Protocol

Vestibular Function Testing

(201104)

Medical Benefit		**Effective Date**: 10/01/17	**Next Review Date**: 05/19
Preauthorization	No	**Review Dates**: 05/17, 05/18	

Preauthorization is not required.

The following protocol contains medical necessity criteria that apply for this service. The criteria are also applicable to services provided in the local Medicare Advantage operating area for those members, unless separate Medicare Advantage criteria are indicated. If the criteria are not met, reimbursement will be denied and the patient cannot be billed. Please note that payment for covered services is subject to eligibility and the limitations noted in the patient's contract at the time the services are rendered.

Populations	Interventions	Comparators	Outcomes
Individuals: • With a suspected vestibular disorder not clinically diagnosed as benign paroxysmal positional vertigo	Interventions of interest are: • Electronystagmography and videonystagmography test batteries	Comparators of interest are: • Clinical diagnosis	Relevant outcomes include: • Test accuracy • Symptoms • Functional outcomes • Quality of life
Individuals: • With a suspected vestibular disorder not clinically diagnosed as benign paroxysmal positional vertigo	Interventions of interest are: • Caloric testing	Comparators of interest are: • Clinical diagnosis	Relevant outcomes include: • Test accuracy • Symptoms • Functional outcomes • Quality of life
Individuals: • With a suspected vestibular disorder not clinically diagnosed as benign paroxysmal positional vertigo	Interventions of interest are: • Rotational chair testing	Comparators of interest are: • Clinical diagnosis	Relevant outcomes include: • Test accuracy • Symptoms • Functional outcomes • Quality of life
Individuals: • With a suspected vestibular disorder not clinically diagnosed as benign paroxysmal positional vertigo	Interventions of interest are: • Vestibular evoked myogenic potential testing	Comparators of interest are: • Clinical diagnosis	Relevant outcomes include: • Test accuracy • Symptoms • Functional outcomes • Quality of life
Individuals: • With clinically diagnosed benign paroxysmal positional vertigo with typical presentation	Interventions of interest are: • Laboratory-based vestibular function tests	Comparators of interest are: • Clinical diagnosis alone	Relevant outcomes include: • Test accuracy • Symptoms • Functional outcomes • Quality of life

DESCRIPTION

Dizziness, vertigo, and balance impairments can arise from a loss of vestibular function. A number of established laboratory-based tests are used to evaluate whether the symptoms are due to dysfunction of the semicircular canals. These tests are based on the vestibulo-ocular reflex, which is an involuntary movement of the eyes (nystagmus) in response to vestibular stimulation. Established laboratory tests include electronystagmography (ENG) and videonystagmography (VNG) test batteries, caloric stimulation, and rotational chair testing. Vestibular

evoked myogenic potentials (VEMPs), triggered by sound and vibration, are also being evaluated for the diagnosis of otolith dysfunction.

SUMMARY OF EVIDENCE

UNDIAGNOSED BENIGN PAROXYSMAL POSITIONAL VERTIGO

For individuals who have a suspected vestibular disorder not clinically diagnosed as benign paroxysmal positional vertigo (BPPV) who receive ENG and VNG test batteries, caloric testing, or rotational chair testing, the evidence includes technology assessments of a large body of literature. Relevant outcomes are test accuracy, symptoms, functional outcomes, and quality of life. Based on review of controlled studies, caloric testing was given a level A recommendation that this test was predictive of loss of vestibular function. Based on a prospective study assessing a narrow spectrum of patients with the suspected vestibular dysfunction, and a well-designed retrospective study, compared with the criterion standard test, which included a criterion standard test, rotational chair testing was also given a level A recommendation. These tests are both considered criterion standard tests of vestibular function. ENG/VNG test batteries, which may include caloric testing, are also established methods of assessing loss of vestibular function. The evidence is sufficient to determine that the technology results in a meaningful improvement in the net health outcome.

For individuals who have a suspected vestibular disorder not clinically diagnosed as BPPV who receive VEMP testing, the evidence includes mainly association studies. Relevant outcomes are test accuracy, symptoms, functional outcomes, and quality of life. There is a large and rapidly growing literature on VEMP tests for the assessment of otolith function, although most studies have assessed how the cervical VEMP (cVEMP) and ocular VEMP (oVEMP) change with various disease states. Studies on diagnostic accuracy and clinical utility of this technique for evaluating otolith organs and central pathways are needed. The evidence is insufficient to determine the effects of the technology on health outcomes.

DIAGNOSED BPPV

For individuals who have clinically diagnosed BPPV with typical presentation who receive laboratory-based vestibular function tests, the evidence includes technology assessments and practice guidelines. Relevant outcomes are test accuracy, symptoms, functional outcomes, and quality of life. BPPV with a typical presentation can be diagnosed clinically based on history, the Dix-Hallpike maneuver, lateral roll test, and canalith repositioning procedures; thus, laboratory-based vestibular function tests do not add diagnostic information in such routine cases. The evidence is sufficient to determine that the technology is unlikely to improve the net health outcome.

POLICY

Vestibular function testing using electronystagmography and videonystagmography testing batteries, caloric testing, or rotational chair testing may be considered **medically necessary** when the following conditions have been met:

- The patient has symptoms of a vestibular disorder (e.g., dizziness, vertigo, imbalance); AND
- A clinical evaluation, including maneuvers such as the Dix-Hallpike test if indicated, has failed to identify the cause of the symptoms.

Vestibular evoked myogenic potential tests are considered **investigational**.

Vestibular function testing for the assessment of typical benign paroxysmal positional vertigo that can be diagnosed clinically is **not medically necessary**.

Repeat vestibular function testing when treatment resolves symptoms is **not medically necessary**.

Vestibular function testing in all other situations is **investigational**.

All other laboratory-based vestibular function tests not described above are considered **investigational**.

POLICY GUIDELINES

ENG/VNG TESTING BATTERIES

The ENG/VNG testing batteries may include caloric testing, positional tests, and oculomotor evaluation (i.e., spontaneous nystagmus including gaze-evoked nystagmus, positional nystagmus, optokinetic nystagmus, smooth pursuit tracking, saccade test).

Computerized dynamic posturography is addressed in the Dynamic Posturography Protocol.

BACKGROUND

VERTIGO

The vestibular is an important component in balance control. It includes five end organs, three semicircular canals sensitive to head rotations, and two otolith organs (saccule, utricle) that sense gravity and straight-line (forward, backward, left, right, downward or upward) accelerations. Vertigo is the primary symptom of vestibular dysfunction. It can be experienced as illusory movement such as spinning, swaying, or tilting. Vertigo may be associated with a feeling of being pushed or pulled to the ground, blurred vision, nausea and vomiting, or postural and gait instability. Vertigo may arise from damage or dysfunction of the vestibular labyrinth, vestibular nerve, or central vestibular structures in the brainstem.

Vertigo may be caused by loose particles (otoconia) from the otolith organs that pass into one of the semicircular canals, most frequently the posterior canal. Specific head movements cause the particle to stimulate the canal, causing brief BPPV.

Diagnosis

Brief BPPV can usually be diagnosed clinically based on history of positional vertigo, response to the Dix-Hallpike maneuver or lateral roll tests, and resolution of symptoms with canal repositioning maneuvers.

If vertigo cannot be attributed to BPPV based on history, symptoms, or response to the standard maneuvers, a number of laboratory-based tests can be used to determine whether the vertigo is due to loss of vestibular function.[1, 2] These tests are based on the vestibulo-ocular reflex, which is an involuntary beating movement of the eyes (nystagmus) in response to vestibular stimulation. Nystagmus induced by these tests can help to distinguish between central and peripheral etiologies, in addition to determining whether the deficit is unilateral or bilateral. The typical tests include the ENG or videonystagmography VNG test batteries, caloric testing, and rotational chair testing.

ENG/VNG Test Batteries

The ENG/VNG test batteries include oculomotor evaluation and positional testing. ENG uses electrodes at the canthus of the eyes to detect nystagmus while VNG uses infrared video monitoring with goggles to measure nystagmus.

Caloric Testing

Caloric testing evaluates unilateral vestibular function. In the caloric test, warm or cold water or warm or cold

air, is introduced into each of the external ear canals. In some descriptions, caloric testing is conducted as part of ENG/VNG test batteries.

Rotational Chair Testing

The rotational chair testing evaluates bilateral vestibular function. Rotational chair devices include a lightproof booth, computer-driven chair with a head restraint that rotates around a vertical axis, ENG recording, an infra-red camera, and a two-way communication system. Typically, the chair is rotated in four different patterns, constant acceleration followed by deceleration, rotating followed by a rapid stop, rotating at progressively increasing velocities, and alternating directions.

Passive rotational testing without a rotational chair may be performed when the rotational chair is not available. For the head impulse test, the patient is instructed to keep his or her eyes on a target. The examiner then turns the head rapidly by about 15°. With passive whole body testing the examiner rotates the whole body to the rhythm of a metronome.

Vestibular Evoked Myogenic Potential Testing

VEMP tests are newer techniques that use loud sound (e.g., click, tone burst) or bone vibration (e.g., tendon hammer tap to the forehead or mastoid) to assess otolith function.[3] Both the saccule and utricle are sensitive to sound as well as vibration and movement.

Cervical VEMPs (cVEMPS) are measured by surface electrodes on the ipsilateral sternocleidomastoid muscle in the neck and are thought to originate primarily in the saccule. Abnormality in any part of the auditory cVEMP pathway (saccule, inferior vestibular nerve, vestibular nucleus, medial vestibulospinal tract, the accessory nucleus, the eleventh nerve, sternocleidomastoid) can affect the response.

Ocular VEMPs (oVEMPs) detect subtle activity of an extraocular muscle using surface electrodes under the contralateral eye during an upward gaze, and are thought to be due primarily to stimulation of the utricle. The vestibulo-ocular reflex stimulated by sound or vibration is very small, but synchronous bursts of activity of the extraocular muscles can be detected by electromyography. Lesions that affect the oVEMP may occur in the utricle, superior vestibular nerve, vestibular nucleus, and the crossed vestibule-ocular reflex pathways.

Dynamic Posturography

Dynamic posturography may also be used to evaluate balance. Dynamic posturography is discussed in the Dynamic Posturography Protocol.

Treatment

The central vestibular system is able to compensate for loss of peripheral vestibular function. Thus, the primary therapy for peripheral vestibular dysfunction is exercise-based and includes exercises to promote gaze stability, habituate symptoms, and improve balance and gait.[4] Medications such as vestibular suppressants or antiemetics may be used in the acute stage but are not recommended for chronic use. For patients who have recurrent symptoms uncontrolled by other methods, a surgical or ablative approach may be used. The objective of the ablative approach is to stabilize the deficit to allow central compensation.

REGULATORY STATUS

Vestibular analysis devices are currently regulated by the Food and Drug Administration (FDA) through the 510(k) pathway, under the product code LXV. The term “vestibular analysis devices” includes both diagnostic devices (e.g., rotary chairs, multiaxial chairs) and therapeutic devices (e.g., balance training and balance rehabilitation devices). Some devices indicated for diagnostic testing are included in Table 1.

Table 1. Vestibular Analysis Devices Approved by the Food and Drug Administration

Trade Name	Manufacturer (510k applicant)	510(k)	Date
ICS Impulse®	Otometrics	K122550	2013
Sway Balance™	Sway Medical (Capacity Sports)	K121590	2012
Nydiag 200 Rotary Chair	Interacoustics A/S	K102364	2010
Epley Omniax®	Vesticon	K071973	2008
VMT System	Target Health	K971549	1998
VORTEQ™ (Vestibular Ocular Reflex Test Equipment)	Micromedical Technologies	K891008	1989
Chair, Vestibular, Rotary, Computerized	Contraves	K781268	1987
RVT-50 Rotary Chair for Vestibular Testing	ICS Medical	K872093	1987
EquiTest®	Natus Medical (NeuroCom International)	K851744	1985

An example of equipment used for vestibular evoked myogenic potentials is the Bio-Logic Nav-Pro (Biologic Systems Corp), which in 2003 was cleared for marketing by FDA through the 510(k) process (K994149) for use in the recording and displaying human physiologic data, for auditory screening and assisting in evaluation of auditory and hearing-related disorders using auditory brainstem responses recorded from electroencephalography electrodes placed on the scalp.

RELATED PROTOCOL

Dynamic Posturography

Services that are the subject of a clinical trial do not meet our Technology Assessment Protocol criteria and are considered investigational. *For explanation of experimental and investigational, please refer to the Technology Assessment Protocol.*

It is expected that only appropriate and medically necessary services will be rendered. We reserve the right to conduct prepayment and postpayment reviews to assess the medical appropriateness of the above-referenced procedures. **Some of this protocol may not pertain to the patients you provide care to, as it may relate to products that are not available in your geographic area.**

REFERENCES

We are not responsible for the continuing viability of web site addresses that may be listed in any references below.

1. Fife TD, Tusa RJ, Furman JM, et al. Assessment: vestibular testing techniques in adults and children: report of the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology. Neurology. Nov 28 2000;55(10):1431-1441. PMID 11094095
2. Schubert MC. Vestibular function tests. In: Herdman SJ, Clendaniel RA, eds. Vestibular Rehabilitation. Vol Contemporary Perspectives in Rehabilitation: F.A. Davis;2014:178-194.
3. Halmagyi GM, Curthoys IS. Otolith function tests. In: Herdman SJ, Clendaniel RA, eds. Vestibular Rehabilitation. Vol Contemporary Perspectives in Rehabilitation: F.A. Davis;2014:195-225.
4. Hall CD, Herdman SJ, Whitney SL, et al. Vestibular rehabilitation for peripheral vestibular hypofunction: an evidence-based clinical practice guideline: From the American Physical Therapy Association Neurology Section. J Neurol Phys Ther. Apr 2016;40(2):124-155. PMID 26913496

5. Gofrit SG, Mayler Y, Eliashar R, et al. The association between vestibular physical examination, vertigo questionnaires, and the electronystagmography in patients with vestibular symptoms. Ann Otol Rhinol Laryngol. Apr 2017;126(4):315-321. PMID 28290231
6. Weber KP, Rosengren SM. Clinical utility of ocular vestibular-evoked myogenic potentials (oVEMPs). Curr Neurol Neurosci Rep. May 2015;15(5):22. PMID 25773001
7. Welgampola MS, Colebatch JG. Vestibulocollic reflexes: normal values and the effect of age. Clin Neurophysiol. Nov 2001;112(11):1971-1979. PMID 11682335
8. Ertl M, Boegle R, Kirsch V, et al. On the impact of examiners on latencies and amplitudes in cervical and ocular vestibular-evoked myogenic potentials evaluated over a large sample (N = 1,038). Eur Arch Otorhinolaryngol. Feb 2016;273(2):317-323. PMID 25628238
9. Hunter JB, Patel NS, O'Connell BP, et al. Cervical and ocular VEMP testing in diagnosing superior semicircular canal dehiscence. Otolaryngol Head Neck Surg. May 2017;156(5):917-923. PMID 28168887
10. Halker RB, Barrs DM, Wellik KE, et al. Establishing a diagnosis of benign paroxysmal positional vertigo through the dix-hallpike and side-lying maneuvers: a critically appraised topic. Neurologist. May 2008; 14(3):201-204. PMID 18469678
11. Bhattacharyya N, Baugh RF, Orvidas L, et al. Clinical practice guideline: benign paroxysmal positional vertigo. Otolaryngol Head Neck Surg. Nov 2008;139(5 Suppl 4):S47-81. PMID 18973840
12. Fife TD, Colebatch JG, Kerber KA, et al. Practice guideline: Cervical and ocular vestibular evoked myogenic potential testing: Report of the Guideline Development, Dissemination, and Implementation Subcommittee of the American Academy of Neurology. Neurology. Nov 28 2017;89(22):2288-2296. PMID 29093067
13. Bhattacharyya N, Gubbels SP, Schwartz SR, et al. Clinical practice guideline: benign paroxysmal positional vertigo (Update). Otolaryngol Head Neck Surg. Mar 2017;156(3_suppl):S1-S47. PMID 28248609
14. American Academy or Audiology. Position statement on the audiologist's role in the diagnosis & treatment of vestibular disorders. n.d.; http://www.audiology.org/publications-resources/document-library/position-statement-audiologists-role-diagnosis-treatment. Accessed January 25, 2018.
15. American Academy of Audiology. Scope of practice. Audiol Today. 2004;15(3):44-45.
16. Papathanasiou ES, Murofushi T, Akin FW, et al. International guidelines for the clinical application of cervical vestibular evoked myogenic potentials: an expert consensus report. Clin Neurophysiol. Apr 2014;125(4): 658-666. PMID 24513390