ICS Impulse: Revolutionizing Vestibular Assessment

Wisconsin Speech Language and Audiology Association 2015 Annual Convention

Today’s Agenda

• Current Status of Vestibular Assessment
• History of the Head Impulse Test (HIT)
• Physiology of the Vestibulo-ocular reflex (VOR)
• Performing the vHIT with ICS Impulse
• Interpretation/Patient Data
• vHIT in the Modern Clinic
• Hands-on

Current State of Vestibular Assessment

• VNG testing
• Rotary Chair testing
• Posturography
Current Status of Vestibular Assessment

Typical VNG protocol consists of:
- Oculomotor testing – Central Lesion
- Positional Testing
  - Static Positional Testing – Typically non-localizing
  - Dynamic Positional Testing (Dix-Hallpike) – Peripheral Lesion
- Calorics – Peripheral finding (usually)
- Both usually indicate peripheral findings and lateralization of lesion

But...
- Time consuming
- Good case history and bedside tests could eliminate certain parts of VNG battery
- Calorics have been the definitive test for decades, but it's not perfect
  - Unpleasant, indirect measurement, time consuming, potential for carry-over

Rotary Chair Testing
- Typically used to verify bilateral weakness from caloric testing
- Can be performed on patients with middle ear disorder
- Can assess utricular function with off-axis testing (not common)

But...
- VERY Expensive
- Incredibly large footprint
- Not pleasant for patient
- Insensitive to many common peripheral vestibular lesions

Posturography
- Track progress of patients
- Use for suspected malingerers

But...
- Insensitive to vestibular disorders
- Insurance deems it as 'Experimental Procedure' (code for 'will not pay')
- Dobie (1997). "In mid 1995, after more than a decade of use, no clinical population has been identified for which CDP reliably distinguishes between disorders or states that might otherwise be confused, adds information to that already available, and leads to a change in management that is beneficial to the patient."
The foundation of the Head Impulse Test is the Vestibulo-Ocular Reflex (VOR).

What is the VOR?

A reflexive eye movement that stabilizes images on the retina by producing eye movement in the opposite direction of head movement.

Rotational movement is mediated by the semicircular canals.

Eye movement must equal head movement in the opposite direction to maintain gaze. Normal VOR has a gain near 1.0.
Head Impulse: The Beginning

Overview

- Described by Halmagyi and Curthoys as a bedside test of the VOR.
- Examiner monitors eye movement as the head is thrust to the left or right. The patient is fixating on an object, typically the examiner's nose.
- Horizontal head thrusts test the lateral semicircular canals.
  - Testing vertical canals is more difficult

Bedside Procedure - Normal
Bedside Procedure - Abnormal

![Diagram showing abnormal bed procedure for vertical canal tests]

Bedside Procedure: Vertical Canal Tests

**Figure 1.** Modified head impulse procedure for vertical semicircular canals.

**RALP**

**LARP**

Animation courtesy of Kamran Barin, PhD
Limitations of Bedside Procedure

- Early experience with bedside head impulse produced mixed results
  - Sensitivity about 70%*
- It is subjective
- No feedback on how well head impulse was delivered
  - 100 deg/sec to reach VOR


Beyond Visual Observation: Scleral Search Coils

Corrective Saccades

Patients produced one of three of eye movements:

Normal: Patient's eyes remain fixated on the target

Overt saccades: Patient makes a corrective eye movement to the target post-head movement. Visible to an observer.

Covert saccades: Patient makes corrective eye movement to the target DURING the head movement. May not be visible to an observer.
Polling Question

• Question

• What are overt catch-up saccades?
  A. A corrective saccadic eye movement (a “catch-up” saccade) after the head
     impulse that can in most cases be identified by the naked eye
  B. A corrective saccadic eye movement (a “catch-up saccade) during the head
     impulse that cannot be identified by the naked eye
  C. A corrective saccadic eye movement (a “catch-up” saccade) that occurs
     minutes after the head impulse has ceased

Polling Question

• Question

• What are covert catch-up saccades?
  A. A corrective saccadic eye movement (a “catch-up” saccade) that occurs
     minutes after the head impulse has ceased and can in most cases be
     identified by the naked eye
  B. A corrective saccadic eye movement (a “catch-up saccade) during the head
     impulse that cannot be identified by the naked eye
  C. A corrective saccadic eye movement (a “catch-up” saccade) after the head
     impulse
Polling Question

• What is the gold standard that the ICS Impulse was tested against? ICS Impulse is the only head impulse device compared to this gold standard.
  A. ENG
  B. VNG
  C. Scleral search coils
  D. Rotary chair

Physiology of VOR

To understand the clinical utility of head impulse testing, a better understanding of the mechanisms of the VOR is needed.

Head Impulse Test – Mechanism

• There is an asymmetry between excitatory and inhibitory neural responses of each semicircular canal (greater dynamic range for excitation)
  − Excitation from tonic level of ~100 up to a maximum of ~400 spikes/sec
  − Inhibition from tonic level of ~100 down to a minimum of 0 spikes/sec
**Head Impulse Test – Normal Responses**

- For head impulses, inhibitory neural responses saturate quickly while the excitatory responses remain proportional to head velocity
  - Despite the asymmetry between excitatory and inhibitory responses, the overall input to the oculomotor system as well as the resulting eye movements remain symmetrical for right-left head impulses
  - Responses to head impulses are mediated primarily by one labyrinth
  - VOR Gain = Eye Move./Head Move. ≈ 1 (Decreases slightly with increasing head velocity)

**Head Impulse Test – Right Vestibular**

- For head impulses toward the side of lesion, the neural input to the oculomotor system is no longer proportional to head velocity
  - The resulting eye velocity does not match head velocity and the eyes fall short of target
  - VOR Gain = Eye Move./Head Move. << 1 (decreases rapidly with increasing head velocity)

- For head impulses away from the side of lesion, the neural input to the oculomotor system is reduced but to a lesser extent
  - The resulting eye velocity is closer but still does not match head velocity and the eyes fall somewhat short of target
  - VOR Gain = Eye Move./Head Move. < 1 (decreases with increasing head velocity but not as rapidly as the VOR gain for head impulses toward the side of lesion)
Head Impulse Test – *Catch-Up Saccades*

- Catch-up saccades reposition the eyes on the target.
- Catch-up saccades that occur after head impulses are called *overt* saccades.
- Overt saccades are visible and can be detected by an experienced examiner during the bedside test without any additional equipment.

---

Head Impulse Test – *Catch-Up Saccades*

- Catch-up saccades that occur during head impulses are called *covert* saccades.
- Covert saccades are practically impossible to detect without specialized equipment.
- Covert saccades typically occur toward the end of head impulses because of the saccadic latency (time between initiation and onset of the saccade).
- It is not clear why some patients generate covert saccades while others do not.
  - May be due to compensation levels, predictability of head impulses, or other yet unknown factors.

---

Head Impulse Testing had the potential to be a significant clinical test. All that was needed was clinical feasibility.
Why not use VNG goggles or rotary chair to perform HIT?

VNG Goggles
- Standard VNG goggles are too bulky
- Cannot detect some saccades, cameras too slow

Rotary Chair Testing
- All issues associated with VNG goggles
- Cannot reach sufficient velocity
  - 10 to 80 deg/sec
  - Need 150 to 250 deg/sec for proper head impulse

Moving beyond the Scleral Search Coil

* To reduce goggle slippage during the rapid head impulse test we have developed tight fitting and lightweight (~60g) goggles with a high speed camera (250 Hz) and miniaturized 6DOF inertial sensors. * Hamish Mc Dougall

Prototype Goggle vs Scleral Search Coil

- Built on the work of Drs. Halmagyi & Curthoys
- Impulse is the only device validated against Scleral Search Coils


Horizontal HIT was recorded simultaneously with vHIT (250 Hz) and search coils (1,000 Hz) in 8 normal subjects, 6 patients with vestibular neuritis, 1 patient after unilateral intratympanic gentamicin, and 1 patient with bilateral gentamicin vestibulotoxicity.

Conclusions: The video head impulse test is equivalent to search coils in identifying peripheral vestibular deficits but easier to use in clinics, even in patients with acute vestibular neuritis.

New, powerful gold standard in VOR
ICS Impulse vs Visual Observation

- Impulse can identify covert saccades
- Validates that head impulse is performed properly
- Sensitivity and specificity are 95% for Impulse
- Reduction in false negatives (in patients as normal who are truly abnormal)
- Objective Analysis with normative data
- Better patient comfort during test (large head thrust common for vis obs)
ICS Impulse: Components

- **Goggles:**
  - High Speed Camera (250 Hz)
  - Gyroscope & Accelerometer
  - Lasers for calibration
  - Face Cushion (single use)

- **Computer:**
  - OtosuiteV Software
  - 2 Algorithms to assess head impulse
  - Pupil Detection Software
  - Analysis
    - Gain Graph
    - 20 curves
    - 30 curves
  - Examiner Camera

Performing Lateral Head Impulses

1. Sit Patient 1 meter from fixation dot
2. Place goggles on patient
3. Adjust Region of Interest (ROI)
4. Adjust Pupil Detection
5. Calibration
6. Perform Test

1. Patient Prep: Position
1. Patient Prep: Goggle Fit

Goggles must fit tightly on patient's face to avoid slippage.

Good!

OtosuiteV – Impulse Test
3. Adjust ROI

- Click on pupil to center green box

4. Adjust Pupil Detection

- In Grayscale or Pupil Location mode, select Auto Threshold
- Crosshair needs to lock on pupil
  - Adjust with – or + if necessary
- *Keep the lights on!! The smaller the pupil, the better*

5. Calibration

- Select OK in ROI box or click on Calibration Tab
- Turn lasers on
- Center target between laser points
5. Calibration

- Center target between laser points

5. Calibration

- Once Centered, select Run
- Have patient follow laser points with eyes only

5. Calibration

- Video of calibration
5. Calibration

- Once calibrated, select Accept

6. Performing (Lateral) Impulses

1. Place hands on top of patient's head
   - DO NOT touch strap or goggles
2. Have patient stare at fixation dot
3. Move head quickly and unpredictably
   - Head is moved ~ 15° to left or right of fixation dot
   - High velocity and small amplitude
4. Monitor Real Time and Training Curve Windows

Real Time Window

- Real Time Window displays curve for Eye and Head Motion
- Monitor movement to ensure other canals aren't involved
- Monitor for artifact
Training Curve Window

- Acceptable head impulses will appear
- Use white dots to monitor velocities
  - Sweet spot is 100 to 250°/sec

6. Performing Impulses

- 20 acceptable head impulses to each side.
- Algorithms reject bad head impulses.

- Use Operator Feedback!
  - Too Slow
  - Overshoot
  - Operator Camera
6. Performing Impulses

Impulses must be:
• Passive (performed by clinician)
• Unpredictable
• Multiple velocities

DO NOT:
• Touch the strap or goggles

Performing LARP and RALP

After performing lateral impulses:
1. Navigate back to Test Setup tab
2. Select the appropriate test (RALP or LARP)
3. Turn the patient’s 30-40° degrees to the side
   • Counter-clockwise for RALP
   • Clockwise for LARP
4. Adjust ROI
5. Begin Test (No need to re-calibrate)

Vertical Canal Tests

RALP

---


http://www.plosone.org/article/info:doi/10.1371/journal.pone.0061488

http://www.plosone.org/article/info:doi/10.1371/journal.pone.0061488
ICS Impulse - Analysis

- Gain Graph with Normative Data
- 2D analysis
- 3D analysis (360 degree view)
- Test Info
- Compare multiple test sessions (Progress Graph and Progress Data)

ICS Impulse – Gain Graph

- Gain – ratio of the eye movement velocity to the head movement velocity
  - Right = red
  - Left = blue
- Normative Data:
  - White = within normal limits
  - Light Grey = unilateral loss
  - Dark Grey = bilateral loss
  - Average (mean) of all gains for Right/Left and standard deviation
  - Cutoffs can be changed under Options window
ICS Impulse – Gain Graph

All tests shown simultaneously

Head Impulse Testing – Normal

What does a patient within normal limits exhibit?

- Gain (comparison of eye and head movement)
  - Greater than 0.8 for Lateral
  - Greater than 0.7 for LARP/RAIP
- Saccades
  - May have a few saccades but nothing significant
- Spontaneous Nystagmus
  - May be present or absent

Head Impulse Testing – Normal 2D

A. The head data shows very well performed head impulses and the eye data shows a vestibular ocular reflex that mirrors the head velocities.
B. Downward spikes are a result of spontaneous nystagmus.
Head Impulse Testing – Normal 3D

A. The head data shows very well performed head impulses and the eye data shows a vestibular ocular reflex that mirrors the head velocities.

B. Downward spikes are a result of spontaneous nystagmus.

Head Impulse Testing – Overt

What does a patient with a vestibular loss exhibit when a Head Impulse test is performed?

- Gain (comparison of eye and head movement)
  - Less than 0.8 is abnormal for Lateral
  - Less than 0.7 is abnormal for LARP/RA/LP
  - 0.1 to 0.8 if unilateral loss for Lateral
  - Less than 0.1 if bilateral loss

- Saccades
  - An overt corrective saccadic eye movement (a “catch-up” saccade) after the head impulse
  - Typically can be identified with the naked eye (visual observation)

- Spontaneous Nystagmus
  - May be present or absent

Head Impulse Testing – Overt 2D

A. The head data shows very well performed head impulses and the eye data shows an inadequate vestibular ocular reflex (A) that does not mirror the head velocities.

B. There are overt catch-up saccades present. Catch-up saccades are easier to visualize in the 3D analysis.
Head Impulse Testing – Overt 3D

A. The head data shows very well performed head impulses and the eye data shows an inadequate vestibular ocular reflex (A) that does not mirror the head velocities.
B. There are overt catch-up saccades present. Catch-up saccades are easier to visualize in the 3D analysis.

Head Impulse Testing – Covert

What does a patient with a vestibular loss exhibit when a Head Impulse test is performed?

• Gain (comparison of eye and head movement)
  - Less than 0.8 is abnormal for Lateral
  - Less than 0.7 is abnormal for LARP/RALP
  - 0.1 to 0.8 if unilateral loss for Lateral
  - 0.1 to 0.7 if unilateral loss for LARP/RALP
  - Less than 0.1 if bilateral loss

• Saccades
  - A covert corrective saccadic eye movement (a "catch-up" saccade) during the head impulse
  - Can not be identified with the naked eye. Will be missed if using visual observation

• Spontaneous Nystagmus
  - May be present or absent

Head Impulse Testing – Covert 2D

A. The head data shows very well performed head impulses and the eye data shows an inadequate vestibular ocular reflex (A) that does not mirror the head velocities.
B. There are covert catch-up saccades present. Catch-up saccades are easier to visualize in the 3D analysis.
A. The head data shows very well performed head impulses and the eye data shows an inadequate vestibular ocular reflex (A) that does not mirror the head velocities.

B. There are covert catch-up saccades present. Catch-up saccades are easier to visualize in the 3D analysis.

Result Average Gain

<table>
<thead>
<tr>
<th></th>
<th>Average Gain</th>
<th>Gain Graph</th>
<th>3D Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Right</td>
<td>0.87</td>
<td><img src="image1" alt="Graph" /></td>
<td><img src="image2" alt="Graph" /></td>
</tr>
<tr>
<td>Overt Left</td>
<td>0.41</td>
<td><img src="image3" alt="Graph" /></td>
<td><img src="image4" alt="Graph" /></td>
</tr>
<tr>
<td>Covert Right</td>
<td>0.33</td>
<td><img src="image5" alt="Graph" /></td>
<td><img src="image6" alt="Graph" /></td>
</tr>
</tbody>
</table>

2 Algorithms – Collection & Analysis

- **Gain and Test Remarks**
  - **Gain**: Imposed
  - **Test Info**: Run #1, 20 Trials, 280°/s
  - **Remarks**: Patient had Spontaneous Nystagmus
ICS Impulse – Test Info

- **Analysis**
  - Number of right/left impulses accepted and number of rejects.
  - Passed the analysis algorithm.
  - This is the data displayed in the 2D and 3D graphs.
- **Collection**
  - Number of right/left impulses accepted and number of rejects.
  - Passed the collection algorithm.
  - This is the data displayed on the collection window while performing the head impulse test.
- **Frames per second** – this is the average frame rate when the data was collected.
  - If the frame rate drops below 219 during data collection, the head impulse will be rejected.

Polling Question

- **Question**

  **What indicates a normal response on a head impulse test?** (may be more than one answer)
  
  A. The absence of catch-up saccades
  B. The presence of catch-up saccades
  C. A gain close to 1 (between 0.8 and 1.2)
  D. A low gain

Polling Question

- **Question**

  **What indicates an abnormal response on a head impulse test?** (may be more than one answer)
  
  A. The absence of catch-up saccades
  B. The presence of catch-up saccades
  C. A gain close to 1 (between 0.8 and 1.2)
  D. A low gain when comparing the head and eye velocity
Polling Question

• Question

• A patient with a vestibular loss exhibits (may be more than one answer)
  A. A corrective saccadic eye movement (a “catch-up” saccade) during the head impulse
  B. A corrective saccadic eye movement (a “catch-up” saccade) after the head impulse
  C. Torsional nystagmus
  D. Gain (comparison of eye and head movement) of 0.8 or less for Lateral or 0.7 or less for LARP/RALP

Spontaneous Nystagmus

What does a patient with spontaneous nystagmus exhibit?

• Spontaneous nystagmus due to acute peripheral vestibular loss beats to the healthy ear (there are other types of spontaneous nystagmus e.g. congenital or cerebellar). Head impulses to the affected side have spontaneous nystagmus beats in the same direction as the catch-up saccades (A). MacDuff HG, Weber KP et al (2009) The video head impulse test: Diagnostic accuracy in peripheral vestibulopathy. Neurology 73:1134-1141.
What does a patient with spontaneous nystagmus exhibit?

- Spontaneous nystagmus due to acute peripheral vestibular beats to the healthy ear (there are other types of spontaneous nystagmus e.g. congenital or cerebellar). Head impulses to the healthy side have spontaneous nystagmus beats to the opposite side ('down').


What should you do if the patient has spontaneous nystagmus?

- Click "Spontaneous nystagmus"
- Uses a different algorithm for head impulse acceptance (if not checked good head impulses are rejected)
- Reanalyze if raw data was saved
ICS Impulse – Progress Data

If there are three or more tests available, the three that display initially are the first test, the most recent test, and the test currently displayed in 2D and 3D window.

Patient Data

Assessing Vestibular End Organs

- Anterior Canal
- Utricle
- Superior Vestibular Nerve
- Posterior Canal
- Saccule
- Lateral Canal
- Inferior Vestibular Nerve
But First…

A brief discussion on the V-word:

VEMP

The V-word: VEMP

- FDA Status
  - Can you legally perform VEMP??
  - Is it ethical to be reimbursed for VEMP??

- Reimbursement
  - CPT Codes: 92585 vs 92700
  - Reimbursement rate??


CvEMP and oVEMP

- Cervical VEMP (cVEMP)
  - Ipsilateral measurement
  - Record from Sternocleidomastoid (SCM)
  - Assess Saccule and inferior vestibular nerve

- Ocular VEMP (oVEMP)
  - Contralateral measurement
  - Record under eyes
  - Assess Utricle and superior vestibular nerve
Polling Question

- Question

- What anatomical structure(s) may be affected in a patient with superior vestibular neuritis? [may be more than one answer]
  A. Superior vestibular nerve
  B. Inferior vestibular nerve
  C. Lateral semicircular canal
  D. Anterior semicircular canal
  E. Posterior semicircular canal
Polling Question

- Question

- What anatomical structure(s) may be affected in a patient with inferior vestibular neuritis? [may be more than one answer]
  A. Superior vestibular nerve
  B. Inferior vestibular nerve
  C. Lateral semicircular canal
  D. Anterior semicircular canal
  E. Posterior semicircular canal

Head Impulse Testing in the Modern Clinic

Limitations of Bedside Procedure

- Early experience with bedside head impulse produced mixed results
  - Calorics and head impulse tests did not always match
- It is subjective
- No feedback on how well head impulse was delivered
  - 100 deg/sec to reach VOR
vHIT vs Rotary Chair

Rotary Chair
• Used to confirm true, bilateral lesions
• Can test patients with middle ear disorder
• Mid frequency Stimulus (reliable testing from 0.1 to 1 Hz)
• Canals are tested simultaneously
• Lateral canals only are commonly tested**
• Allows for serial testing
• Requires large physical space
• Mostly insensitive to to common vestibular lesions (most unilateral in origin)
• Can be unpleasant
• Test Time ~30 minutes

HIT
• Can confirm unilateral or bilateral lesions
• Can test patients with middle ear disorder
• High Frequency Stimulus (4 to 5 Hz)
• Individual canals tested
• All canals tested
• Allows for serial testing
• Very small footprint
• Sensitive to common (unilateral) vestibular lesions
• Not taxing on patient
• Test Time ~12-15 minutes

vHIT vs Caloric

Caloric
• Ear-specific
• Indirect measurement of function
• Detects in cases of peripheral vestibular loss in Lateral SCC
• Tests at Low Frequencies (~0.025 Hz)
• Stimulus can persist between irrigations especially if not performed properly
• Difficult to impossible for serial testing
• Unpleasant patient experience
• Test time: ~30 minutes

vHIT
• Ear-specific
• Obtain absolute measurement of canal function
• Detects abnormalities in all 6 semicircular canals
• Tests at High Frequencies (4-5 Hz)
• Stimulus does not persist between tests
• Serial testing is possible
• Does not tax patient
• Test time: ~12-15 minutes

New Realms

• Use in conjunction oVEMP/cVEMP
• Pediatric Vestibular Assessment
• Cochlear Implant Assessments
• Vestibular Ablation – IT Injections
• Stroke detection in ER
• TBI and Concussions
• Physical Therapy
• New Understandings of Pathways and Physiology
The End...
Just Kidding!!!

Elephant in the Room

Reimbursement

• CPT Code 92700 – Unspecified Otolaryngology Procedure
• Accompanied with:
  – An explanation of the presenting sign or symptom that caused one or more of these procedures to be performed for this patient
  – A complete description of what was done and what was found
  – A description of any equipment that was used in the evaluation process and a justification for its necessity
  – A description of your clinical assessment and interpretation of the test outcomes
  – The length of time required to complete the evaluation
• Included in this report should be sufficient information to justify why these procedures were done in addition to or in place of other diagnostic procedures that have standard CPT codes.
Reimbursement

- CPT Code 92700 – Unspecified Otolaryngology Procedure
- Accompanied with:
  - An explanation of the presenting sign or symptom that caused one or more of these procedures to be performed
  - A description of any equipment used in the evaluation process and a justification for its necessity
  - The length of time required to complete the evaluation
  - Included in this report should be sufficient information to justify why these procedures were done in addition to or in place of other diagnostic procedures that have standard CPT codes.

Reimbursement

- Couple things...
  - Can be billed > 1 time per date of service
  - Must use 59 modifier EACH time to indicate separate and distinct procedure
  - Otherwise, multiple services will likely be rolled into one service
  - Anyone who is authorized to use CPT codes can report this code

Stay updated or learn more...

www.icsimpulse.com  www.headimpulse.com
Polling Question

• Question

• What Type of head rotation is preferable and produces a more accurate diagnosis? (may be more than one answer)
  A. Low-velocity
  B. High-velocity
  C. Passive
  D. Active
  E. Predictable
  F. Unpredictable
  G. Varying velocities above 50 degrees per second
  H. Only one velocity

Polling Question

• Question

What is head impulse? (may be more than one answer)
  A. Side of Lesion Specific test (can identify which side the vestibular disorder resides on)
  B. Test that detects disorders of the vestibule-ocular reflex (VOR)
  C. Test of peripheral vestibular loss
  D. Test of central disorders

Hands on!
Thank you!!!
Example letter for ICS Impulse
Reimbursement for testing using CPT code 92700

[The letter to insurance should be on your letterhead]

[Include Date of Test]

RE: 92700 Unlisted otorhinolaryngological service or procedure – Video Head Impulse Test (vHIT).

To Whom It Concerns:

This letter is to request consideration of coverage for the vHIT procedure. vHIT testing was completed on the following patient:

The vHIT was completed as the result of patient complaint of dizziness (i.e., room spinning, light headedness, etc). The vHIT provides information regarding function of all semi-circular canals (horizontal, superior, and posterior), which is complementary to traditional vestibular testing (ENG/VNG) that provides information regarding only horizontal canal function.

The vHIT can be completed in addition to ENG/VNG or in isolation when portions of the ENG/VNG cannot be completed, due to outer ear malformation, tympanic membrane perforation, among other factors. During vHIT, patients wear infrared goggles and their head is quickly moved in the plane of each semi-circular canal. This procedure provides an assessment of the vestibulo-ocular reflex of each semicircular canal.

This procedure required approximately 20 minutes of time. A GN Otometrics unit was used to obtain vHIT responses. Today's clinical assessment indicates [state the outcome e.g. normal vHIT in all canals assessed].

Based on the additional information provided by the vHIT test and the considerable amount of time to administer, please consider allowing coverage for this procedure. Should you require additional information, please do not hesitate to contact me at [include phone number].

Respectfully,

Include: Name, Title, Facility Name, Address, Email, Phone Number
Can Impulse be reimbursed? Yes

CPT code 92700 would be the code of choice. Code 92700 is the unspecified otolaryngology procedure that is intended to cover a variety of procedures that do not have their own codes. When this code is billed, a detailed report needs to accompany the invoice to the third party payer with the following pieces of information:

- An explanation of the presenting sign or symptom that caused one or more of these procedures to be performed for this patient
- A complete description of what was done and what was found
- A description of any equipment that was used in the evaluation process and a justification for its necessity
- A description of your clinical assessment and interpretation of the test outcomes
- The length of time required to complete the evaluation
- Included in this report should be sufficient information to justify why these procedures were done in addition to or in place of other diagnostic procedures that have standard CPT codes.

It can be billed more than one time per date of service for different procedures (e.g. Impulse and VEMP). However, in order to have the reporting of the code for each procedure respected by the payer, there needs to be a – 59 modifier each time it is used to indicate that it is a separate and distinct procedure. Customers have been adding -59 modifier when performing vHIT on the same day as ENG/VNG. If the code is billed over and over again without a modifier, the payer is most likely to roll it into one service and pay it only for one procedure.

Anyone who is authorized to report CPT codes can report this code for an unlisted procedure.

www.asha.org/aud/articles/hcecanswers.htm

Billing charges do vary - These averages are from 2013 and may vary for your facility:

- Maryland - avg reimbursement is $65
- Nebraska - avg reimbursement is Medicaid $56, United Health Care $54, Coventry of IA $60
- California - avg reimbursement for private insurance $159 (Aetna, Blue Cross, United HealthCare, HealthNet, Cigna), Medi-Cal does not reimburse, Medicare approximately $6.30.
- West Virginia - charge $57 and have patient sign an advanced beneficiary notice. Reimbursement from private insurance is $20-30. Only 1 person out of 100s has refused the test.