamic Posturography)
 Metitur™ (See Dynamic Posturography)

Section:	Medicine	Effective Date:	July 15, 2016
Subsection:	Medicine	Original Policy Date:	September 13, 2012
Subject:	Dynamic Posturography	Page:	8 of 8

Moving Platform Posturography
Posturography, Dynamic

This policy was approved by the FEP® Pharmacy and Medical Policy Committee on June 24, 2016 and is effective July 15, 2016.

Deborah M. Smith, MD, MPH