

Best practice assessment and management of benign paroxysmal positional vertigo in older adults.

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Publication year: 2025

Journal: Age and ageing

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Origin country: United Kingdom

Target countries: United Kingdom

DOI: 10.1093/ageing/afaf225

PMID: 40819291

Source: <https://pubmed.ncbi.nlm.nih.gov/40819291/>

pmc Age Ageing Age Ageing 709 ageing 0375655 ageing Age and Ageing 0002-0729 1468-2834
Oxford University Press PMC12358047 PMC12358047.1 12358047 12358047 40819291
10.1093/ageing/afaf225 afaf225 1 Editor's Choice Best Practice Paper
AcademicSubjects/MED00280 ageing/10 Best practice assessment and management of benign
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2025 18 08 2025 10 09 2025 © The Author(s) 2025. Published by Oxford University Press on behalf
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Abstract Benign paroxysmal positional vertigo (BPPV) is a common and disabling condition, with
prevalence increasing with advancing age. It typically causes positional dizziness but is also
common in those with balance abnormalities and falls without the typical dizziness. It is an
underdiagnosed problem, which can lead to reduced quality of life, depression and increased falls
risk. Whilst the diagnosis and treatment of the commonest form of BPPV (posterior canal) is
straightforward in robust and younger populations, this is frequently not the case in people with
multiple long-term conditions or frailty. Barriers to diagnosis and treatment of BPPV in each of the
three canals can be overcome with simple practical measures, which are presented here. Given the
lack of good quality evidence in this area, this best practise article presents evidence, where it
exists, alongside expert clinical experience.

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pmc-prop-preprint no pmc-prop-in-epmc yes pmc-license-ref CC BY-NC-ND Key points Benign paroxysmal positional vertigo (BPPV) is common in older adults and in people who fall, but barriers to the diagnosis and treatment are more common with advancing age, frailty and multiple long-term conditions.

Particle repositioning manoeuvres are the treatment of choice but require adequate mobility to achieve correct positioning

Simple solutions exist to overcome diagnostic and treatment barriers, improving the diagnosis and treatment success in older populations.

In recent years, several new and modified manoeuvres have been created which allow for greater personalisation of care.

Benign paroxysmal positional vertigo (BPPV) is a condition of the inner ear, where otoconia (calcium carbonate crystals) from the utricle are displaced into the semi-circular canals, whose function is to detect direction and velocity of rotational head movement. This displacement affects the afferent signals from the semi-circular canal to the balance areas of the central nervous system giving false sense of motion, which disturbs the perception of balance. BPPV often occurs after trauma to head such as from a fall but can also occur spontaneously.

As is often the case, although diagnostic criteria and clinical guidelines [1 , 2] exist, they are based on evidence derived from younger and more robust populations [3]. The treatment of BPPV is through particle repositioning manoeuvres, such as the Epley manoeuvre. Most manoeuvres are well tolerated, even in the oldest old, however older and frailer populations carry an increased burden of challenges, creating barriers and challenges to diagnosis and treatment [4]. Orthopnoea, musculoskeletal issues of the neck and back, reduced mobility, muscle weakness and cognitive impairments all create barriers to the assessment and treatment of BPPV. However, there is a growing number of manoeuvres that provide solutions to overcome these barriers.

In this best practise article, common barriers are presented with simple solutions to improve diagnosis and treatment in older populations. Additional figures can be found in the supplementary material .

The prevalence of BPPV is very common in older adults. In a population-based study of 75-year-olds the prevalence was 10% [5]. In a general geriatrics clinic the prevalence was found to be 9% [, increasing to 39% in those referred to falls clinics [6], with a quarter of these not reporting dizziness in history taking [7]. Older adults' symptoms of BPPV are less specific than younger populations, with unsteadiness or falls rather than classic vertigo [5–9]. Due to the variation in subjective symptoms, expert recommendation is BPPV assessment should occur for all older adults with history of falls [10]. However, it is worth noting that there is no current evidence that the treatment of nonvertiginous BPPV reduces falls.

Solution : Consider testing for BPPV in patients presenting with unsteadiness, balance dysfunction or falls for BPPV regardless of presence of dizziness or vertigo.

Testing only for posterior canal BPPV leads to ineffective treatment for patients with horizontal, anterior or multi-canal BPPV. Otoconia once displaced from the utricle, can travel into any of the three semicircular canals. Each of the subtypes are briefly described below:

This is the most common form of BPPV, accounting for 80%–90% of cases [1]. The gold standard test for posterior canal BPPV is the Dix–Hallpike test. This requires 45° rotation and 30° extension of cervical spine and the ability to lie supine from a seated position, with the head off the edge of the bed. This position is tolerated by some adults however there are alternative options.

The prevalence of horizontal canal varies in literature from 8% to 46% and is typically assessed using the supine roll test [11]. During testing, horizontal canal BPPV results in apogeotropic (away from the ground) and geotropic (towards the ground) horizontal nystagmus, which makes the diagnosis more complex. However, like posterior canal BPPV, the treatments are very effective and relatively straight-forward.

The prevalence of anterior canal BPPV is 1%–2% of all BPPV cases and consequently there is limited evidence in all age groups. Typical tests used are the Dix–Hallpike or the Deep Head Hang both of which require neck extension to position the head below the horizontal plane [1]. To overcome limitation in neck extension, a tilt bed can be used to achieve the head down position.

Multi-canal involvement is present in 5%–20% of BPPV cases [12 , 13]. As anterior canal BPPV is uncommon, due to the anatomy of this canal, guidelines recommended completing tests for horizontal and posterior canal each time you assess for BPPV [2].

Solution: Consider testing the horizontal canal, as well as the posterior canal, to avoid missing the diagnosis.

When performing particle repositioning manoeuvres, such as the Dix–Hallpike or Epley manoeuvre, consideration should be made to the presence of occipital/atlandoaxial instability, cervical myelopathy or radiculopathy, severe carotid artery stenosis, vertebral artery insufficiency, orthopnoea, or unstable cardiac conditions. Precautions often are in relation to the Dix–Hallpike test rather than the alternative tests available and are based on expert opinion. A previous review of commonly available manoeuvres advised that due to high level of evidence for many BPPV treatments that selection should be made based on number of factors including patients' movement restrictions [14].

Where contraindications do exist, be cautious and consider whether a referral to a specialist would be appropriate. Some specialist centres use highly specialised rotating chairs, but these are not widely available.

Use shared decision making to weigh up the risks of performing the manoeuvre versus the benefits of treatment.

Following current guidelines most patients can be assessed for BPPV using modifications (described below) where indicated [2].

A degree of mobility is required from the patient when performing manoeuvres. Where mobility is reduced additional staff may be required for adequate moving and handling to protect staff from injury.

Use additional members of staff to assist the movement of the trunk whilst the leading clinician guides head into position.

Where available the use of a wide examination bed (Figure 1) or hospital bed can make rolling the patient onto their side during the Epley manoeuvre easier for those with reduced mobility.

The side lying test (Figure 2) is an alternative as the patient can assist the movements using their arms.

The side lying test is also useful for patients in bed or with reduced spinal mobility as the moving and handling requirements are reduced and it can be performed where it is not possible to reach the head of the bed (such as in the patient's home).

Modified Dix–Hallpike over pillow using wider examination couch (see Video 1 in the online material).

Summary of manoeuvres and modifications for BPPV diagnosis and treatment.

The BBQ roll involves rotation of the head in both directions in the supine position, followed by rolling into the prone position. The use of a wide examination bed and additional staff can make this easier.

Where the prone position is not possible, the Gufoni manoeuvre is an alternative to the BBQ roll. The Gufoni manoeuvre involves moving from sitting on the edge of the bed into side lying and subsequent neck rotation of 45°. It is achievable in most patients where the BBQ roll would not be feasible. Clinicians require training to determine the correct variation of this manoeuvre, given the different apogeotropic and geotropic forms of nystagmus.

There are other horizontal canal manoeuvres with more limited studies that are also effective and do not require prone positioning such as the modified Zuma and Kurtzer Hybrid [15 , 16].

Most manoeuvres require some neck rotation and/or rotation, making assessment and treatment more difficult in those with neck pain or stiffness.

A modified Dix–Hallpike manoeuvre with a pillow placed underneath the shoulders[(Figure 1 , online Video 1) can improve neck extension, via increased thoracic extension, where cervical extension is limited [17]. This has high sensitivity (95.5%) and specificity (87.9%) compared to the standard Dix–Hallpike. This modification can also be used in the initial phase of the Epley manoeuvre and is as effective as the standard Epley [18].

Where neck extension is not possible, the Trendelenburg (head down) position on a bed can achieve the required extension (Figure 3 , online Video 2). Please consider if any precautions are present for head down positioning (e.g. recent eye surgery).

The Gans manoeuvre is an alternative treatment option to the Epley manoeuvre. It incorporates movements of both the side lying test, a head shake and the Epley manoeuvre. It is particularly useful where there is neck pain or it is not possible to achieve adequate neck extension [19 , 20].

Dix–Hallpike test with head down tilt of 30° (see online Video 2).

The supine roll test (which involves rotating the head and neck to the side whilst lying in the supine position) can be modified by using a log roll. With the log roll, the entire body and head rotates, so overcomes problems with limited neck rotation (Figure 4 , online Video 3).

Supine roll test using log roll technique maintaining cervical neutral position (see online Video 3).

Reduced mobility of the thoracic spine, back pain and a kyphosis can all limit the appropriate positioning during manoeuvres. In addition, orthopnoea can limit manoeuvres involving the supine position.

The side lying test avoids these difficulties and has been found to be a sensitive test for anterior and posterior canals. It avoids extension of the back and neck and uses lateral flexion with rotation instead (Figure 2).

As mentioned earlier, there is also reduced load on the clinician as the patient may be able to assist in the movement. If the side lying test is positive, the Semont manoeuvre can be used as an alternative treatment to the Epley. This involves moving the patient from lying on one side, to sitting

upright and lying down on their other side, whilst maintaining 45° rotation of neck away from affected side [21].

If necessary, the side lying test can be modified with additional head down positioning if there is insufficient lateral flexion of the spine to achieve downward angle of the head to 20–30° (Figure 5 , online video 4).

Side lying test with head of bed angled 20° down (see online Video 4).

Nausea, vomiting and a sense of imbalance are common side effects, which occur in 13.8% of patients post-BPPV treatment and can last up to 24 hours [22]. Canal conversion (moving otoconia typically from posterior into horizontal canal) occurs in 6% of cases, who would experience additional symptoms and require further manoeuvres [23]. An otolithic (or postural) crisis is a sudden and severe sensation of imbalance at the end of a repositioning manoeuvre. It occurs in up to 10% of manoeuvres to treat posterior canal BPPV, a result of the otoconia passing from the canal into the utricle [24]. Despite this, 95% of patients report that they would elect to have treatment again if BPPV recurred [25 , 26].

Discuss the patient's concerns, inform them of the short-lived side effects, the risks of declining treatment and the benefits of accepting treatment, as well as any plans to manage side effects should they occur.

Consider rescheduling the appointment if they would prefer to have someone with them for reassurance. If possible, consider treatment in their home if they prefer.

If there is anxiety around nausea and vomiting, an anti-emetic can be administered before the manoeuvre. Provide reassurance that there is time to rest and lie still after the treatment.

Familiarise the patient with the movements involved by demonstration. Often patients have assumptions about the test being physically taxing or risky and by understanding the condition their fears are addressed.

To prevent falls during an otolithic crisis, the clinician(s) should support the patient on the bedside for 60 seconds following the manoeuvre.

Head movement restrictions post-manoeuve are not indicated as they do not improve treatment success and are impractical for patients to adhere to; nor do they impact recurrence rates [2 , 27–29].

There are no effective medications to treat BPPV. Although betahistine, cinnarizine and prochlorperazine are frequently prescribed to people with BPPV, they do not improve symptoms, are less effective than repositing manoeuvres and risk side effects and adverse reactions [2 , 30].

Provide patient education on efficacy of particle repositioning.

Do not offer medication as a treatment option.

Develop competency in BPPV management or identify local referral pathway to direct patients to for BPPV assessment for prompt and effective treatment.

There may be social, geographical, medical or practical reasons why patients are unable to attend a clinic. Performing repositioning manoeuvres in alternative settings can be more challenging, but are possible.

Complete BPPV treatment in patient's home. If for practical reasons it is not possible to position the head in extension due to furniture, the Semont or Gans manoeuvre can be used. Home Epley had no significant difference in effectiveness of treatment compared to Epley performed in clinic [31].

Brandt–Daroff Exercises should not be used; these exercises have limited effect on symptoms and do not promote recovery from BPPV in comparison to other treatment options [32]. [Given the number of effective treatment options available choose an alternative treatment.

Virtual appointments might be appropriate if a care giver is present who can assist in the procedures and video the eye movements during testing to enable accurate diagnosis. However, without assistance, home virtual appointments are not recommended [33].

In older and frailer patients more time is needed for assessment and treatment, usually to accommodate reduced mobility. In addition, more staff may be required to assist with mobility during manoeuvres. There may also be increased burden of appointments with follow-up visits to cheque resolution.

Consider if multiple appointments or alternatively a single longer appointment to complete course of BPPV treatment is more appropriate for your patient.

The success rate of a single course of treatment is lower in those over 60 years of age (67% vs 72.5%) and more treatment manoeuvres are required (mean 1.5 vs 1.4) [28 , 29].

Multiple treatments (typically two) can be completed within a single session to reduce the number of visits required [34]. However, with frail older adults they may not tolerate multiple treatments in a single session due to fatigue. It is important to discuss with the patient their preferences for treatment alongside the practicalities of what can be provided by the health service.

Reassess the patient within 4 weeks of treatment to determine if further treatment is required, in line with recommendations. Use clinical judgement to decide whether remote follow-up to assess symptoms is sufficient, or whether attendance at clinic to repeat assessment is needed [2].

If a third repeat repositioning manoeuvre is not effective, refer to a specialist in BPPV management for consideration of complex and less common variants of BPPV or establish alternative causes for dizziness such as central neuro-vestibular causes.

Recurrence rates of BPPV are higher in older adults (23.2% vs 18.6%) [27 , 34]. A phenomenon known as vestibular agnosia can lead to persistent unsteadiness and disequilibrium rather than vertigo, following effective treatment of BPPV, in as many as 30%–61% of cases [35 , 36]. This can result in apathy and disengagement as patients feel treatments are unsuccessful.

Evaluate symptoms during testing and treatment to educate patients to recognise their symptoms and guide follow-up strategies.

Follow-up people who have been treated, to identify any recurrence of BPPV, and to assess need for balance rehabilitation.

Educate patients about recurrence of BPPV, how to recognise it, and who they should contact to seek treatment. Patient-initiated follow-up is one solution, whereby they can request follow-up if their symptoms recur.

Older adults report a wide range of symptoms with BPPV and may not report dizziness. Consider assessing for BPPV in any older adult with balance difficulties or falls.

There is limited evidence specific to the older adult population, and it is the older population who more frequently require modified investigation and treatment of BPPV

Assess the range of motion of the spine, review precautions and consider medical history prior to selecting the most appropriate test, and if indicated treatment.

Consider the number of staff required and clinic environment to adapt tests and treatment to ensure comfort for both patient and staff and effectiveness of the manoeuvre.

Services need clinicians that have training and understanding of a variety of BPPV tests and treatment approaches and cannot use a one treatment fits all approach (Table 1).