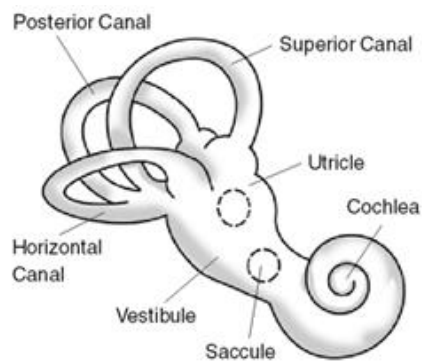


Benign Paroxysmal Positional Vertigo (BPPV or BPV)

Benign paroxysmal positional vertigo (BPPV or BPV) is an inner ear disorder usually affecting the posterior and/or lateral semicircular canals and causing repeated episodes of positional vertigo. The posterior canals are affected in approximately 85%-95% of cases of BPPV, and the lateral/horizontal canals are affected in approximately 5%-15% of cases. The anterior (AKA superior) semicircular canals are rarely affected, accounting for 1%-3% of cases (Parnes 2003).



BPPV is characterized by a sudden onset of an abnormal sensation of motion provoked by movement of the head that has a latent period of 2-20 seconds (but can be up to one minute (Baloh 1987; Imai 2017) and typically lasts less than 20 seconds (Dynamed 2017). It is usually accompanied by nystagmus, involuntary repeating eye movements. The direction of the nystagmus is variable, and often associated with the canal affected.

It is thought that the symptoms of BPPV are caused by otoconia aka canaliths (small crystals), which should be attached to the cupula, coming loose and entering the semicircular canals. Having otoconia in the semicircular canals causes endolymph (fluid) to flow abnormally and sends false signals of movement to the brain and initiates nystagmus (Dynamed 2017).

BPPV is the most common cause of peripheral vertigo.¹ It is at least two times more likely to affect women than men. The peak onset is between ages 50-70. It is uncommon in people under 35 and rare in children² (Dynamed 2017) There is an estimated lifetime prevalence of 2.4% (Dynamed 2017; Kim 2014). The cause of BPPV is idiopathic, but it is more common following head trauma, inner ear disease, and prolonged periods of immobility of the head (Dynamed 2017).

¹ The lesion affects the peripheral nervous system as opposed to the CNS.

² In children, this condition is called benign paroxysmal vertigo of childhood (BPVC); however, epidemiological studies don't report prevalence for children.

ASSESSMENT

HISTORY

A chief complaint of a short (usually less than 20 second) episode of vertigo after a change in head position suggests a diagnosis of BPPV. Patients may describe vertigo as a rotational, spinning, swaying, rocking, or moving sensation. The sensation may occur with any movements of the head, and is commonly reported after such activities as getting out of or rolling over in bed, bending forward, or looking up. Patients may have nausea and vomiting as associated symptoms. Also note that patients may complain of light-headedness, dizziness, nausea, or the feeling of being off balance rather than true “room spinning” vertigo. About half of BPPV patients report subjective imbalance between the classic episodes of vertigo. Episodes of vertigo without associated light-headedness increase the likelihood of a diagnosis of posterior canal BPPV. (Bhattacharyya 2017)

Differential diagnoses

Patients often label vertigo as “dizziness,” and it is important to have the patient describe their symptoms. A description of feeling faint, lightheaded, off balance or concomitant hearing loss suggests additional diagnoses that may need to be ruled out. In several large studies of patients with a chief complaint of dizziness or vertigo presenting to either emergency rooms, primary care offices, or ENT specialty offices, only about 20%-53% were diagnosed with BPPV or a related vestibular diagnosis (Hanley 2002; Newman 2008; Luscher 2014). A number of competing diagnoses must also be considered.

One approach is to focus more on the duration (acute vs chronic) and episode triggers rather than on the patient’s exact description of the symptoms. See table below.

Categories of Vertigo	Clinical Presentation	DDX
Acute Vestibular Syndrome	Persistent, continuous symptoms lasting days to weeks and usually associated with nausea, vomiting, and intolerance to head motion.	Vestibular neuritis, labyrinthitis, posterior circulation stroke, demyelinating diseases, posttraumatic vertigo
Triggered Episodic Vestibular Syndrome	Episodes triggered by specific actions, usually a change in head or body position. Episodes generally last <1 minute.	Benign paroxysmal positional vertigo, postural hypotension, perilymph fistula, superior canal dehiscence syndrome, vertebrobasilar insufficiency, central paroxysmal positional vertigo
Spontaneous Episodic Vestibular Syndrome	Episodes without triggers, lasts minutes to hours.	Vestibular migraine, Meniere’s disease, posterior circulation transient ischemic attack, medication side effects, anxiety or panic disorder
Chronic Vestibular Syndrome	Symptoms lasting weeks to months or longer.	Anxiety or panic disorder, medication side effects, posttraumatic vertigo, posterior fossa mass lesions, cervicogenic vertigo (variable)

Once this is done, a careful history should also ascertain what other signs and symptoms may accompany the patient’s complaint of vertigo or dizziness. See table below.

Associated Symptoms/Signs	Possible differential diagnosis to consider
Dysequilibrium (feeling off balance), positive Romberg test, altered gait.	Peripheral neuropathy or Parkinson’s disease, a cerebellar lesion, posterior column disease, or head trauma (e.g., minimal traumatic brain injury)
Feeling faint, lightheaded, syncope, orthostatic hypotension, history of arrhythmia or MI	Cardiac pathology, anxiety or panic disorder, or autonomic abnormalities.
Migraine headache, photophobia, phonophobia, aura	Migrainous vertigo
Hearing loss, tinnitus, longer episodes of vertigo	Meniere’s disease, labyrinthitis, tumor pressing on CN VIII (Bates, 2003)
Brainstem or neurological signs/symptoms, Nystagmus without dizziness/vertigo	Central vestibular dysfunction possibly due to a medication side effect.
Jaw pain, clicking, altered jaw gait	TMD (more likely associated with dizziness than true vertigo)

A Word on Cervicogenic Vertigo

Additionally, the diagnosis of cervicogenic or cervical vertigo should be considered. Cervicogenic vertigo is thought to originate from structures in the neck and is a controversial diagnosis. The exact pathogenesis is unknown, although there are several hypotheses, including altered proprioceptive input from uneven mechanical pressure on cervical muscles and joints. This vertigo is usually accompanied by neck pain and often the patient has a recent history of head and/or neck trauma, such as whiplash, or a diagnosis of degenerative joint disease in the upper cervical spine (Wrisley, 2000) Patient history may be very similar to that of a patient with BPPV. Nystagmus may or may not be present with vertigo. Unlike BPPV where vertigo is associated with head positional changes relative to gravity, symptoms of cervical vertigo may be triggered by rotation of the head relative to the body while upright.

A quick and simple test called the Neck Torsion Test or Swivel Chair Test can help to distinguish between BPPV and cervicogenic vertigo.

Have the patient sit on a chair that swivels such as a treatment stool and have them close their eyes. For step one, ask them to shake their head from side to side. If symptoms of vertigo return, the vestibular system or cervical spine may be responsible. Wait until symptoms subside.

For step two, hold the patient's head still while they swivel their body from side to side in the chair.



SWIVEL CHAIR TEST

If symptoms return it is likely from a cervical structure, as the vestibular system is not provoked. Cervicogenic vertigo may be treated effectively with chiropractic manipulation in many circumstances (Lystad 2011; Reid 2005).

PHYSICAL EXAMINATION FOR BPPV

Prior to testing, the patient should be warned that tests may bring on an episode of vertigo and they may feel nauseous. It is also advisable to have a receptacle handy in case the patient vomits.

In the following tests the patient's report of vertigo and observed nystagmus is monitored.

Clinical warning: A down beating vertical nystagmus with slight torsion towards the down side ear may imply anterior canal involvement, *but may also be due to brainstem or cerebellar lesions.* These cases should be referred out to a provider with specialized training. (Casani 2011; Lopez 2006; Fife 2009).

DIX-HALPIKE MANEUVER

The Dix-Hallpike maneuver (aka head hanging test) should be performed to test for posterior canal BPPV.

Procedure: Instruct the patient to remove glasses and to keep their eyes open during the maneuver. They should sit positioned so that when they lie down their head will be clear of the table and cervical extension will be allowed during the test. Begin with the patient seated upright with legs extended and head in 45 ° of rotation. The head is rotated towards the side of the canal being tested. Sometimes the patient's report of their symptom triggers can help to identify the affected side, and sometimes both sides will need to be tested. The patient is then quickly lowered to the supine position and their head is held in 30°of extension and 45°of rotation. The practitioner should be positioned to support the head as it hangs off the end of the table. Observe

the patient's eyes for nystagmus and ask about reproduction of vertigo symptoms. There is usually a latency period of 2-20 seconds before signs and symptoms appear, and so it is important to maintain this position if they are not immediately present. The symptoms usually last 60 seconds or less. The patient should then slowly be repositioned and wait until any additional symptoms pass.



DIX-HALPIKE

Interpretation: Vertigo with upbeat-torsional (rotary) nystagmus in which the upper (superior) pole of the eyes rotates towards the affected ear and upward toward the forehead indicates posterior canal BPPV. Sometimes vertigo will be present without nystagmus, and this is an indication to test the lateral canal. If both sides appear to be positive, presume that the affected ear is on the side that produces the most intense nystagmus.

Test Validity: In one study, the test was rated to have a positive LR of 3.17 and $-LR$ of 0.28 (sensitivity 79%, specificity 75%). (Halker 2008) Another study in a primary care environment reported a positive predictive value of 83% and a negative predictive value of 52%. (Hanley 2002). Therefore, a negative test cannot completely rule out BPPV.

Contra-indications and precautions: Caution must be exercised with patients who may have cervical spinal instability or other physical limitations including cervical stenosis, severe kyphoscoliosis, limited cervical range of motion, Down's syndrome, Ehlers Danlos syndrome, severe rheumatoid arthritis, cervical radiculopathies, Paget's disease, ankylosing spondylitis, low back pain, spinal cord injuries, known cerebrovascular disease, and the morbidly obese.

Follow up: If the Dix-Hallpike test is negative or cannot be performed due to a contraindication or physical limitation, perform the supine roll test for lateral involvement (see below).

THE SUPINE ROLL TEST

The supine roll test should be performed to test for lateral canal BPPV or when Dix-Hallpike cannot be performed due to a contraindication or physical limitation.

Procedure: Begin with the patient supine with the head in a neutral position. Quickly turn the head 90 degrees to one side and observe the patient's eyes for nystagmus, again maintaining the position to allow for a latency period before signs and symptoms appear. Repeat on the opposite side.



SUPINE ROLL TEST

Interpretation: Vertigo with horizontal nystagmus indicates lateral canal BPPV. In most cases, the eyes will beat towards the floor when the patient is turned either direction, but the beating will be more intense towards the involved side. Occasionally, the nystagmus will beat away from the floor towards the upside ear (Bhattacharyya 2017).

Test Validity: The test validity is unknown.

Follow up: If this test is positive for lateral canal BPPV, perform the Barbecue Roll Maneuver (AKA Lempert 360 Roll Maneuver) as a treatment (see below).

MANAGEMENT

A number of specific in-office maneuvers have been recommended as initial treatments for BPPV. These appear to be superior to simply giving home positioning exercises. Home restriction of activities is not recommended. Clinicians in the past have recommended sleeping with the head elevated or with the treated ear in a dependent position, or to avoid vertical head movements, or wearing a soft cervical collars to limit certain head movements. Research has not supported any of these additional precautions. (Bhattacharyya 2017)

An initial watch and wait approach for a month could also be an optional approach and has been acknowledged in 2017 BPPV Guidelines. Spontaneous resolution has been reported in 15% to 85% of cases without intervention at one month. (Bhattacharyya 2017)

Even when treatment is provided, the patient should return at one month to make sure symptoms have been resolved. Evidence suggests that 12.8% to 15.3% of patients will require a second Epley maneuver and that with 1 or 2 treatments 79.4%-92.7% should experience symptom resolution. Approximately 5.1% will be classified as treatment failures. (Bhattacharyya 2017)

Clinical warning: Other conditions including CNS disorders can masquerade initially as BPPV and so treatment failure should trigger a more thorough evaluation.

Patient education

An important goal is to reassure the patient that although the symptoms can be frightening and impactful, BPPV is not a serious condition and is treatable without medications or expensive medical workup. Patients should be warned that there is a significant recurrence rate (see prognosis).

Finally, patients, especially older frail patients, should be cautioned regarding the risks and hazards of falling. Counseling should include assessment of home safety, activity restrictions, the need for balance aid such as a cane or a walker and in some cases the need for home supervision until symptom resolution. For more information on fall prevention, see Appendix.

EPLEY'S MANUEVER

Epley's Maneuver is a safe and effective canalith repositioning procedure for BPPV (Hilton 2014). It is the key in-office treatment in most cases of posterior canal BPPV.

Indications: A positive Dix-Hallpike test.

Possible Contraindications/Limitations: The same as for the Dix-Hallpike test. (Hilton 2014; Roberts 2016).

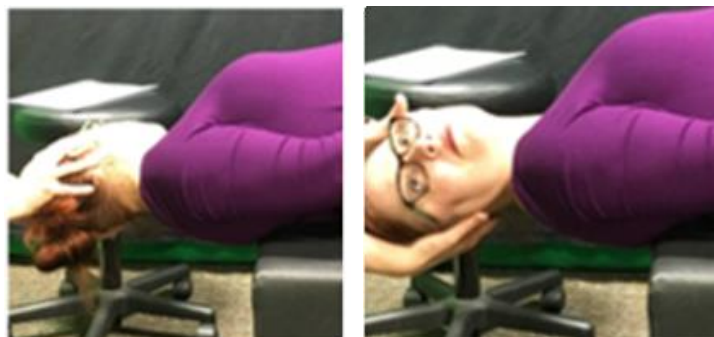
Risks: Some patients may vomit or experience an increase in nausea.

Procedure: Prior to performing the test, the patient should be warned that this might bring on an episode of vertigo, and they may feel nauseous. It is also advisable to have a receptacle handy in case the patient vomits.

Step 1: Step one is the same as the Dix-Hallpike test. Begin with the patient seated upright with legs extended and head in 45 degrees of rotation. The patient is then quickly lowered to the supine position and their head is held in 30 degrees of extension and 45 degrees of rotation. Hold this position for about one minute, or for 30 seconds after their symptoms and nystagmus have subsided. If it still hasn't subsided, go on to step 2.



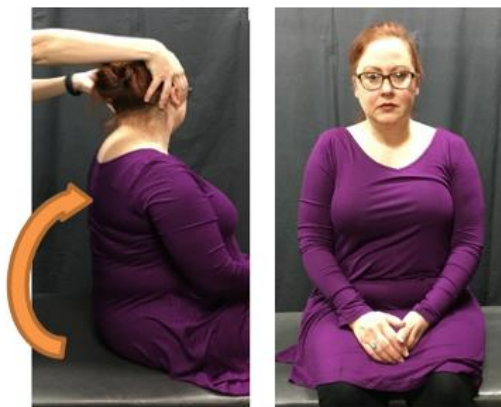
Step 2: Turn the patient's head 90 degrees so that it is in 45 degrees of rotation in the opposite direction of step one, and maintain the extension. Hold this position for about one minute, or for 30 seconds after their symptoms and nystagmus have subsided.



Step 3: While maintaining rotation, have the patient roll 90 degrees onto their side that they are facing, such that they end up looking at the floor. Hold this position for about one minute, or for 30 seconds after their symptoms and nystagmus have subsided.



Step 4: Have the patient bring their knees up toward their chest and then hang their legs over the edge of the table, and bring them to a seated position. Maintain their head in rotation as you bring them up. Return the patient's head to a neutral position and support the patient until they are stable.



Common errors: Patients will naturally close their eyes as they are lowered to the supine position. Instruct them to keep their eyes open so that nystagmus can be observed. Do not tell the patient to fix their gaze, as this can decrease nystagmus.

When going from Step 2 to Step 3, it is important to maintain the neck in 45 degrees of rotation relative to the patient's chest. Do not allow the patient to turn their body and then move their head. Keep the patient's chin pointing towards their shoulder as they turn onto their side.

Effectiveness: A 2014 Cochrane review (N=745, 11 trials) reported that this treatment was statistically and clinically more effective than sham maneuvers or other controls. Complete resolution had an OR of 4.42; 95% CI, 2.62-7.44). A single treatment was >10 times more effective than a week of 3-times-daily Brandt-Daroff exercises which have often been prescribed to "habituate" the patient to the condition (OR, 12.38; 95% CI, 4.32-35.47). (Hilton 2014)

BARBECUE ROLL MANEUVER (AKA Lempert Maneuver)

Indications: A positive supine roll test

Possible Contraindications/Limitations: The same limitations as Epley's maneuver should be taking into consideration before performing this procedure. Obesity and cervical spine problems such as severe arthritis, carotid artery stenosis, or vertebral basilar insufficiency may make this procedure difficult or impossible to perform. (Hilton 2014; Roberts 2016). This procedure should not be performed in those with conditions such as Down's syndrome, severe rheumatoid arthritis, Paget's disease, or spinal cord injuries.

Risks: Some patients may vomit or experience an increase in nausea.

Procedure: There are a number of variations to performing this maneuver, they all depend on rotating the head and body slowly through 360 degrees in an attempt to guide a free otolith out of the lateral canal where it is stimulating the vertigo. Start from a supine position. Roll the patient onto their side with the unaffected ear down. (Alternatively have them rotate just their head 90 degrees to the side.) Hold this position for about 30-60 seconds (one suggestion is to wait for the nystagmus to subside and then wait another 30 seconds). This time is necessary to be sure that the otolith has re-positioned itself by drifting down the lateral canal. Next keep rolling the patient (head and body) in the same direction until they are completely prone. Hold this position for about 30-60 seconds so that the crystal settles into a new position further down the canal. Next continue to rotate head and body on to their side facing the opposite direction. Wait again 30-60 seconds. Finally complete the roll, hold for 30-60 seconds and return to a sitting position. If the symptoms have not resolved, the maneuver can be performed 2-3 more times.



Procedural errors: If each new position is not held long enough, the otolith may not have settled far enough down the canal and then may actually drift back into its previous location when the head is turned again. If the procedure is done too slowly, there won't be enough momentum to get the otolith moving and the treatment may fail.

Effectiveness: Response rates range from 50% to 100% based on several cohort studies and case series. (Bhattacharyya 2017)

CURRENT GUIDELINES

According to the clinical practice guideline for BPPV from the American Academy of Otolaryngology-Head and Neck Surgery Foundation (Bhattacharyya 2017), canalith repositioning procedures such as Epley's maneuver should be the choice of treatment for BPPV. They recommend against radiographic imaging and vestibular suppressant medications. Forced prolonged positioning (having a patient lie on their unaffected ear for 12 hours) can also be effective for treatment of lateral canal BPPV (Casani 2011). However, this treatment may not be practical in many cases and may more likely be a treatment of last resort.

Patients should be informed that aside from the discomfort of vertigo, a major concern with BPPV is the risk of falls and injury from falls (Agrawal 2009; Murdin 2015). It is recommended especially in geriatric populations that a patient's risk for falls be assessed (Lawson 2005). Home exercises called Brandt-Daroff exercises are often prescribed to patients with BPPV. While these may be effective in some cases, one in-office canalith repositioning procedure has been found to be more than 10 times as effective as a week of these home exercises (Amor-Dorado 2012). Having a patient do canalith repositioning procedures by themselves at home has been shown to be more effective than Brandt-Daroff exercises, but still not as effective as in office treatment by a trained provider (Radtke 1999). See table next page for a summary of the recommendations.

PROGNOSIS

BPPV sometimes resolves on its own, before patients receive treatment. Amor Dorado 2012 found an 80% rate of resolution of BPPV with Epley's maneuver performed only once. This procedure can sometimes completely resolve symptoms (OR 4.42 when compared to a sham or control) (Hilton 2014), but sometimes it will need to be repeated multiple times or it may be ineffective all together. There is no consensus in the literature about the number of times that a canalith repositioning maneuver such as Epley's or the barbeque roll should be performed, although it usually does not require more than 2 treatments. BPPV has a recurrence rate of 5% to 13.5% at 6-month follow-up, annual recurrence rate of approximately 15%, and a recurrence rate up to 50% after 40 months (Kim 2014).

Recommendations (adapted from 2017 Clinical Guidelines, American Academy of Otolaryngology—Head and Neck Surgery)

Diagnose posterior semicircular canal BPPV when vertigo associated with torsional, upbeating (as opposed to vertical) nystagmus is provoked by the Dix-Hallpike maneuver.	Strong recommendation Grade B evidence based on diagnostic studies with minor limitations
Perform a supine roll test to assess for lateral semicircular canal BPPV on patients with a history suggestive of BPPV and the Dix-Hallpike test exhibits horizontal or no nystagmus.	Recommendation Grade B evidence based on several RCTs with supine roll test as the reference entry standard
Differentiate BPPV from other causes of imbalance, dizziness, and vertigo.	Recommendation Grade C evidence based on observational studies with limitations
Do not obtain radiographic imaging for patients who meet diagnostic criteria for BPPV.	Recommendation (against imaging) Grade C evidence based on observational studies for radiographic imaging
Apply repositioning procedures as initial therapy	Strong recommendation Grade A based on systematic reviews of RCTs
Do not recommend post-procedural postural restrictions after canalith repositioning procedure for posterior canal BPPV.	Strong recommendation (against) Grade A evidence.
Clinicians may offer observation with 1 month follow-up as an initial treatment approach instead of the head position maneuvers.	Recommendation (option) Grade B evidence based on control groups from RCTs and observational studies with heterogeneity in follow-up and outcomes measures
Clinicians should reassess patients within 1 month after an initial period of observation or treatment to document resolution or persistence of symptoms.	Recommendation Grade C evidence based on studies with known significant failure rates for an observation option and lower failure rates for repositioning procedures
Further evaluate, or refer for further evaluation, patients with persistent symptoms other evidence of underlying peripheral vestibular or central nervous system disorders.	Recommendation Grade A evidence for observation of treatment failure and Grade B for failure based on RCT and systematic review examining treatment responses and failure rates
Educate patients regarding the impact of BPPV on their safety, the potential for disease recurrence, and the importance of follow-up.	Recommendation Grade C evidence based on observational and cross-sectional studies of recurrence and fall risk

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References

1. Agrawal Y, Carey JP, Della Santina C,C., Schubert MC, Minor LB. Disorders of balance and vestibular function in US adults: data from the National Health and Nutrition Examination Survey, 2001-2004. Arch Intern Med. 2009 05/25;169(10):938-44.
2. Amor-Dorado JC, Barreira-Fernández MP, Aran-Gonzalez I, Casariego-Vales E, Llorca J, González-Gay MA. Particle repositioning maneuver versus Brandt-Daroff exercise for treatment of unilateral idiopathic BPPV of the posterior semicircular canal: a randomized prospective clinical trial with short- and long-term outcome. Otolology & neurotology : official publication of the American Otological Society, American Neurotology Society and] European Academy of Otolology and Neurotology. 2012 10;33(8):1401-7.
3. Baloh RW, Honrubia V, Jacobson K. Benign positional vertigo: clinical and oculographic features in 240 cases. Neurology. 1987 03;37(3):371-8.
4. Bhattacharyya N, Gubbels SP, Schwartz SR, Edlow JA, El-Kashlan H, Fife T, et al. Clinical Practice Guideline: Benign Paroxysmal Positional Vertigo (Update). Otolaryngol Head Neck Surg. 2017 03/01; 2017/09;156(3):S1-S47.
5. Casani AP, Nacci A, Dallan I, Panicucci E, Gufoni M, Sellari-Franceschini S. Horizontal semicircular canal benign paroxysmal positional vertigo: effectiveness of two different methods of treatment. Audiol Neurootol. 2011;16(3):175-84.
6. DynaMed Plus [Internet]. Ipswich (MA): EBSCO Information Services. 1995 - . Record No. 113695, Benign paroxysmal positional vertigo (BPPV); [updated 2017 Aug 28, cited 2017 Jun 8]; [about 16 screens]. Available from <http://www.dynamed.com/login.aspx?direct=true&site=DynaMed&id=113695>. Registration and login required.
7. Fife T. Benign Paroxysmal Positional Vertigo. Semin Neurol. 2009 11;29(5):500.
8. Halker RB, Barrs DM, Wellik KE, Wingerchuk DM, Demaerschalk BM. Establishing a diagnosis of benign paroxysmal positional vertigo through the dix-hallpike and side-lying maneuvers: a critically appraised topic. Neurologist. 2008 05;14(3):201-4.

9. Hanley K, O'Dowd T. Symptoms of vertigo in general practice: a prospective study of diagnosis. *Br J Gen Pract.* 2002;52:809-812.
10. Hanley K, O' Dowd T. Symptoms of vertigo in general practice: a prospective study of diagnosis. *Br J Gen Pract.* 2002 10;52(483):809-12.
11. Hilton MP, Pinder DK. The Epley (canalith repositioning) manoeuvre for benign paroxysmal positional vertigo. *Cochrane Database of Systematic Reviews.* 2014 (12).
12. Imai T, Takeda N, Ikezono T, Shigeno K, Asai M, Watanabe Y, et al. Classification, diagnostic criteria and management of benign paroxysmal positional vertigo. *Auris Nasus Larynx.* 2017;44:1-6.
13. Kim J, Zee DS. Clinical practice. Benign paroxysmal positional vertigo. *N Engl J Med.* 2014 03/20;370(12):1138-47.
14. Lawson J, Johnson I, Bamiou DE, Newton JL. Benign paroxysmal positional vertigo: clinical characteristics of dizzy patients referred to a Falls and Syncope Unit. *QJM.* 2005 05;98(5):357-64.
15. Lopez-Escamez J, Molina MI, Gamiz MJ. Original contribution: Anterior semicircular canal benign paroxysmal positional vertigo and positional downbeating nystagmus. *American Journal of Otolaryngology--Head and Neck Medicine and Surgery.* 2006;27:173-8.
16. Lüscher M, Theilgaard S, Edholm B. Prevalence and characteristics of diagnostic groups amongst 1034 patients seen in ENT practices for dizziness. *J Laryngol Otol.* 2014 02;128(2):128-33.
17. Lystad R, Bell G, Bonnevie-Svendsen M, Carter C. Manual therapy with and without vestibular rehabilitation for cervicogenic dizziness: a systematic review. *Chiropr Man Therap.* 2011 Sep 18;19(21).
18. Murdin L, Schilder AGM. Epidemiology of Balance Symptoms and Disorders in the Community: A Systematic Review. *Otology & Neurotology.* 2015 03;36(3):387.
19. Newman-Toker D, Hsieh Y, Camargo J, Carlos A., Pelletier AJ, Butchy GT, Edlow JA. ORIGINAL ARTICLE: Spectrum of Dizziness Visits to US Emergency Departments: Cross-Sectional Analysis From a Nationally Representative Sample. *Mayo Clin Proc.* 2008;83:765-75.
20. Parnes LS, Agrawal SK, Atlas J. Diagnosis and management of benign paroxysmal positional vertigo (BPPV). *CMAJ.* 2003 09/30;169(7):681-93.
21. Radtke A, Neuhauser H, von Brevern M, Lempert T, Lempert T. A modified Epley's procedure for self-treatment of benign paroxysmal positional vertigo. *Neurology.* 1999;53(6):1358-60.
22. Reid SA, Rivett DA. Manual therapy treatment of cervicogenic dizziness: a systematic review. *Manual Therapy.* 2005 February 2005;10(1):4-13.
23. Wrisley DM, Sparto PJ, Whitney SL, Furman JM. Cervicogenic dizziness: a review of diagnosis and treatment. *J Orthop Sports Phys Ther.* 2000; 30: 755– 766.

Appendix: Fall Prevention Safety Tips

These recommendations are most appropriate for older patients who also complain of balance problems between acute episodes of BPPV.

It is recommended that if you are dizzy or unsteady when standing or walking that you use a cane or a walker for support.

Indoor Safety Tips

- Keep floors free of clutter. Remove all loose wires and cords that are in a traffic area.
- Be sure all carpets, including those on stairs, and area rugs have skid-proof backing or are tacked to the floor. Do not use slippery wax on bare floors.
- Use non-skid mats or rugs on the floor near the stove and sink. Clean up spills immediately.
- Keep stairwells well lit with light switches both at the top and the bottom, and install sturdy handrails on *both* sides. Mark the top and bottom steps with bright or fluorescent tape.
- Install grab bars on the bathroom walls beside the tub, shower and toilet. Use a non-skid rubber mat in the shower or tub. If you are unsteady on your feet, consider using a plastic chair with a back and non-skid legs in the shower or tub and use a hand-held shower head to bathe.
- Place light switches within reach of your bed and a night light between the bedroom and bathroom. Get up slowly from sitting or lying since a drop in blood pressure may cause dizziness at these times. Keep a flashlight with fresh batteries beside your bed.
- If you live alone, you should consider wearing a personal emergency response system (PERS). Also consider purchasing a portable telephone to take from room to room so you can call for help immediately if you fall.
- Place frequently used items within easy reach to avoid frequent bending or stooping. Minimize the use of step-stools. If a stool is necessary, use a sturdy one with a handrail and wide steps.
- Learn to rely on assistive devices to help you avoid strain or injury. For example, use a long-handled grasping device to pick up items without bending or reaching. Use a pushcart to transfer heavy or hot items from the stove or counter top to the table.

Outdoor Safety Tips

- Cover porch steps with gritty, weatherproof paint.
- Use caution when walking on floors that are slippery or have visually confusing floor patterns. You may find these in the lobby of a hotel or bank, a hospital, or the grocery store. Do not hesitate to ask for assistance or use a cane or a walker on unfamiliar or uneven ground.
- Slow down. Accidents are more likely to happen when you do things in haste.
- Remember that more fractures occur when it is wet or icy, so be extra careful in those conditions. During the winter, carry a small bag of sand in your car. If the ground is icy where you park, sprinkle the sand by your car door.

Preventing Trauma While in Transit

- Remain alert and brace yourself when riding a bus that is slowing down or turning.
- Watch for slippery pavement and other hazards when entering or leaving a vehicle.
- Have fare ready to prevent losing balance while looking for change.
- Do not carry too many packages. You should always have one hand free to grasp railings.
- Allow extra time to cross the street, especially in bad weather.
- At night, wear light-colored or fluorescent clothing and carry a flashlight.
- Reduce the time spent driving your own car if possible; try to avoid driving at night, during rush hour, or in bad weather.