

International guidelines for education in vestibular rehabilitation therapy

Helen S. Cohen^{a,*}, Kim R. Gottshall^b, Mariella Graziano^c, Eva-Maj Malmstrom^d,
Margaret H. Sharpe^e and Susan L. Whitney^f

^a*Bobby R. Alford Department of Otolaryngology – Head and Neck Surgery, Neck Surgery, Baylor College of Medicine, Houston, TX, USA*

^b*Department of Defense Spatial Orientation Center, Naval Medical Center, San Diego, CA, USA*

^c*Physiotherapist in the community, Esch-sur-Alzette, Luxembourg*

^d*Departments of Otorhinolaryngology – Head and Neck Surgery and Rehabilitation Medicine, Clinical Sciences, Skåne University Hospital, Lund, Sweden*

^e*Dizziness & Balance Disorders Centre, Unley, South Australia, Australia*

^f*Departments of Physical Therapy and Otolaryngology, University of Pittsburgh, Pittsburgh, PA, USA*

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Abstract. The Barany Society Ad Hoc Committee on Vestibular Rehabilitation Therapy has developed guidelines for developing educational programs for continuing education. These guidelines may be useful to individual therapists who seek to learn about vestibular rehabilitation or who seek to improve their knowledge bases. These guidelines may also be useful to professional organizations or therapists who provide continuing education in vestibular rehabilitation. We recommend a thorough background in basic vestibular science as well as an understating of current objective diagnostic testing and diagnoses, understanding of common tests used by therapists to assess postural control, vertigo and ability to perform activities of daily living. We recommend that therapists be familiar with the evidence supporting efficacy of available treatments as well as with limitations in the current research.

Keywords: Vestibular rehabilitation, occupational therapy, physical therapy, training

1. Introduction

Vestibular rehabilitation therapy (VRT) is practiced in at least 25 countries, by physicians and by occupational and physical therapists (in this document, these two groups will be considered together as therapists). Therapists graduate from university programs that meet educational standards established by their respective professions. Specialty training for therapists is uncommon. In the few countries that offer limited specialty training programs specialty certification involves ad-

vanced academic and clinical training in a specific field and passing an examination or completing other requirements stipulated by the certifying specialty organization. No such certification is required to practice VRT.

We know of three professional organizations with requirements or documentation about VRT. Only one professional organization, the American Occupational Therapy Association (AOTA), has published guidelines for its members who specialize in VRT [23], but AOTA does not require entry level education to include coursework on VRT. The American Physical Therapy Association recommends that all physical therapists should be able to evaluate and treat balance disorders and should be able to evaluate vestibular responses but no specific skills are specified for entry-level education [1]; for advanced therapists the American Board of Physical

*Corresponding author: Helen S. Cohen, Bobby R. Alford Department of Otolaryngology – Head and Neck Surgery, Neck Surgery, Baylor College of Medicine, Houston, TX, USA. Tel.: +1 713 798 6336; Fax: +1 713 798 8658; E-mail: hcohen@bcm.edu.

Therapy Specialties includes questions about VRT on the examination to certify American neurologic physical therapists. The Australian College of Physiotherapists requires candidates for certification as specialist Neurological physiotherapists to complete their two-year structured training program, which includes VRT, and pass clinical and oral examinations (Paul Bew, PT, personal communication). In Sweden the professional associations have no national standards at this time but two physical therapy programs, at University of Lund and University of Linköping, have either required or elective courses in VRT.

To address the lack of educational standards and the lack of specialty certification in VRT the Ad Hoc Committee on Vestibular Rehabilitation Therapy was formed by interested therapists at the 2006 meeting of the Barany Society in Uppsala. All committee members are clinicians with many years of experience treating vestibular disorders, and who are interested in research on the vestibular system; some members are also scientists or educators. Our first task was to conduct a world-wide survey of therapists who practice VRT to learn about their practice patterns and educational backgrounds [24]. That survey was completed by 133 rehabilitation professionals from 19 countries, including 117 physical therapists, 15 occupational therapists and 1 audiologist. Their responses showed that most VRT therapists are experienced clinicians who obtain continuing education from national and local conferences and seminars, publications, and continuing education courses. Most respondents supported the idea of developing standards for education in this specialty.

The following sections describe the Committee's recommendations for education of therapists who practice VRT, in entry-level or continuing education programs or for self-directed study. To develop these recommendations we considered the comments of survey respondents and we discussed these issues among ourselves over several years. We used the AOTA Knowledge and Skills paper [23] as a guide but have broadened the recommendations to be relevant to physical therapists and to occupational therapists in other countries. These recommendations are intended as guidelines, only. Therapists may use these recommendations to work with their own professional organizations to develop their own standards of education that will meet the unique needs of therapists in their countries while still adhering to internationally accepted standards. Therapists may also use these recommendations to develop their own individualized learning plans for continuing education and professional growth.

Note on references: An exhaustive, critically reviewed reference list is beyond the scope of this paper. We have tried to include significant references on all topics, emphasizing primary sources and other important papers. To design an educational plan we recommend that therapists read the cited references, other peer-reviewed papers, many of which are indexed on PubMed (www.ncbi.nlm.nih.gov/pubmed/), the biomedical index compiled by the United States National Library of Medicine. This index is available, worldwide, at no charge, to anyone who has Internet access. To guide their reading, therapists who are new to VRT should also consider reading some of the many textbooks on vestibular physiology and vestibular rehabilitation. For example some useful textbooks are listed in the references [4,12,42,61,66] but the reader should be aware that the list of textbooks is extensive and is not limited to the few books we have cited here.

To understand the problems of patients with vestibular impairments and the functional limitations caused by those impairments therapists need to have strong backgrounds in basic science principles. Therefore this information must be included in educational programs about VRT and therapists who practice VRT should understand this information.

2. Basic science recommendations

Understanding the anatomic and physiologic mechanisms of normal and abnormal behavior is essential for understanding evaluation, treatment planning and management of patients with vestibular impairments. Therefore the Committee recommends that therapists who practice VRT have at least a basic understanding of the topic areas below. Therapists should be familiar with advances in the field as basic research progresses. The literature on the basic anatomy and physiology of the vestibular system is too extensive to cite here. Therefore, we recommend that therapists who are beginning to develop expertise in VRT should begin learning about the vestibular system by reading one of the many textbooks and review papers on the vestibular system and then begin reading the classic papers cited in those publications.

- 1) Anatomy of the ear and inner ear, including a detailed understanding of the peripheral structures of the vestibular system. These structures include the semicircular canals, otoliths, blood supply, and vestibular nerve. A general understanding of the relationship of the vestibular structures to the cochlea and auditory nerve is also useful.

- 2) Physiology of the vestibular labyrinth, including basic understanding of the principle of inertia and the inertial functions of the semicircular canals and otoliths.
- 3) Basic anatomy of the central projections of the vestibular nerve to the vestibular nuclei and projections from the vestibular nuclei to the cerebellum, spinal cord – including cervical spine, nuclei of the cranial nerves, thalamus and cerebral cortex.
- 4) Basic principles of signal integration and velocity storage.
- 5) Basic understanding of intersensory interactions among visual, vestibular, auditory, autonomic and somatosensory systems.
- 6) Basic understanding of functions and mechanisms of normal eye movements (optokinetic nystagmus, pursuit, saccades, vergence, angular and linear vestibulo-ocular reflex (VOR), VOR cancellation/ suppression, ocular tilt reaction).
- 7) Basic understanding of the vestibular influence on postural control via the vestibulospinal reflexes.
- 8) Basic understanding of non-vestibular contributions to postural control and balance, including vision, somatosensory input, strength, and motor control.
- 9) Basic understanding of vestibulo-autonomic mechanisms and the vestibular contributions to vasovagal responses.
- 10) Basic understanding of vestibular influence on spatial orientation, including vertical orientation and path integration.
- 11) Basic knowledge of findings on central mechanisms of vestibular plasticity, adaptation, habituation, substitution, and compensation.
- 12) Basic understanding of the influence of age on functional and physiologic performance.
- 13) Basic understanding of “dizziness” of non-vestibular origin.
- 14) Basic knowledge of vital signs that require examination by a specialist physician.

3. Clinical science recommendations

To evaluate, treat and manage care of patients with vestibular disorders the VRT therapist must understand the clinical problems with which these patients present. Therefore the Committee recommends education in the following areas:

- 1) Etiology, pathophysiology, epidemiology, natu-

ral history, medical/ surgical interventions, therapy interventions and prognosis for benign paroxysmal positional vertigo (BPPV) [34,40, 48,75,83,112]; unilateral vestibular neuronitis/ labyrinthitis; superior canal dehiscence; bilateral vestibular weakness or loss; Meniere’s disease; acoustic neuroma; vestibular migraine, cerebellopontine angle tumors/ meningioma; Chiari malformation; multiple sclerosis; cerebral, cerebellar and brainstem strokes that affect vestibular pathways, e.g., lateral medullary syndrome; disequilibrium of aging (presbystasis); traumatic brain injury that includes a vestibular component; vestibular impairment related to cochlear implants [82,85] and multifactorial balance disorders. Knowledge about the etiology and pathophysiology of these disorders continues to evolve; therapists who practice VRT should be familiar with these issues, as much as possible, to inform treatment planning.

- 2) The process of differential diagnosis based on the history, analysis of eye movements, evaluation of sensory impairment that contributes to postural control problems, evaluation of spatial impairments, and other signs and symptoms, although actually making a diagnosis is outside the scope of practice for therapists in some countries. Therapists who practice VRT should understand the components of the complete, objective vestibular diagnostic battery, including bi-thermal caloric tests, Dix-Hallpike maneuvers, positional tests, low frequency sinusoidal tests in the rotatory chair [16], and vestibular evoked myogenic potentials [37,56].
- 3) Basic knowledge of common pharmacologic interventions that are often prescribed by physicians, and basic knowledge of common otologic and neurologic surgical procedures.
- 4) Basic understanding of cognitive problems in vestibular disorders, which may develop secondary to vestibular disorders [110].
- 5) Understanding of psychosocial problems experienced by patients with vestibular disorders, such as generalized anxiety, situational anxiety, panic disorder and depression [41,71,77,92].
- 6) Advanced understanding of visual-vestibular interaction and the effects of apparent visual motion in patients with vestibular impairments [101]
- 7) Advanced understanding of problems performing activities of daily living, including self care,

home management, driving, instrumental activities in the community, work, leisure and social activities, and communication [17,19,35,43,44,72].

- 8) Advanced understanding of gait and postural control problems caused by vestibular disorders [8,97].
- 9) Advanced understanding of treatment planning that is diagnosis-specific when possible, or symptom-specific when differential diagnosis is unavailable or irrelevant to the therapy treatment plan.
- 10) Advanced understanding of complex, long-standing symptoms and the multifactorial causes for long-term complaints and relapses [11].

All clinicians should practice evidence-based therapy. Therefore, therapists should be familiar with published studies showing evidence for effectiveness or usefulness of various modalities and treatments in vestibular rehabilitation therapy. Therapists should understand the limitations of published reports as well as the possibilities presented by current findings.

4. Specific assessment skills

Therapists are skilled in assessing functional problems when they begin to learn about VR. The Committee recommends extending those skills in areas specific to vestibular disorders (Examples of each recommended area are given but other scales or tests may also be used.):

- 1) Assessment of standing balance: e.g., Romberg/sharpened Romberg [46], Clinical Test of Sensory Integration on Balance (CTSIB) [18,106,107], Berg Balance Scale [6,115], single leg stance [10], and computerized dynamic posturography/ Sensory Organization Tests [97].
- 2) Assessment of walking balance: e.g., Dynamic Gait Index [108,116], tandem gait [47], walking with simultaneous head rotations, obstacle avoidance [29,96,114], Timed Up and Go [103].
- 3) Path integration: veering task [21,26].
- 4) Subjective visual vertical: Bucket test [118].
- 5) Oculomotor tests: use of infrared video-oculography (VOG); oculomotor tests including spontaneous nystagmus, gaze tests, head shaking, saccades, pursuit, and vergence; VOR tests including head thrust/ head impulse tests [9,57]; tests for BPPV including Dix-Hallpike maneuvers [38], sidelying [22], lateral canal test [7,99], and an-

terior canal tests [76]. Many papers and texts discuss vestibulometric testing including, but not limited to, the references cited here [12,16,61,79].

- 6) Vertigo scales, as such simple ordinal scales [20,81], Vertigo Symptom Scale [117], UCLA Dizziness Questionnaire [72].
- 7) Self-assessments of functional performance/quality of life: Dizziness Handicap Inventory [78], Vestibular Disorders Activities of Daily Living Scale [25,30], Vestibular Rehabilitation Benefit Questionnaire [93,94].
- 8) Dynamic visual acuity, either non-computerized or computerized. Non-computerized testing can be performed with the patient walking in place or walking on a treadmill, using a Snellen chart or other standard eye chart. Computerized tests are described in the literature and continue to be developed [64,69,102,111].
- 9) Evaluation of musculoskeletal issues that are prerequisite for postural control: joint range of motion, muscle strength, and motor control [109].

5. Specific treatment skills

Therapists have expertise in planning and administering exercise- and activity-based treatments, in general, and they are skilled at helping patients to adapt to disabling conditions with environmental changes, modifications in performance of specific skills, and other therapeutic strategies. Therapists who practice VRT should develop specific expertise in the following treatment methodologies, including an understanding of typical treatment plans, appropriate modifications and limitations of these treatments. We recommend one paper that critically reviews research on VRT, treatment, in general [68]. Otherwise, most recommended papers are original research. Because each patient is unique treatment should be individualized, to meet the needs of each patient. The clinician should explain the premise supporting the chosen treatment or treatments and should instruct the patient in how to perform any home exercises or activities. Merely providing a preprinted hand-out is not sufficient. Therapists who practice VRT should know the following:

- 1) To treat benign paroxysmal positional vertigo: therapists who are beginning to practice VRT should be familiar with the canalith repositioning (CRP) and liberatory maneuvers [28,45,105]. Therapists at the advanced level should

- be familiar with the liberatory maneuver modified for anterior canal BPPV, the log-rolling maneuver for lateral canal BPPV, and the modified Brandt-Daroff and self-CRP exercises [59, 84,98]. Advanced therapists should be familiar with the research literature on CRP, especially controlled studies about treatment efficacy [28, 31–33,36,39,63,65,70,113]. Therapists should be equally familiar with evidence that some clinical practices do not work [3,13,49,55,59].
- 2) To treat chronic, uncompensated vertigo due to peripheral unilateral or unequal bilateral impairment or central vestibular impairment due to naturally occurring lesions or traumatic brain injury: vertigo habituation exercises and activities [2,20,27,50–53,67].
 - 3) To treat oscillopsia and visual motion sensitivity (visual vertigo) due to bilateral peripheral vestibular loss or central vestibular lesions: gaze stabilization exercises and activities, visual desensitization exercises and activities [14,60,62].
 - 4) Balance deficits: balance and gait training skills [73].
 - 5) Use of gait aids: cane, walker, rollator (walker with wheels) [5,74].
 - 6) Mobility and strength training, conditioning programs, modified t'ai chi [51,54,86,90,91].
 - 7) Environmental adaptations: safety grab bars or rails that are easy to see [89], tub benches, night-lights, lighted canes. Although clinicians should know how to prescribe these devices, at the time of publication no studies have tested the efficacy of bathtub grab bars and safety benches in reducing falls, and some evidence suggests that most fall-prevention strategies are not very effective [104].
 - 8) Recommendations for shoes, socks, orthotics [100].
 - 9) For some patients use of single long-distance lenses rather than multifocal lenses may be effective in falls reduction outdoors [58]. Therapists are not qualified to prescribe lenses but should be aware of recent research on multifocal lenses and falls and should be able to discuss this issue with patients and their eye care professionals.
 - 10) Recommendations for driving cessation, driver reeducation or car adaptation, e.g., Certified Driver Rehabilitation Specialists (United States and Canada). (See the website for the Association of Driver Rehabilitation Specialists, <http://www.driver-ed.org> [15,35,80,87,88,95].

Therapists who practice VRT should understand the limitations, average time course and average number of treatments, the post-treatment effects, and use of home programs. All clinicians who prescribe home programs should understand the process of instructing patients in home programs, the benefits and limitations of such programs, and follow-up procedures. Therapists should be able to adapt any type of treatment to musculoskeletal limitations, motor control deficits, or cognitive impairments.

When designing continuing education courses for therapists these knowledge domains should be included. Therapists might focus their own, individual educational programs on selected components of this outline or they may limit their use of specific treatment skills in practice. Nevertheless, the therapist who practices VRT should be familiar with all of the issues described here. Of course, other areas of study may be added to augment the extensive list in this document.

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