Vestibular Rehabilitation for Peripheral Vestibular Hypofunction: Clinical Practice Guideline and Beyond!

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Financial disclosure/COI

All members of the workgroup and Advisory Board submitted written conflict of interest forms and CVs which were evaluated by a member of the Neurology Section Clinical Practice Director (Beth Crowner, PT, DPT, NCS, MPPA) and found to be free of financial and intellectual conflict of interest.

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Session Learning Objectives

At the completion of this session, participants will be able to:

- Describe/discuss the action statements from the vestibular rehabilitation clinical practice guideline
- Understand how to implement the action statements into clinical practice.
- Identify the gaps in the evidence and future research directions in vestibular rehabilitation

Background

- Dizziness is one of the most common reasons patients seek medical care from primary care providers, and the cause of dizziness is often related to the vestibular system (Kroenke & Mangelsdorff, 1989).

- Uncompensated vestibular hypofunction results in postural instability, visual blurring with head movement, and subjective complaints of dizziness and/or imbalance.

Background

- An estimated 9% of ~7 million clinic visits (or 630,000 clinic visits) each year for dizziness are due to vestibular neuritis or labyrinthitis (Kroenke et al., 2000).
  - Prevalence of dizziness and balance problems in children is 5.3% (~3.3 million U.S. children; Li et al., 2016)
- There are no clinical practice guidelines for the treatment of peripheral vestibular hypofunction.
  - 2015 Cochrane review of vestibular hypofunction treatment
  - Clinical practice guidelines for benign paroxysmal positional vertigo (BPPV) from the American Academy of Neurology (Fife et al., 2008) and the American Academy of Otolaryngology - Head and Neck Surgery Foundation (Bhattacharyya et al., 2008)
The clinical practice guideline process
The vestibular guideline workgroup (Courtney Hall, Susan Herdman, Sue Whitney) proposed the topic to the APTA/Neurology Section.
– attended APTA Workshop on Developing Clinical Practice Guidelines in July, 2012
– Formed expert multidisciplinary Advisory Board

The Advisory Board
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The process continued...
• Identification and critical appraisal of the evidence and graded recommendations based on level of evidence.
• External review of the CPG was solicited (email blasts, websites of Neurology Section/Vestibular SIG) from key stakeholders:
  – Practice Committee for the Neurology Section of the APTA
  – Professional organizations including Audiology, Neurology, Otolaryngology, and Physical Therapy
  – Consumers via Vestibular Disorders Association (VEDA)

Clinical Practice Guideline Steps: Identification of the Evidence

PICO Question
Systematic Literature Search
Identification of Relevant Studies

PICO Question: “Is exercise effective at enhancing recovery of function in people with peripheral vestibular hypofunction?”

Systematic Literature Search
Academic Librarians from ETSU (Nakia Woodward, Richard Wallace), Emory University (Amy Allison), University of Pittsburgh (Linda Hartman)

Search query combined terms: Patient population AND Intervention AND Outcome

Patient population Set
Peripheral vestibular (hypofunction or loss), vestibular system, Vestibular labyrinth, Vestibular nervous system, Vestibular nerve, Vestibular nucleus, Vestibulocochlear nerve, Benign paroxysmal positional, Vertigo, Inner ear, Labyrinth disease, Vestibular disease, Labyrinth Vestibule, Vestibulum Auris, Ear Vestibule, Vestibular Apparatus, Oval Window AND ear, Saccule AND Utricle, Acoustic Maculae, Vestibular Aqueduct, Dizziness

Intervention set
Exercise, Visual-vestibular interaction, Adaptation exercises, Substitution exercises, Habituation exercises

Outcome set
Balance, Gait, Quality of life, Position, Falls

Identification of Relevant Articles

FIGURE 1. (A) Flowchart of initial identification of relevant articles from 1985 through March 2013. (B) Flowchart of identification of additional relevant articles through February 2015.
Clinical Practice Guideline Steps

Critical Appraisal of the Evidence

Grades of recommendation based on level of evidence

Critical Appraisal Team


Critical Appraisal of Evidence
(based on Fetters & Tilson, 2012)

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
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<tbody>
<tr>
<td>1) Were participants randomly assigned to intervention groups?</td>
<td>26-H</td>
<td>0</td>
</tr>
<tr>
<td>2) Were the groups either at baseline?</td>
<td>26-H</td>
<td>0</td>
</tr>
<tr>
<td>3) Is the sampling procedure (marcovary treatment) random?</td>
<td>18</td>
<td>7-H</td>
</tr>
<tr>
<td>4) Are all participants who entered the study accounted for?</td>
<td>26-H</td>
<td>0</td>
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<tr>
<td>5) Was a comparison made between groups with preservation of original group assignments?</td>
<td>26-H</td>
<td>0</td>
</tr>
<tr>
<td>6) Was blinding/masking optimized in the study design? (evaluators, participants, therapists)?</td>
<td>26-H</td>
<td>0</td>
</tr>
<tr>
<td>7) Aside from the allocated treatment, were groups treated equally?</td>
<td>17</td>
<td>9-H</td>
</tr>
<tr>
<td>8) Were outcome measures reliable and valid?</td>
<td>26-H</td>
<td>0</td>
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<tr>
<td>9) Were inferential statistics applied to the results? (if any descriptive statistics are used, state if so)</td>
<td>24-H</td>
<td>2</td>
</tr>
<tr>
<td>10) If a treatment effect was calculated, was its clinical relevance interpreted (e.g. effect size, MDIC, or other calculation)?</td>
<td>26-H</td>
<td>0</td>
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<tr>
<td>11) Were confidence intervals reported?</td>
<td>26-H</td>
<td>0</td>
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Levels of Evidence

I Evidence obtained from high-quality (≥ 50% critical appraisal score) diagnostic studies, prospective studies, or randomized controlled trials

II Evidence obtained from lesser quality (< 50% critical appraisal score) diagnostic studies, prospective studies, or randomized controlled trials

III Case-controlled studies or retrospective studies

IV Case study or case series

V Expert opinion

Grades of Recommendations

<table>
<thead>
<tr>
<th>GRADE</th>
<th>RECOMMENDATION</th>
<th>STRENGTH OF RECOMMENDATION</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>Strong evidence (&quot;should&quot;)</td>
<td>A preponderance of Level I and/or Level II studies supports the recommendation. This must include at least one Level I study.</td>
</tr>
<tr>
<td>B</td>
<td>Moderate evidence (&quot;may&quot;)</td>
<td>A single high quality RCT or a preponderance of Level II evidence supports the recommendation.</td>
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<tr>
<td>C</td>
<td>Weak evidence (&quot;may&quot;)</td>
<td>A single Level II Study or a preponderance of Level III and IV studies supports the recommendation.</td>
</tr>
<tr>
<td>D</td>
<td>Expert opinion</td>
<td>Best practice based on the clinical experience of the guideline development team and guided by the evidence, which may be conflicting. Where higher quality studies disagree with respect to their conclusions, it may be possible to come to agreement on certain aspects of intervention.</td>
</tr>
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Action Statement 1

Effectiveness of Vestibular Rehabilitation in persons with acute and subacute unilateral vestibular hypofunction

Acute: first two weeks after onset

Subacute – from two weeks up to three months after onset
Acute unilateral vestibular hypofunction

Applies to the consequences of disruption of the dynamic vestibular response:
• imbalance, dysequilibrium and other symptom complaints, reduced ability to perform some normal activities of daily living; e.g., driving and therefore quality of life

Does not apply to the consequences of disruption of the static vestibular system:
• nystagmus, vertigo, nausea and vomiting, which recover without intervention

Action Statement 1:

Clinicians should offer vestibular rehabilitation to patients with acute or subacute unilateral vestibular hypofunction. (Evidence quality: I; Recommendation Strength: Strong)

Level I. Based on 5 Level I randomized controlled trials and 4 Level II randomized controlled trials.

Action Statement 1:

Role of patient preferences:
Cost and availability of patient time and transportation may play a role.

Exclusions:
• Individuals who have already compensated sufficiently to the vestibular loss and no longer experience symptoms or gait and balance impairments do not need formal vestibular rehabilitation.
• Active Meniere’s disease
• Those with impairment of cognitive
• Those with general mobility function that precludes adequate learning and carry over or otherwise impedes meaningful application of therapy.

Research recommendations

1a) Look for a critical period for the initiation of the exercises – is there a time from onset after which vestibular rehabilitation is less beneficial or no longer beneficial?

1b) Can we identify which patients will recover without needing to perform vestibular exercises and which will need to perform the exercises in order to optimize recovery?

Action statement 2: Effectiveness of Vestibular Rehabilitation in persons with chronic unilateral vestibular hypofunction.

Clinicians should offer vestibular rehabilitation to patients with chronic unilateral vestibular hypofunction. (Evidence quality: I; Recommendation Strength: Strong)

Level I. Based on 3 Level I and 1 Level II randomized controlled trials.

Strong evidence that vestibular rehabilitation provides clear and substantial benefit to patients with chronic UVH. Therefore, with the exception of extenuating circumstances, vestibular rehabilitation should be offered to patients who are still experiencing symptoms or imbalance due to UVH.
Action Statement 2:
Most studies used gaze stabilization and balance exercises plus a home exercise program
Optokinetic stimuli was used in one study (no home exercise program)
Habituation used in another study as the home exercise program for motion sensitivity

Action Statement 3: Effectiveness of Vestibular Rehabilitation in persons with bilateral vestibular hypofunction.
Clinicians should offer vestibular rehabilitation to patients with bilateral vestibular hypofunction. (Evidence quality: I; Recommendation Strength: Strong)
Level I. Based on 4 Level I randomized controlled trials.
Strong evidence that vestibular rehabilitation provides clear and substantial benefit to patients with BVH, so with the exception of extenuating circumstances vestibular rehabilitation should be offered to patients who are still experiencing symptoms or imbalance due to BVH.

Action statement 3
All level 1 RCT used gaze stabilization plus balance and gait exercises and a home exercise program
One study modified the approaches to fit children’s motor abilities, attention span and motivational factors.
The results suggest that children with BVH respond similarly to adults to vestibular rehabilitation.

Research recommendations
2a) Researchers should examine rehabilitation outcomes in persons with damage to semicircular canal versus otolith components of the vestibular apparatus.
2b) Researchers should examine the impact of the magnitude of hypofunction relative to functional recovery.

Research recommendations
3a) Researchers should examine rehabilitation outcomes in children with confirmed vestibular dysfunction based on vestibular laboratory tests.
3b) Researchers should examine the concept of a critical period of balance development in children in the context of providing vestibular rehabilitation.

Action Statement 4: Effectiveness of saccadic or smooth pursuit exercises in persons with peripheral vestibular hypofunction (unilateral or bilateral).
Clinicians should not offer saccadic or smooth-pursuit eye exercises in isolation (i.e., without head movement) as specific exercises for gaze stability to patients with unilateral or bilateral vestibular hypofunction. (Evidence quality: I; Recommendation Strength: Strong)
Level I. Based on 3 Level I randomized controlled trials.
Smooth pursuit and saccadic eye movement exercises do not appear to harm patients with unilateral or bilateral vestibular hypofunction.

Delay in patient receiving an effective exercise program.

Increased cost and time spent traveling associated with ineffective supervised exercises.

**Benefit-harm assessment:**
Preponderance of harm

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**Action Statement 5**

- EFFECTIVENESS OF DIFFERENT TYPES OF EXERCISES IN PERSONS WITH ACUTE OR CHRONIC UNILATERAL VESTIBULAR HYPOFUNCTION

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**Action Statement 5**

- Clinicians may provide targeted exercise techniques to accomplish specific goals appropriate to address identified impairments and functional limitations. (Evidence quality: II; Recommendation Strength: Moderate)

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**Action Statement 6**

- EFFECTIVENESS OF SUPERVISED VESTIBULAR REHABILITATION

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**EFFECTIVENESS OF SUPERVISED VESTIBULAR REHABILITATION**

- Clinicians may offer supervised vestibular rehabilitation to patients with unilateral or bilateral peripheral vestibular hypofunction. (Evidence quality: I - III; Recommendation Strength: Moderate)

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**Action Statement 7**

- OPTIMAL EXERCISE DOSE OF TREATMENT IN PEOPLE WITH PERIPHERAL VESTIBULAR HYPOFUNCTION (UNILATERAL AND BILATERAL).
**Action Statement 7**

- Clinicians may prescribe a home exercise program of gaze stability exercises consisting of a minimum of 3 times per day for a total of at least 12 minutes per day for patients with acute/subacute vestibular hypofunction and at least 20 minutes per day for patients with chronic vestibular hypofunction. (Evidence Quality: V; Recommendation Strength: Expert opinion)

**Research Recommendation 4**

There is sufficient evidence that vestibular exercises compared to no or placebo exercises is effective; thus, future research efforts should be directed to comparative effectiveness research. Researchers should directly compare different types of vestibular exercise in large clinical trials to determine optimal exercise approaches.

**Examples of Different Types of Exercise**

- Cooksey-Cawthorne
- Habituation
- Adaptation
- Sensory Substitution
- Balance Training
- Exercise in the pool
- Virtual reality
- Cognitive behavioral

**Research Recommendation 5**

Researchers should include measures of compliance in order to understand the impact of supervision.

Researchers need to incorporate intent-to-treat research designs in order to understand dropout rates related to supervision.

**Exercise Compliance**

- Huang HP et al (2015) in cancer survivors has suggested that positive predictors of exercise compliance were interest in exercise and perceived importance of exercise.
Intention to treat definition

• An intention-to-treat (ITT) analysis of the results of a study is based on the initial treatment assignment but not on the treatment that the person received.

Research Recommendation 6

Researchers should examine the impact of frequency, intensity, time and type of exercises on rehabilitation outcomes. Researchers should determine the difficulty of exercises and how to progress patients in a systematic manner.

Research Ideas

• Multi-site trials are needed in order to answer many of our questions.

Research Ideas

• Does one type of intervention work optimally for certain symptoms/pathology?

Action Statement 8

DECISION RULES FOR STOPPING VESTIBULAR REHABILITATION IN PERSONS WITH PERIPHERAL VESTIBULAR HYPOFUNCTION

Clinicians may use achievement of primary goals, resolution of symptoms, or plateau in progress as reasons for stopping rehabilitation. (Evidence Quality: V; Recommendation Strength: Expert opinion)

We will need to work together in networks to get answers

❖ APTA Registry Project
When to discharge?
Consider the following:
1. Goals met, plateau reached, or patient is not symptomatic
2. Non-compliance/patient choice
3. Deterioration of clinical status or prolonged increase in symptoms
4. Fluctuating vestibular conditions and co-morbidities that affect participation
5. Overall length of treatment

General guidelines
• Acute/subacute unilateral vestibular hypofunction
  — 1x/week supervised sessions for 2-3 sessions
• Chronic unilateral vestibular hypofunction
  — 1x/week supervised sessions for 4-6 weeks
• Bilateral vestibular hypofunction
  — 1x/week supervised sessions for 8-12 weeks

Research Recommendation 7
Researchers should determine:
- Optimal duration of vestibular rehabilitation
- Factors that impact functional recovery

Action Statement 9
FACTORS THAT MODIFY REHABILITATION OUTCOMES
Clinicians may evaluate factors that could modify rehabilitation outcomes. (Evidence quality: I-III; Recommendation Strength: Weak to Strong)

Factors that modify outcomes
• Age
  — Increased age does not affect potential for improvement with vestibular rehabilitation. (Recommendation Strength: Strong)
• Gender
  — Gender may not impact rehabilitation outcomes. (Weak)
• Time from onset (acute)
  — Earlier intervention improves rehabilitation outcomes. (Moderate)

Factors that modify outcomes
• Time from onset (chronic)
  — Vestibular exercises improve outcomes regardless of time from onset.
  — Because of the potential for harm initiate rehabilitation as soon as possible. (Moderate)
• Comorbidities
  — Anxiety, migraine, and peripheral neuropathy may negatively impact rehabilitation outcomes. (Weak)
• Vestibular suppressant medications
  — Long term use of valium or meclizine may negatively impact patient recovery (Moderate)
Research Recommendation 8

- Researchers should perform longitudinal studies.
- Researchers should examine time from onset and see if it affects short- and long-term outcomes.

Action Statement 10

THE HARM/BENEFIT RATIO FOR VESTIBULAR REHABILITATION IN TERMS OF QUALITY OF LIFE/PSYCHOLOGICAL STRESS

Clinicians should offer vestibular rehabilitation for persons with peripheral vestibular hypofunction. (Evidence quality: Level I-III; Recommendation Strength: Strong)

Harm/Benefit Ratio

- **Benefit:**
  - Quality of life and psychological outcomes improve following vestibular rehabilitation.

- **Harm:**
  - Neck pain, motion sickness, and nausea may be side effects of rehabilitation and can affect quality of life.
  - Dizziness may be a side effect of exercises and can increase psychological distress.

- Preponderance of benefit, although not all patients improve with vestibular rehabilitation

Research Recommendation 9

Researchers should examine the concept of return to work:

- job requirements that may be difficult for patients with vestibular hypofunction
- job modification or assistive technology to allow return to work
- criteria for return to work or disability assignment, indicators for return to safe driving

Guideline Implementation Recommendations

- Keep a copy of the Vestibular Rehabilitation CPG.
- Seek training in the recommended intervention approaches.
- Build relationships with referral sources to encourage early referral.
- Use recommended outcome measures across multiple domains.

Coming in April...

Special Issue on Knowledge Translation in JNPT
Clinical decision making and the CPG:
Acute UVL
Chronic UVL
BVL

OBJECTIVES
• Discuss 3 vestibular patients during their course of treatment including outcome measures, interventions, number of visits, and time between visits following the CPG guidelines
• Discuss how I decided when to discharge the patient
• Reasons why I deviated from the guidelines

CASE 1: ACUTE UVL
Patient is a 59 year old female who suffered 30 seconds of severe vertigo with N/V, went to her local emergency room, was diagnosed with BPPV
Symptoms did not resolve, so her PCP sent her to the Emory Dizziness and Balance Center
Clinical examination showed a positive head impulse test for head movement to the right
➢ VNG showed 100% asymmetry decreased on the right side
➢ Diagnosis was acute right vestibular hypofunction
➢ Rotary Chair showed uncompensated

PHYSICAL THERAPY EVALUATION
• ABC - 48%
• DGI - 16/24; abnormal preferred gait speed
• mCTSIB – able to maintain 30 sec each position, but had increased sway on eyes closed conditions
• DVA normal to left; severely abnormal to right (>1.0 logMAR) Invision™
• Dizziness interfered with activities 80% of the time

• Medical history - anxiety and depression, migraines
• Social History - single; works as a medical technician in a hospital
• Functional status - unable to work or drive at this time due to imbalance and dizziness when moving her head
GOALS

- Improve ABC score to >80%
- Low risk for falls based on DGI
- Normal preferred gait speed
- Normal DVA for leftward head turns
- No dizziness with activities

PT PLAN OF CARE

Pt was seen for a total of 5 visits over the course of 8 weeks
HEP initiated on the first visit included:
1) Static and dynamic balance activities with eyes open and closed
2) Gait with head turns
3) X1 gaze stability exercises 3 times/day
4) Walking for endurance daily outdoors

FOLLOW-UP VISITS

- Upgraded HEP with increased time with eyes closed on foam, single leg stance exercises
- Added eye/head movements between two targets (second visit)
- Assisted in return to work documentation - starting 4 hours with breaks as needed

5th VISIT - OUTCOMES

<table>
<thead>
<tr>
<th>INITIAL</th>
<th>DISCHARGE</th>
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<tbody>
<tr>
<td>ABC</td>
<td>48.0%</td>
</tr>
<tr>
<td>DGI</td>
<td>16/24</td>
</tr>
<tr>
<td>FGA</td>
<td>NT</td>
</tr>
<tr>
<td>Gait Speed</td>
<td>2.51 f/s (.76 m/s)</td>
</tr>
<tr>
<td>DVA (R)</td>
<td>&gt;1.0 logMAR</td>
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<tr>
<td>(nl for age 0.388 logMAR)</td>
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</tbody>
</table>

Clinical Practice Guidelines Followed

- Persons with acute or subacute UVL should be offered vestibular rehabilitation
  - Evidence quality: I; Recommendation Strength: Strong
  - Vestibular rehabilitation consisting of gaze stability, balance and gait exercises were offered

- Clinicians may prescribe a home exercise program of gaze stability exercises consisting of a minimum of 3x/day for a total of at least 12 m/day
  - Evidence Quality: V; Recommendation Strength: Expert opinion
  - The HEP program started with performing gaze stability exercises 3x/day for 12 minutes total time and progressed to 3x/day for a total of 15 minutes.

5th VISIT

- Retested all outcome measures
- Added X2 viewing since dynamic visual acuity had improved, but not normal
- Patient was now without dizziness, working full time, back to normal activities of shopping, social activities, but still c/o fatigue at the end of every eight hour work shift
- Discussed adding another visit since DVA was still impaired, to return in 6 months
Clinicians should not offer saccadic or smooth-pursuit eye exercises in isolation (i.e., without head movement) as specific exercises for gaze stability to patients with unilateral or bilateral vestibular hypofunction.

Evidence quality: I; Recommendation Strength: Strong

- The HEP did not include eye movement exercises without head movements

Exercises included both supervised and unsupervised sessions

Evidence quality: I-III; Recommendation Strength: Moderate

- She came to the clinic weekly for 5 visits (supervised exercises) and performed exercises on a daily basis at home

DEVIATIONS FROM GUIDELINES

- Chose to discharge her before she reached her goal of normal DVA
  - Reasons
    - Patient reported even though her objective visual acuity score showed impairments, it did not affect her function including ADL’s, driving or job demands.
    - She was consistently compliant with her HEP and agreed she did not need additional weekly supervised sessions, retest in 6 months

CASE 2: CHRONIC UVL

- Patient is a 52 year old female with history of acute vertigo, went to her local ED, and was diagnosed with BPPV
- Dizziness never resolved completely, so 8 months later she returned to her PCP, and symptoms were attributed on stress from her job and she began taking meclizine
- She was referred to the Dizziness and Balance Center nine months after onset of symptoms

NEUROLOGY EVALUATION

- Neurologist found no indication of vestibular hypofunction on his clinical exam (negative head thrust, negative head shake nystagmus), but VNG showed left UVL with no response on left side
- Rotary chair testing the following week confirmed a left UVL, however showed central compensation