Vestibular Function Testing

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INSTRUCTIONS FOR USE: Company Medical Policies serve as guidance for the administration of plan benefits. Medical policies do not constitute medical advice nor a guarantee of coverage. Company Medical Policies are reviewed annually and are based upon published, peer-reviewed scientific evidence and evidence-based clinical practice guidelines that are available as of the last policy update. The Company reserves the right to determine the application of medical policies and make revisions to medical policies at any time. The scope and availability of all plan benefits are determined in accordance with the applicable coverage agreement. Any conflict or variance between the terms of the coverage agreement and Company Medical Policy will be resolved in favor of the coverage agreement. Coverage decisions are made on the basis of individualized determinations of medical necessity and the experimental or investigational character of the treatment in the individual case. In cases where medical necessity is not established by policy for specific treatment modalities, evidence not previously considered regarding the efficacy of the modality that is presented shall be given consideration to determine if the policy represents current standards of care.

SCOPE: Providence Health Plan, Providence Health Assurance, Providence Plan Partners, and Ayin Health Solutions as applicable (referred to individually as “Company” and collectively as “Companies”).

PLAN PRODUCT AND BENEFIT APPLICATION

☒ **Commercial** ☒ **Medicaid/OHP*** ☐ **Medicare****

*Medicaid/OHP Members

Oregon: Services requested for Oregon Health Plan (OHP) members follow the OHP Prioritized List and Oregon Administrative Rules (OARs) as the primary resource for coverage determinations. Medical policy criteria below may be applied when there are no criteria available in the OARs and the OHP Prioritized List.

**Medicare Members

This *Company* policy may be applied to Medicare Plan members only when directed by a separate *Medicare* policy. Note that investigational services are considered **"not medically necessary"** for Medicare members.

COVERAGE CRITERIA

Note: This medical policy does not address the use of rotational chair testing or caloric testing, which may be considered medically necessary to diagnose vestibular disorders.

I. Vestibular autorotation testing (VAT) is considered **not medically necessary** to diagnose any condition.

II. Vestibular Evoked Myogenic Potential (VEMP) is considered **not medically necessary** for the diagnosis of any condition, including but not limited to Meniere's disease.

Link to Evidence Summary

POLICY CROSS REFERENCES

None

The full Company portfolio of current Medical Policies is available online and can be accessed here.

POLICY GUIDELINES

BACKGROUND

Vestibular System

The vestibular system mediates a person's ability to continue looking at an object, such as another person's face, despite turning his/her head from side to side, or looking at a road sign ahead while walking. This coordination of head turning with eye movement to allow persistent fixation is known as the vestibulo-ocular reflex (VOR) and relies on the peripheral nervous system connections from the inner ear to the brain and to the eye muscles. Impairment of this reflex may lead to vertigo, dizziness and imbalance, and may indicate the presence of a vestibular disorder.

VOR response is measured primarily by a calculation called the "gain". Gain is defined as the change in the eye angle divided by the change in the head angle during the head turn, with an ideal gain of the rotational VOR being 1.0. In addition, the involuntary eye movement (nystagmus) that is a part of the VOR, is defined, in part by "phases". Nystagmus has quick phase and slow phases velocities. The slow phase component of nystagmus can be factored in while calculating the gain.

Vestibular Autorotation Test (VAT)

The vestibular autorotation test (VAT), also referred to as an "active hear rotation (AHR) or "head-shake" test, is a subjective diagnostic test designed to detect abnormalities in VOR function caused by defects in the peripheral nervous system and inner ear. In this test, a seated patient wears a headband with an embedded motion sensor and five electrodes are placed on the forehead and face. To establish a baseline, the patient holds their head down, to the right, and then the left with eyes closed for 20 seconds each. To assess the horizontal canals, the patient fixates on a point on the wall and moves his/her head from side to side (in a "no" motion) while maintaining fixation on a point on the wall. Over 18 seconds, the patient is asked to turn his/her head in response to a series of preset timed high-frequency tones that increase in speed. To assess the vertical canals, a similar process is repeated for vertical movements (the "yes" motion). The facial electrodes capture the movement of eye muscles with respect to the timing of tones and offer an assessment of VOR function.[1]
The accuracy of VAT testing is unclear, since the test cannot adequately control for slippage of the head velocity sensor during fast motion or factor in the potential contribution of another compensatory eye movement reflex (the cervico-ocular reflex). Also, from a clinical perspective, it is unclear to what extent the results of this test contribute to patient management.[1]

VAT differs from the standard of care vestibular test known as the *rotational* or *rotary* chair test in several ways:[2]

- the *rotary chair* test requires a special motorized chair that swivels at a controlled rate, whereas in the VAT test the patient may be seated, but it is not a requirement and no specialized chair is used.
- the *rotary chair* test only measures the contribution of the inner ear alone to nystagmus, whereas the VAT test measures the contribution of both the inner ear and neck inputs to nystagmus.

- in the *rotary chair* test the patient's head remains in a fixed position with a component of the test uses rotating or moving stripes or dots, whereas in the VAT test the patient actively rotates their head to look at a fixed target.

This medical policy does not address the use of rotational chair testing, which may be considered medically necessary to diagnose vestibular disorders. This policy also does not address caloric testing, which may be considered medically necessary to diagnose vestibular disorders.

Meniere Disease (Endolymphatic Hydrops)

Meniere disease is an inner ear disorder that causes episodic vertigo, tinnitus, hearing loss and a feeling of ear congestion.[3,4] The condition is thought to arise from the buildup of abnormal fluid (endolymph*)* in the labyrinth of the inner ear. As the body moves, endolymph stimulates receptors that coordinate the body's position and movement with the brain. In Meniere disease, endolymph buildup disrupts normal balance and hearing signals between the inner ear and the brain, causing vertigo and other symptoms.

Vestibular Evoked Myogenic Potential (VEMP)

Vestibular evoked myogenic potential (VEMP) is a short-latency electromyographic (EMG) potential, activated in response to high-intensity acoustic stimuli. It is hypothesized that VEMP is a vestibulocollic reflex, the afferent limb of which arises from acoustically responsive sensory cells and neurons in the saccule, with signals conducted centrally via the inferior vestibular nerve.[5] Because VEMP is sensitive to structural changes in the saccule indicative of asymptomatic or presymptomatic endolymphatic hydrops, VEMP may aid in the diagnosis or monitoring of Meniere disease.[6]

REGULATORY STATUS

U.S. FOOD AND DRUG ADMINISTRATION (FDA)

Approval or clearance by the Food and Drug Administration (FDA) does not in itself establish medical necessity or serve as a basis for coverage. Therefore, this section is provided for informational purposes only.

CLINICAL EVIDENCE AND LITERATURE REVIEW

EVIDENCE REVIEW

A review of the ECRI, Hayes, Cochrane, and PubMed databases was conducted regarding the use of vestibular autorotation testing as a diagnostic test for vestibular conditions. Below is a summary of the available evidence identified through March 2023.

Vestibular Autorotation Test (VAT)

Technology Assessment

No systematic reviews or recent technology assessments were identified for the use of Vestibular Autorotation Test (VAT) to evaluate any vestibular disorder. One technology assessment was identified and is described below.

In 2000, Fife et al. conducted a technology assessment on behalf of the American Academy of Neurology (AAN). In the assessment of vestibular testing techniques in adults and children, the AAN reported that VAT was not accepted as an established technique, nor did it appear useful in detecting partial unilateral vestibular loss. They stated further that AHR was "probably useful", based on limited data, in detecting bilateral peripheral vestibular loss when used at frequencies above 2 Hz, especially when rotational chair testing was unavailable.

Nonrandomized Studies

- In 2004, Tirelli et al. published a study that evaluated the test-retest reliability of the VAT in 16 patients using the Vorteq system.[7] The study reported that test was not sufficiently reliable, as there was no repeatability of the same measurements at the various frequencies, and therefore the test should not be used in clinical practice. The authors note that advantages of the head auto-rotation test by Vorteq included the ability of the test to evaluate the vestibolo-ocular reflex at high head-rotation frequencies, patients were not disturbed by the active head movements and full test protocol, and that the test is relatively brief, lasting only a few minutes. Disadvantages reported included poor test-retest inter-individual repeatability, wide standard deviations of results, heterogeneous inter-individual spread with regard to phase, and asymmetrical values at high rotation frequencies.

- In 2006, Chen et al. published a study that evaluated the diagnostic potential of VAT for patients with vertebrobasilar insufficiency (VBI), performing VAT and videonystagmography (VNG) on 73 patients with VBI and 48 patients with peripheral vestibular lesions (comparator group).[8] For the VAT, significantly more cases in the VBI group showed enhanced gain values compared to the comparator group (64.4% of cases versus 10.4%, respectively; $\chi^2 = 31.19$, $p < 0.01$). Similarly, gain values were reduced in significantly less VBI cases than in the comparator group (15.5% of cases versus 45.8%, respectively; $\chi^2 = 13.82$, $p < 0.01$). However, values for phase, asymmetry and integration were not significantly different between the VBI and comparator groups. The authors concluded that the gain values generated by VAT were informative for assessing characteristics of vestibular lesions, but the phase and asymmetry values were not. Chen et al. went on to test the same 48 patients with peripheral vestibular lesions with caloric testing (CT) and then compared it to VAT in these patients.[9] VAT and CT both showed abnormal results in 25 patients, with VAT being abnormal in 11 additional patients and CT abnormalities were found in 8 additional patients. There were only four patients with normal results of both VAT and CT. Abnormal results of VAT combined with CT were assessed in 44 (91.7%) patients, leading the authors to conclude that when used as a supplement to CT, VAT can increase the diagnostic yield for patients with peripheral vestibular disorders.

- In 2008, Blatt et al. published the results of a study that evaluated intra- and inter-rater reliability of the VAT in 98 patients reporting dizziness. A subsample of 49 individuals repeated the test for a second rater. Approximately 66% of subjects were unable to meet the performance criterion of six consecutive trials where data was displayed at frequencies higher than 3.9 Hz with coherence values held constant trial to trial. There was a good level of intra-rater reliability for gain (intra-class correlation coefficient [ICC] = 0.78 [95% confidence interval [CI]: 0.69 to 0.87] to 0.95 [(95% CI: 0.93 to 0.97]). A significant difference in intra-rater reliability was found when the first three trials were compared to the last three trials for phase (ICC ranged from 0.04 [95% CI: 0.00 to 0.31] to 0.96 [95% CI: 0.93 to 0.97]) and asymmetry (ICC ranged from 0.39 [95% CI: 0.17 to 0.56] to 0.73 [95% CI: 0.32 to 0.81]). These differences were more prominent at frequencies greater than or equal to 4.3 Hz. Inter-rater reliability was good to excellent across all variables at frequencies less than or equal to 3.9 Hz. The authors noted that many patients had difficulty performing VAT. The authors concluded that reliability estimates for phase and asymmetry were significantly affected by differences in test administration, and that additional studies were needed to demonstrate the stability of the test.

- In 2008, Ozgirgin and Tarhan published the results of a small case series that assessed the use of the VAT for evaluating benign paroxysmal positional vertigo (BPPV).[10] This study included 20 patients who had been diagnosed as having posterior semicircular canal BPPV that were evaluated with the VAT before and after the use of the Epley maneuver for treatment. The difference between the pre-treatment and post-treatment VAT values for gain was not statistically significant for both the horizontal and vertical autorotation tests. Similar nonsignificant results were found for pre-treatment and post-treatment phase values for both the horizontal and vertical autorotation tests. The authors concluded that stimulation of the VOR caused by BPPV did not affect gain and phase values to a statistically significant degree, and the VAT values after the resolution of the patient's symptoms improved slightly but without statistical significance.

- In 2010, Gao et al. published the results of a small comparative study that evaluated the utility of VAT in the diagnosis of BPPV, comparing VAT to the standard of care caloric test in 41 patients.[11] The authors reported that results of VAT were abnormal in 34 (82.93%) patients with BPPV. Fourteen cases were found with abnormal vertical phase, one case with abnormal vertical gain in a total of 21 vertical semicircular canal BPPV patients. Six cases with abnormal horizontal phase lead, five cases with abnormal horizontal gain and two cases with asymmetry were found in 12 patients with horizontal semicircular canal BPPV. Phase lead was abnormal in all frequencies in four patients, and in 2-3 Hz frequencies in 21 patients. Twenty four (58.5 %) patients showed abnormal canal paresis and direction preference in caloric test. Contradictory to the results published by Ozgirgin and Tarhan in 2008, the authors reported that the phase of VAT was enhanced in BPPV, especially in the 2- 3 Hz range. Authors concluded that as a supplement to caloric testing, VAT may prove helpful in the assessment of semicircular canal function.

- In 2017, Thungavelu and colleagues conducted a retrospective cohort study examining the clinical utility of VAT in treatment of vestibular migraine (VM).[12] The experimental group comprised 441 subjects (364 females) who had been diagnosed with VM. The control group comprised 65 subjects (31 females), excluded from which were patients with vision, hearing or balance disorders. Investigators reported significant differences in VAT results between the

experimental and control group, with increases among the former in horizontal gain; horizontal phase delay, vertical gain, and vertical phase delay. The generalizability of results is limited, however, due to the study's retrospective design with data collected at a single institution in China. Investigators concluded that that VAT may aid in the diagnosis of VM, but called for larger prospective studies to validate findings.

Vestibular Evoked Myogenic Potential (VEMP)

- In 2015, Zhang and colleagues conducted a systematic review and meta-analysis evaluating the clinical diagnostic value of VEMPs for endolymphatic hydrops (EH).[13] Investigators systematically searched the literature, identified eligible studies and extracted data. In total, 30 articles were included for review and analysis. Investigators calculated the pooled sensitivity, specificity, positive likelihood ration, negative likelihood ratio, diagnostic odds ratio (OR) and area under summary receiver operating characteristic curves (AUC). Pooled sensitivity and the specificity were 49 % (95 % CI: 46 % to 51 %) and 95 % (95 % CI: 94 % to 96 %), respectively. Pooled positive likelihood ratio was 18.01 (95 % CI: 9.45 to 34.29) and the pooled negative likelihood ratio was 0.54 (95 % CI: 0.47 to 0.61); AUC was 0.78 and the pooled diagnostic OR of VEMPs was 39.89 (95 % CI: 20.13 to 79.03). The generalizability of results is limited by reviewed studies' heterogeneous treatment parameters and small sample sizes of (n=6 to 114). Moreover, investigator analysis for potential publication bias revealed that the diagnostic value of VEMP for MD might be over-estimated. Investigators concluded that VEMP alone is insufficient for the diagnosis of MD, but may prove useful alongside other diagnostic tests, pending results of additional prospective studies.

- In 2020, Maia and colleagues conducted a systematic review evaluating the utility of vestibular evoked myogenic potentials in the prognosis of sudden hearing loss.[14] Investigators systematically searched the literature through December 2018, identified eligible studies and extracted data. In total, 16 studies were included for review (8 prospective; 8 retrospective; 1 cross-sectional). A total of 872 patients were evaluated (50.22% males and 49.77% females) with a mean age of 51.26 years. Four hundred and twenty-six patients (50.35%) had vertigo and/or dizziness associated with sudden hearing loss. The cervical vestibular evoked myogenic potential was performed in all studies, but only seven assessed the ocular vestibular evoked myogenic potential. The cervical vestibular evoked myogenic potential showed alterations in 38.65% of 846 evaluated ears, whereas ocular vestibular evoked myogenic potential showed alterations in 47.88% of 368 evaluated ears. The hearing recovery rate was analyzed by 8 articles, with 63.4% of 410 evaluated ears showing hearing recovery. Investigators concluded that vestibular evoked myogenic potential seems to be important in the prognosis of sudden hearing loss, but noted study limitations that undermine generalizability. Limitations included a lack of high-quality studies, small sample sizes, a lack of long-term follow-up and limited patient selection criteria.

Non-Randomized Studies

Several nonrandomized studies have reported poor to inconclusive findings regarding VEMP's predictive value in diagnosing Meniere disease.[15-20]

CLINICAL PRACTICE GUIDELINES

No evidence-based clinical practice guidelines were identified that addressed either vestibular autorotation testing (VAT) or vestibular evoked myogenic potential (VEMP) as diagnostic tools for any condition.

EVIDENCE SUMMARY

There is not enough evidence to indicate that the use of vestibular autorotation test (VAT) is an effective test, either alone or in conjunction with standard vestibular tests, to evaluate vestibular function or disorders. There have been no randomized studies comparing the efficacy of VAT to standard tests such as caloric or rotational chair testing for any condition. In addition, a number of the small case series published have reported low reproducibility when patients were subject to more than one test, indicating that VAT is not reliable. Additional studies are required to support the efficacy and validity of this testing.

BILLING GUIDELINES AND CODING

- There is no specific code for VAT. Therefore, VAT testing should be billed with the unlisted code 92700.
- Use of any 925XX code for VAT is inappropriate, including the following: 92531, 92532, 92533, 92534, 92537, 92538, 92540, 92541, 92542, 92544, 92545, 92546, 92547, and 92548.

CODES*		
CPT	92517	Vestibular evoked myogenic potential (VEMP) testing, with interpretation and report; cervical (cVEMP)
	92518	Vestibular evoked myogenic potential (VEMP) testing, with interpretation and report; ocular (oVEMP)
	92519	Vestibular evoked myogenic potential (VEMP) testing, with interpretation and report; cervical (cVEMP) and ocular (oVEMP)
	92700	Unlisted otorhinolaryngological service or procedure

***Coding Notes:**

- The above code list is provided as a courtesy and may not be all-inclusive. Inclusion or omission of a code from this policy neither implies nor guarantees reimbursement or coverage. Some codes may not require routine review for medical necessity, but they are subject to provider contracts, as well as member benefits, eligibility and potential utilization audit.
- All unlisted codes are reviewed for medical necessity, correct coding, and pricing at the claim level. If an unlisted code is submitted for non-covered services addressed in this policy then it will be **denied as not covered**. If an unlisted code is submitted for potentially covered services addressed in this policy, to avoid post-service denial, **prior authorization is recommended**.
- **See the non-covered and prior authorization lists on the Company Medical Policy, Reimbursement Policy, Pharmacy Policy and Provider Information website for additional information.**
- HCPCS/CPT code(s) may be subject to National Correct Coding Initiative (NCCI) procedure-to-procedure (PTP) bundling edits and daily maximum edits known as "medically unlikely edits" (MUEs) published by the Centers for Medicare and Medicaid Services (CMS). This policy does not take precedence over NCCI edits or MUEs. Please refer to the CMS website for coding guidelines and applicable code combinations.

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POLICY REVISION HISTORY

DATE	REVISION SUMMARY
2/2023	Converted to new policy template.
5/2023	Annual review. Separated by line of business. No other changes.