A Streamlined Approach to Assessing Patients with Peripheral Vestibular Disorders

By Maggie Boorazanes, Wendy Crumley-Welsh, and Brianna Young

ICS impulse video head impulse testing.
Approximately 2.4 million Americans suffer from dizziness and it takes an average of three to five years for a person with a vestibular disorder to receive a diagnosis (Vestibular Disorders Association). There are several reasons for the long diagnosis time. It is difficult to diagnose a vestibular disorder as dizziness is a common symptom for many illnesses. In addition, getting access to appropriate testing is challenging for patients achieving the services they need. Many clinics have limited time slots for vestibular assessment, which causes months-long wait lists due to the amount of time needed for testing and schedule availability. If audiologists and physicians modified their testing protocol to streamline the assessment process, they could assess and treat more patients in less time.

This article provides an in-depth review of new advancements in balance assessment technologies that are helping practitioners reduce the time it takes to test patients with peripheral vestibular disorders, highlighting benign paroxysmal positional vertigo (BPPV), Ménière’s disease, and vestibular neuritis. It will inform audiologists about the benefits of implementing video head impulse testing (vHIT) into their clinical practice and suggest ways to adapt to the new technologies available today.

Status of Vestibular Testing Today
Assessment of a patient with a balance disorder can be challenging to perform and diagnose. Some of the symptoms commonly associated with vestibular disorder can mimic those of non-vestibular etiology, such as migraine, stroke, or head injury. Therefore, in addition to the physical examination often performed by the referring physician, obtaining a thorough case history is essential to achieving a vestibular diagnosis. It is important to determine the patient’s past medical history, onset of symptoms, temporal course, the type of dizziness, and any auditory-related concerns, especially since symptoms can vary.

The case history, in particular, is vital in distinguishing between true vestibular symptoms from the possibility of another etiology. An audiologist who is experienced with vestibular testing can often have a general working diagnosis throughout testing based on the patient’s reported case history. However, when patient-reported symptoms are confounding, or unclear, this can prolong the examination process. For example, many peripheral vestibular disorders share the symptoms of vertigo (spinning sensation) that can worsen with head movement. However, a thorough case history can help to distinguish one from the other, and therefore guide the clinician in key findings within the test results.

While a thorough case history is important, it is also important to perform efficient, yet comprehensive testing with each patient. Many audiologists and other professionals who work with dizzy patients perform a 60–90 minute videonystagmography (VNG) evaluation, which includes oculomotor examination, positional testing, and caloric irrigation. Some audiologists also add other
measures into this examination, such as video head impulse testing (vHIT) and vestibular-evoked myogenic potentials (VEMP).

“The availability of vHIT and VEMP as new clinical tests has greatly enhanced the assessment of dizzy patients,” says Kamran Barin, PhD, and assistant professor emeritus in the Department of Otolaryngology–Head and Neck Surgery and Department of Speech and Hearing Science, at Ohio State University, and educational speaker on balance disorders. “Whereas now and in the past, we may have performed a full VNG on the patient, it is far more efficient to perform vHIT, cervical VEMP (cVEMP), and ocular VEMP (oVEMP) and then decide what parts of the VNG, if any, are needed to reach a diagnosis.”

Of the measures listed earlier, the head impulse test (also referred to as video head impulse and vHIT) is among the newer technologies for vestibular testing. Head impulse is a lesion-specific test that detects a deficiency of the vestibulo-ocular reflex (VOR), and identifies which ear and semicircular canal is affected in cases of peripheral vestibulopathy. In cases where there are concerns for central etiology, vHIT can be used to rule out a peripheral involvement.

Dr. Barin also states that although the VNG has served, and will continue to serve, professionals for over a century, the test has its limitations in that it does not fully assess the entire vestibular system. Many of these limitations are centered on caloric irrigation. Caloric irrigation is used to assess semicircular canal function, and clearly define any unilateral or bilateral weakness; however, calorics assess only the lateral semicircular canals. Time can also be a factor as caloric irrigation can take up to 30 minutes of testing to assess two semicircular canals; whereas vHIT takes around 12–15 minutes to assess all six semi-circular canals. vHIT also has the advantage of being easily performed on patients who have middle ear disorders, and those who cannot tolerate caloric irrigation such as young children, elderly patients, or patients with severe hearing loss. Properly performed vHIT assesses the vestibular frequency range consistent with movements comparable to looking both ways before crossing the street (approximately 4000 Hz to 5000 Hz). In contrast, caloric irrigation tests at lower frequencies (approximately 0.025 Hz), which are not used in day-to-day life. However, much like performing a comprehensive auditory assessment, no vestibular sub-test on its own is perfect. Dr. Barin confirms, “Together, vHIT and VEMPS provide a full assessment of the entire peripheral vestibular structures.”

Another challenge facing an increasing number of professionals is the need to reduce test time and increase patient flow through the clinic. More facilities are using benchmarking, and in order to meet patient

**Patient with Peripheral Vestibular Symptoms**

![Workflow 1](image1)

**Additional Diagnostic Tests**

Use dependent on results of the above tests

- Caloric
- EchocG

**WORKFLOW 1.** Recommended workflow for peripheral vestibular disorder assessment.

![Workflow 2](image2)

**WORKFLOW 2.** Recommended suspected suspected BPPV management workflow.
A Streamlined Approach to Assessing Patients with Peripheral Vestibular Disorders

care goals, test time must be reduced. It is possible to provide more efficient patient care by making clinical decisions for testing based on the patient’s case history. This has been reflected through many disciplines, including new recommendations being made by the American Academy of Otolaryngology–Head and Neck Surgery (AAO). In the AAO Guidelines, the panel made strong recommendations that clinicians should diagnose posterior semicircular canal BPPV when vertigo associated with nystagmus is provoked by the Dix-Hallpike maneuver. The panel made further recommendations against radiographic imaging, vestibular testing, or both in patients diagnosed with BPPV, unless the diagnosis is uncertain or there are additional symptoms or signs unrelated to BPPV that warrant testing (WORKFLOW 1).

By integrating this information and providing a slimmed-down workflow, clinicians can fit more patients into their schedule by not spending as much time obtaining a diagnosis, and therefore, providing more access to patients. The remainder of this article will focus on integrating the above streamlined workflow into your clinical practice. Segments are divided to present with key case history information for each disorder, the recommended workflow, other tests to consider, and when further testing might be necessary.

**Benign Paroxysmal Positional Vertigo**

Benign paroxysmal positional vertigo (BPPV) is the most common cause of vertigo. Further broken down into canalithiasis and cupulolithiasis, as well as location by semicircular canal, it is well known that canalithiasis of the posterior canal is the most common diagnosis. Patients with BPPV experience brief of vertigo caused by rapid changes of head position. Unique to BPPV, these episodes are typically less than one minute, but episodes can last up to two minutes, and are typically brought on by head repositioning, such as bending the head up or down and rolling over in bed. These are usually described in the case history, which can also include complaints of mild postural instability between attacks. WORKFLOW 2 outlines the current recommended workflow.

If the Dix-Hallpike is unremarkable, then further investigation is warranted to work toward a diagnosis.

**Vestibular Neuritis**

Vestibular neuritis is an acute vestibulopathy caused by inflammation of the inner ear or vestibular nerves. This inflammation disrupts the transmission of the information from the ear to the brain. The vestibulopathy can be either viral or degenerative, and can affect the superior or inferior branch of the vestibular nerve.

Patients with vestibular neuritis will often present with prolonged severe rotational vertigo, head movement
that worsens vertigo, postural imbalance to the side of lesion, nausea, and spontaneous/torsional nystagmus beating towards the good ear. They key difference within the patient’s case history is duration of the vertigo, as patients with vestibular neuritis commonly report a sudden onset of symptoms for one to three days that presents after a recent cold or upper respiratory infection (URI) (Jacobson, 2008). By comparison, vertigo associated with BPPV lasts less than two minutes, whereas vertigo associated with Ménière’s disease lasts 20 minutes to several hours. Refer to WORKFLOW 3 for the current recommended workflow.

vHIT is particularly useful in working with neuritis patients because of the equipment’s capability to assess all six semicircular canals, allowing the audiologist to isolate which canal is compromised. If the impulse identifies catch-up saccades, and cVEMP or oVEMP is abnormal, then the evaluation is complete. The presence of catch-up saccades in the lateral or anterior canals, with abnormal oVEMP indicate superior vestibular neuritis. Refer to FIGURE 1 for an example of catch-up saccades in superior vestibular neuritis. Catch-up saccades in the posterior canals and abnormal cVEMP indicate inferior vestibular neuritis. Refer to FIGURE 2. It may be desired to perform calorics to confirm the diagnosis, but not necessary. If the vHIT is normal, then further testing is warranted to confirm another diagnosis. FIGURE 3 provides a clear summary of test findings to differentiate vestibular neuritis versus a healthy patient versus a patient with unilateral vestibular loss.

**Ménière’s Disease**

Also referred to as endolymphatic hydrops, Ménière’s disease describes a set of symptoms including vertigo, hearing loss, tinnitus, and a sensation of fullness in the affected ear(s). Refer to FIGURE 4 for anatomical representation of where Ménière’s disease affects the vestibular system. Episodes typically last from 20 minutes up to four hours. Hearing loss is often intermittent, occurring mainly at the time of the vertigo attacks. Patients may also report hyperacusis and distortion of sound. Usually, the hearing loss involves mainly the lower frequencies, but over time can cover the entire frequency range. After months or years of the disease, hearing loss often becomes permanent, and can vary in degree and configuration. Tinnitus and fullness of the ear with changes in hearing may come and go, occur during or just before the attacks, or be constant.

Patients with Ménière’s exhibit varying results. High gain above 1.2 has been reported in the literature

**WORKFLOW 3.** Recommended suspected vestibular neuritis workflow.*

*VEMP is not FDA-approved in the United States.

**WORKFLOW 4.** Recommended workflow for suspected Ménière’s disease.
A Streamlined Approach to Assessing Patients with Peripheral Vestibular Disorders

**FIGURE 1.** Superior vestibular neuritis (affects lateral and anterior canal).

**FIGURE 2.** Inferior neuritis (affects posterior canal).
A Streamlined Approach to Assessing Patients with Peripheral Vestibular Disorders

(Manzari, 2011). Of note, high gain on vHIT testing can also be contributed to goggle slippage or user error, so it is important to rule out any extraneous factors when interpreting results. In addition to high gain results from vHIT testing, you may also see a reduced amplitude in cVEMP findings for the affected ear. If the vHIT results are normal, then further investigation is warranted to work toward a diagnosis. Refer to WORKFLOW 4 for current recommended workflow. A new publication in 2015 by McGarvie et al has described a hypothesis based on past

**FIGURE 3.** Differentiating vestibular neuritis.

**FIGURE 4.** Back-up fluid in the sac and inner ear leads to swelling and pressure. Distorted information travels from the inner ear to the brain.
A Streamlined Approach to Assessing Patients with Peripheral Vestibular Disorders

animal and human research which describes how the anatomical changes due to Ménière's affects the vHIT and caloric results. This further explains why differences in test results may occur for these two tests due to the increase in endolymphatic fluid in the semi-circular canal (McGarvie, 2015).

**Conclusion**

In an era of increased testing capabilities, decreased time allowed for testing, and a growing need to streamline efficient patient care, audiologists and physicians can save time when assessing patients with vestibular symptoms by reconsidering current work flow practices. Allowing for research-based updates to assessment protocols based on the patient's case history can increase efficiency and decrease the time a dizzy patient has waited to be evaluated, as often they have been waiting years for a diagnosis. While comprehensive testing is necessary to obtain an accurate diagnosis, it is equally important not to put a distressed patient through superfluous testing.

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**References**


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