

# Balance disorders and ENT

## A project to prioritise Cochrane systematic reviews

### SUMMARY

Balance disorders are common. Many are related to abnormalities of function in the inner ear.

The overall aims of this project are to

- Identify the most common ear-related balance disorders seen in primary and secondary care
- Understand the prevalence and incidence of these disorders and their natural history
- Produce a comprehensive list of interventions used in the management of people with these disorders
- Identify existing high-quality evidence (systematic reviews and randomised controlled trials - RCTs) and guidelines related to these interventions
- Work with stakeholders to agree
  - Which disorders and/or interventions are most important for patients, carers and health practitioners?
  - For which disorders and which interventions is it most important to prepare new Cochrane systematic reviews, or update existing ones?
  - In those reviews, which outcomes are most important for patients, carers and health professionals?

### BACKGROUND

#### The importance of balance disorders

Balance disorders - characterised by feelings of dizziness, vertigo or unsteadiness - comprise a significant proportion of medical consultations in both general practice and ENT clinics. Dizziness in general, and more specifically, vertigo (a sense of external motion, usually spinning) are both disabling conditions and are widely recognised as being challenging to diagnose and treat.

The lifetime prevalence of dizziness that is severe enough to warrant medical attention or interfere with activities, has been estimated at between 17 and 30%<sup>1</sup>. The lifetime prevalence of vertigo is reported as between 3 and 10%<sup>1</sup>. The impact of this condition is significant, with a recent registry study reporting that 69.8% of vertigo sufferers had reduced their workload, and 63.3% had lost working days due to their vertigo<sup>2</sup>.

#### Why do we need a scoping process?

The current portfolio of Cochrane reviews in the field of balance disorders has been developed over time, in a piecemeal fashion. This has historically been led by the interests of particular authors, or the availability of evidence in a specific area. We are aware that some reviews now require updating, others may not be relevant to current practice, and that new reviews are necessary. We hope to implement these changes in a strategic way –

preparing a comprehensive suite of reviews covering those areas which would be of most benefit to patients, their carers, and healthcare professionals.

The field of balance is wide ranging, and encompasses a number of distinct underlying conditions. Each of these individual conditions could be the focus for a number of reviews. However, by conducting a scoping and prioritisation process we aim to identify the areas in which up-to-date reviews are most needed. This process will produce a prioritised list of reviews in the general area of balance which will inform a workplan for the next 12-18 months.

### Existing prioritisation documents

We are aware of two existing prioritisation processes which relate to balance disorders in ENT. The first of these was a James Lind Alliance Priority Setting Partnership, which took place in 2011 and specifically addressed research priorities in the field of balance disorders (<http://www.jla.nihr.ac.uk/priority-setting-partnerships/ear-nose-and-throat-aspects-of-balance/>). The second was the GENERATE project<sup>3</sup>, commissioned by ENT UK and published in 2015, which outlined the research priorities for ENT in general. The focus of these projects was to identify research gaps - where evidence is lacking. In contrast, the focus for this current scoping process is to identify areas in which high quality, up-to-date systematic reviews are required. Clearly there may be some overlap between these aims. We have highlighted in the sections below where the existing projects have identified that a condition or intervention is a priority.

### Definitions used in this report

Dizziness, vertigo and unsteadiness are not easy to define, nor are they always easy to distinguish. The Bárány Society has produced the following definitions<sup>4</sup>:

- Dizziness as “the sensation of disturbed or impaired spatial orientation without a false or distorted sense of motion”
- Vertigo as “the sensation of self-motion when no self-motion is occurring, or the sensation of distorted self-motion during an otherwise normal head movement”.
- Unsteadiness as “the feeling of being unstable while seated, standing, or walking without a particular directional preference”.

We do not consider light-headedness (for example that due to hypotension or other cardiovascular issues) as a symptom related to balance disorders.

### AIMS

The overall aim for the process is to identify which systematic reviews should be prepared or updated as a priority, within the broad topic of “balance disorders” in ENT.

For this phase of the project, we will determine which topic areas could be covered, within the remit of ENT balance disorders, and then prioritise specific topics within this broad area.

As part of this process we aim to determine the following:

- What are the relevant topics areas that could be considered within the field of ear-related balance disorders?

- What is the current state of the evidence for these topics, in terms of national/international guidelines and high-quality systematic reviews?
- What interventions have been used as treatments for these disorders?
- Are there any areas where systematic reviews are obviously lacking? This may include interventions that have not been assessed with a recent systematic review, topics where guidelines and reviews are missing or areas highlighted by guidelines or existing prioritisation projects as requiring additional evidence.

In the subsequent phase of the project, we will consider each of these priority topics to determine which reviews should be developed or updated, including how the reviews should be conducted (covering all aspects of the relevant population, interventions, comparators and outcomes).

During this process we will consider the following issues:

- The 'accuracy' of diagnosis, in conditions in which there may be uncertainty (for example, Ménière's and vestibular migraine) and how this should be managed in the review process (determining the relevant population for the reviews).
- Which interventions could be considered for each of the priority topics, and within this, which are most in need for new or updated reviews?
- Identification of core outcome sets (if any), or relevant outcomes used in RCTs evaluating the effectiveness of interventions for the identified disorders.

### Scope of the project

This prioritisation process predominantly focuses on balance disorders related to the ear; those which affect peripheral vestibular function. However, we recognise that assessment and diagnosis of balance disorders is challenging. Many patients experience a long delay before a formal diagnosis is made, and it may not be possible to reach a specific diagnosis. Therefore, we also consider a broader range of 'balance disorders' and symptoms that are commonly seen in ENT clinics. For example, we specifically include acute vertigo and vertiginous migraine.

### Exclusions

A range of other conditions may affect balance, including neurological conditions (such as stroke, Herpes Zoster Oticus – Ramsay-Hunt syndrome, etc) and systemic diseases (such as hypotension and diabetes). We will not include these specifically.

Management of malignant conditions is outside the remit of the Cochrane ENT group. However, we will include the management of long-term impairment secondary to treatments (for example, imbalance after labyrinthectomy). A number of ENT conditions *may* cause symptoms of dizziness or vertigo, without these being the predominant symptoms of the disease (for example, cholesteatoma eroding into the labyrinth). We will not address the treatment of these conditions *per se*.

## METHODS

### *Identifying relevant topic areas and available evidence*

We defined a “topic area” as a specific disorder, condition, symptom or state associated with balance problems. This might be a particular disorder (for example, Ménière’s disease), a symptom (acute vertigo), a patho-physiological state (bilateral vestibular hypofunction) or an affected population (dizziness in the elderly).

To determine which topics were potentially relevant within the broad topic of “balance disorders in ENT” we undertook a number of activities.

- We assessed the current Cochrane ENT portfolio to identify existing systematic reviews in the area of balance.
- We conducted broad scoping searches for existing guidelines and systematic reviews, using terms which relate to vertigo, balance and dizziness.
- We searched the Cochrane Trials Register, again using broad terms relating to vertigo and balance, to identify relevant RCTs to highlight interventions that had been assessed for the different topics.
- We supplemented the scoping searches with hand searching of references, text books and websites of organisations with an interest in balance disorders.

A final list of potential topics was then developed. This was discussed with the clinical experts involved in the scoping phase, to ensure that no important, relevant areas had been missed.

For each topic we sought to identify:

- Existing national or international guidelines which relate to the topic
- Any agreed diagnostic criteria that should be considered when defining the population for reviews
- A list of interventions which are used, or could be used, in the treatment of individuals with the disorder
- Any uncertainties in treatment effects (considering existing Cochrane reviews, and national/international guidelines)
- Whether the topic had been identified as a priority (through existing prioritisation exercises or guidelines).

## RESULTS

### *Topic areas identified by scoping searches*

The broad search for balance disorders within ENT identified a number of areas to consider for prioritisation. Many of these areas were defined disorders. However, many trials were conducted in more disparate populations, selected on the basis of particular symptoms rather than a unifying underlying diagnosis. The full list of prospective topic areas for consideration is shown below:

Specific disorders:

- Ménière’s disease/syndrome
- Benign paroxysmal positional vertigo

- predominantly posterior semi-circular canal, but also other variants including horizontal and vertical semi-circular canals
- Vestibular migraine
- Vestibular neuritis/neuronitis
- Labyrinthitis
- Cervical dizziness
- Vertebrobasilar insufficiency
- Motion sickness
  - including *mal de débarquement* syndrome
- Superior semi-circular canal dehiscence
- Perilymph fistula
- Microvascular loops
- Persistent postural perceptual dizziness
  - including the related terms “phobic postural vertigo”, “space-motion discomfort”, “chronic subjective dizziness” and “visual vertigo”

#### General topics

- Unilateral peripheral vestibular dysfunction
  - including both “vestibular neuritis/neuronitis” and “labyrinthitis”, as well as other underlying causes of sudden, unilateral vestibular problems
- Bilateral vestibular hypofunction
- Post-traumatic vertigo or dizziness
  - including post-concussion, whiplash injury and others
- Acute vertigo
- Chronic vertigo or dizziness
- Dizziness in the elderly
- Dizziness or vertigo in children

#### Prevalence of different disorders

##### Primary care

Primary care-based studies have a different preponderance of vestibular diagnoses than studies based in secondary care<sup>5</sup>. This is in part due to the high spontaneous resolution rates for some diagnoses (for example, vestibular neuritis) but also due to the ability of many GPs to carry out appropriate diagnostic tests and treatments without the need for referral<sup>6</sup>. A UK based study identified that only 16% of patients who consulted their GP with a complaint of dizziness were referred to a specialist, with similar figures from the USA<sup>7,8</sup>. However, the most common referral route was to an ENT clinic<sup>7</sup>.

A study of patients presenting to primary care with vertigo found 42.2% were diagnosed with BPPV, 40.8% were diagnosed with acute vestibular neuritis and 10% with Menière’s disease<sup>9</sup>. The remainder were diagnosed with vascular, neurological, psychological or unspecified causes of vertigo (7.5%).

##### Emergency care

An emergency department (ED) based survey of dizziness identified vestibular neuritis/labyrinthitis as the most common otological cause, accounting for 5.6% of all

presentations<sup>10</sup>. This was followed by migraine (1.1%), BPPV (0.7%) and Ménière's disease (0.3%). Similar figures were found by a second ED-based survey, with peripheral vestibular disorders accounting for around 6% of consultations for dizziness (comprising 4.5% labyrinthitis, 0.6% BPPV, 0.34% Ménière's disease and 0.7% "other and unspecified vertigo")<sup>11</sup>.

#### Secondary/tertiary care

Individuals seen with vertigo and dizziness in ENT clinics or specialist otoneurology clinics are more commonly diagnosed with conditions that cause recurrent, episodic vertigo. A recent retrospective survey of an otoneurology clinic identified BPPV and vestibular migraine as the most commonly diagnosed disorders in patients with balance problems, each accounting for approximately 28% of referrals<sup>12</sup>. These were followed by Ménière's disease, which accounted for 14% of diagnoses. Similar figures were found by a second study, which also identified Ménière's disease (23.0%), vestibular migraine (19.3%) and BPPV (19.1%) as the three most frequent diagnoses<sup>13</sup>.

### Specific disorders

#### Ménière's disease/syndrome

Ménière's disease is characterised by episodic vertigo, hearing loss, tinnitus and aural fullness. We identified a number of clinical guidelines on Ménière's disease. The American Academy of Otolaryngology - Head and Neck Surgery (AAO-HNS) have recently produced a Clinical Practice Guideline<sup>14</sup>. There is currently no NICE guideline on Ménière's disease, although a Clinical Knowledge Summary (CKS) has been produced, which covers treatment options for initial management. Other guidance includes an international consensus statement<sup>15</sup>, a European Position Statement<sup>16</sup>, a guideline from the French Otorhinolaryngology-Head and Neck surgery Society (SFORL)<sup>17</sup> and a guideline from the Danish National Board of Health (<https://www.sst.dk/da/udgivelses/2018/nkr-behandling-af-menieres>).

#### Diagnostic criteria

Diagnostic criteria for Ménière's disease have been formulated by international consensus<sup>18</sup>. Two categories are included – definite Ménière's disease (which requires symptoms of Ménière's disease and audiometrically documented hearing loss) and probable Ménière's disease (which includes symptoms only) (see Appendix C).

#### Interventions that may be used

Interventions identified during the scoping process that could be considered for reviews were:

- Pharmacological interventions
  - betahistine, diuretics, antivirals, antihistamines, steroids
- Lifestyle modifications
  - restrictions of salt, water, caffeine, alcohol, sleeping in darkness
- Vestibular rehabilitation
- Intratympanic treatments
  - aminoglycosides, corticosteroids, antivirals
- Ventilation tubes
  - with or without positive pressure

- Surgery
  - endolymphatic sac surgery, vestibular neurectomy, semi-circular canal plugging, stellate ganglion block and mastoid shunt
- Other interventions
  - low level laser therapy, mastoid oscillation and tympanic membrane massage devices

#### Current evidence base and uncertainties in treatment effect

Despite a number of RCTs in this topic area, there are few certainties regarding the efficacy of different treatments. A Cochrane review on betahistine is currently being updated, although the previous version of this review found insufficient evidence to establish the efficacy of betahistine in Ménière's disease<sup>19</sup>. The existing Cochrane reviews find insufficient evidence to establish the efficacy of diuretics (no included studies)<sup>20</sup>, positive pressure therapy (five included studies)<sup>21</sup>, surgery (2 included studies)<sup>22</sup> or restriction of salt, caffeine and alcohol (no included studies)<sup>23</sup>. Only intratympanic treatments were found to have any beneficial effects in the disease, and the number of included studies for these reviews was small (two studies on intratympanic gentamicin, and a single trial on intratympanic steroids)<sup>24,25</sup>. NICE has issued Interventional Procedures Guidance (IPG) which addresses positive pressure therapy, and concludes that there is some evidence of efficacy, but evidence on safety is inadequate.

#### Priority status

The James Lind Alliance Priority Setting Partnership in 2011 identified the following priorities for healthcare professionals and patients:

1. Is any specific surgical intervention effective in Ménière's disease, and what procedure is best?
2. Are there any effective interventions for the ear pressure symptoms in Ménière's disease?
3. What is the optimal pharmacological strategy for the management of patients with Ménière's disease? In particular, what are the effects of betahistine (including long term effects)?
4. Is it helpful in preventing the severity, frequency and progression of attacks of Ménière's disease to adopt a specific diet, or restrict salt, caffeine or fluid intake?

Cochrane reviews have been produced in an attempt to answer some of these questions<sup>22,23</sup>.

### Benign Paroxysmal Positional Vertigo (BPPV)

BPPV is characterised by recurrent, short episodes of vertigo precipitated by head movement. Scoping searches identified three guidelines on the management of BPPV. The most recent of these is from the AAO-HNS<sup>26</sup>. Other guidelines were identified from the Spanish Society of Otolaryngology and Head and Neck Surgery<sup>27</sup> and the Croatian Society for Vestibular Rehabilitation<sup>28</sup>. No NICE guideline exists, but a CKS does consider management of BPPV.

#### Diagnostic criteria

The AAO-HNS guideline includes diagnostic criteria for posterior canal BPPV, and similar criteria have been proposed by the Bárány Society (see Appendix C).

## Interventions that may be used

Interventions identified during the scoping process that could be considered for reviews were:

- Canalith repositioning manoeuvres
  - Different manoeuvres compared to each other, repeated performance of manoeuvres, post-procedure restrictions
- Self-management strategies
  - self-performance of canalith repositioning, Brandt Daroff exercises
- Pharmacological management
  - betahistine, benzodiazepines, antihistamines, antiemetics, calcium antagonists
  - instead of/in addition to canalith repositioning manoeuvres
- Vestibular rehabilitation

## Current evidence base and uncertainties in treatment effect

Evidence for effectiveness of canalith repositioning manoeuvres (such as the Epley manoeuvre) appears to be well established, with guidelines supporting the first-line use of these interventions. However, the management of individuals who fail to respond to these manoeuvres, or develop recurrent disease is less clear. The existing Cochrane review on the Epley manoeuvre does find evidence of the efficacy of this treatment<sup>29</sup>. Furthermore, postural restrictions were found to improve the efficacy of the Epley manoeuvre, although the authors note that this benefit is small<sup>30</sup>.

## Priority status

The AAO-HNS guideline suggests the following topics as relevant:

1. What is the optimal number of canalith repositioning treatments that should be performed and the time interval between them?
2. Does self-performance of canalith repositioning manoeuvres, or vestibular rehabilitation, reduce the recurrence of BPPV?
3. Does vestibular therapy after CRP improves outcomes?
4. Is mastoid vibration effective in treating BPPV?

The James Lind PSP did not identify any priority topics which specifically relate to BPPV. We note that the existing Cochrane review on the Epley manoeuvre is the most highly accessed of the current portfolio of balance reviews.

## Vestibular migraine

Vestibular migraine has been increasingly recognised as a cause of dizziness and vertigo over the past 30 years. The disorder is characterized by vertigo episodes in association with other features of migraine (such as headache, photophobia, phonophobia or visual aura). However, no guidelines on the treatment of vestibular migraine were identified.

## Diagnostic criteria

The Bárány Society and the International Headache Society have produced a consensus statement with diagnostic criteria for vestibular migraine<sup>31</sup>. These criteria include recurrent episodes of vestibular symptoms, in association with one of more migraine features, and a current or previous history of migraine (see Appendix C).

### Interventions that may be used

Interventions identified during the scoping process that could be considered for reviews were:

- Lifestyle modification (stress management, dietary modification)
- Acute pharmacological interventions (triptans, cinnarizine, betahistine, ergot alkaloids, analgesics)
- Prophylaxis (beta blockers, calcium channel blockers, anti-epileptics, antidepressants, acetazolamide, cognitive behavioural therapy, vestibular rehabilitation)

### Current evidence base and uncertainties in treatment effect

No guidelines were identified that cover the treatment of vestibular migraine. The existing Cochrane review on pharmacological management of vestibular migraine identified no relevant trials for inclusion<sup>32</sup>.

### Priority status

The James Lind Alliance identified “What is the most effective treatment for vestibular migraine” as one of their top ten priority topics in 2011.

## Vestibular neuritis/neuronitis

This disorder results in acute, isolated vertigo. Historically it has been thought to be caused by inflammation of the vestibular nerve, likely secondary to viral infection. However, the underlying aetiology remains unclear. No guidelines were identified which relate to the diagnosis or treatment of vestibular neuritis, although a NICE CKS exists on the topic.

### Diagnostic criteria

The Japan Society for Equilibrium Research has produced diagnostic criteria for vestibular neuritis<sup>33</sup>, but no other consensus documents were identified.

### Interventions that may be used

Interventions identified during the scoping process that could be considered for reviews were:

- Pharmacological management
  - corticosteroids, antivirals, antihistamines, antiemetics
- Vestibular rehabilitation

### Current evidence base and uncertainties in treatment effect

As no guidelines exist, we were unable to identify widely acknowledged treatment uncertainties in this disorder. Corticosteroids have been used for their anti-inflammatory effects, but the existing Cochrane review on this intervention found insufficient evidence (from 4 trials) to demonstrate effectiveness<sup>34</sup>.

### Priority status

Vestibular neuritis was not listed as a priority topic by the existing prioritisation exercises.

## Labyrinthitis

This is characterised by acute onset of vertigo, in principle, in association with hearing loss. However, the term can often be used even in the absence of hearing loss and the distinction between this and vestibular neuritis/neuronitis is then unclear. As with vestibular neuritis, it is thought to be due to inflammation of the

inner ear, affecting both the vestibular and auditory systems. This is often regarded as viral in nature, although the precise aetiology is unclear. Again, the scoping searches did not identify any national or international guidelines addressing this topic.

#### Diagnostic criteria

No agreed diagnostic criteria were identified during the scoping process.

#### Interventions that may be used

We did not identify any RCTs that specifically considered labyrinthitis. However, this term has been used interchangeably with “vestibular neuritis” in the past and we consider that some trials will have included individuals with hearing loss as well as a vestibular deficit. The interventions listed above (under vestibular neuritis) could therefore also be considered relevant for labyrinthitis.

#### Current evidence base and uncertainties in treatment effect

As no guidelines exist, we were unable to identify widely acknowledged treatment uncertainties in this disorder.

#### Priority status

Labyrinthitis was not listed as a priority topic during the existing prioritisation exercises.

### Cervical dizziness

Cervical dizziness refers to symptoms of dizziness which are precipitated by neck movement, and associated with neck pain. No guidelines were identified which address the treatment of cervical vertigo.

#### Diagnostic criteria

No agreed diagnostic criteria were identified during the scoping process.

#### Interventions that may be used

Interventions identified during the scoping process that could be considered for reviews were:

- Mobilisation
- Acupuncture
- Chinese herbal medicine
- Heat therapy

#### Current evidence base and uncertainties in treatment effect

As no guidelines exist, we were unable to identify widely acknowledged treatment uncertainties in this disorder.

#### Priority status

Cervical dizziness was not listed as a priority topic during the existing prioritisation exercises.

### Vertebrobasilar insufficiency

Vertebrobasilar insufficiency describes symptoms of vertigo which are thought to be due to transitory ischaemia of the vertebrobasilar circulation<sup>35</sup>. Typically, these episodes occur in association with other neurological symptoms, such as headache, drop attacks, weakness or visual disturbance (field defects, diplopia or blindness). Many professionals would feel it inappropriate to make this diagnosis without one or

more of these other symptoms, as vertigo alone as a consequence of vertebrobasilar insufficiency seems exceptionally unlikely. Given the close relationship of this condition with posterior circulation stroke, this may be regarded as a neurological, rather than otological diagnosis.

#### Diagnostic criteria

No agreed diagnostic criteria were identified during the scoping process.

#### Interventions that may be used

Interventions identified during the scoping process that could be considered for reviews were:

- Pharmacological interventions (betahistine, antihistamines, calcium antagonists)
- Acupuncture
- Chinese herbal medicine

#### Current evidence base and uncertainties in treatment effect

As no guidelines exist, we were unable to identify widely acknowledged treatment uncertainties in this disorder.

#### Priority status

Vertebrobasilar insufficiency was not listed as a priority topic during the existing prioritisation exercises.

## Motion sickness

This describes the uncomfortable set of symptoms, including dizziness, nausea and vomiting, experienced by many individuals when travelling. Almost all individuals can experience motion sickness, when provided with sufficient stimulus<sup>36</sup>; consequently the true prevalence of troublesome symptoms is hard to quantify. No national or international guidelines were identified for the management of this condition, perhaps as it is predominantly self-managed, or dealt with by pharmacists, rather than primary or secondary care. *Mal de débarquement* syndrome is a variant of motion sickness, characterised by a persistent sense of motion after travel (typically after travel by sea).

#### Diagnostic criteria

The Bárány Society have recently presented diagnostic criteria for motion sickness and *mal de débarquement* syndrome (see Appendix C).

#### Interventions that may be used

Interventions identified during the scoping process that could be considered for reviews were:

- Pharmacological interventions
  - antimuscarinics, antihistamines, phenothiazines, 5-hydroxytryptamine<sub>3</sub> receptor antagonists
- Acupuncture/acupressure
- Breathing exercises
- Dietary supplements
  - ginger
- Vestibular rehabilitation
- Cognitive behavioural therapy

#### Current evidence base and uncertainties in treatment effect

As no guidelines exist, we were unable to identify widely acknowledged treatment uncertainties in this disorder. The existing Cochrane review concludes that scopolamine is more effective than placebo at preventing motion sickness, but found insufficient evidence on the relative efficacy of different types of medication<sup>37</sup>.

#### Priority status

Motion sickness and *mal de débarquement* syndrome were not listed as priority topics during the existing prioritisation exercises. However, we note that the current review on the Cochrane Library which considers motion sickness is the second most highly accessed review within the field of balance disorders in ENT.

### Superior semi-circular canal dehiscence

This disorder is characterized by the presence of an abnormal opening between the superior semi-circular canal and the middle cranial fossa. Individuals present with vertigo which is related to loud sounds or pressure changes.

#### Diagnostic criteria

No agreed diagnostic criteria were identified during the scoping process.

#### Interventions that may be used

Interventions identified during the scoping process that could be considered for reviews were:

- Surgical techniques

#### Current evidence base and uncertainties in treatment effect

As no guidelines exist, we were unable to identify widely acknowledged treatment uncertainties in this disorder.

#### Priority status

It was not listed as a priority topic during the existing prioritisation exercises.

### Perilymph fistula

This condition involves a leak of perilymph fluid via a channel between the inner and middle ear, usually at the round or oval window. This is often precipitated by trauma, and usually includes hearing loss as well as vertigo.

#### Diagnostic criteria

No agreed diagnostic criteria were identified during the scoping process.

#### Interventions that may be used

Interventions identified during the scoping process that could be considered for reviews were:

- Surgical techniques

#### Current evidence base and uncertainties in treatment effect

As no guidelines exist, we were unable to identify widely acknowledged treatment uncertainties in this disorder.

#### Priority status

It was not listed as a priority topic during the existing prioritisation exercises.

### Microvascular loops/vestibular paroxysmia

In this condition, tortuous blood vessels are thought to compress the root of the VIIIth cranial nerve as it leaves the brainstem. This may result in vertigo and tinnitus.

#### Diagnostic criteria

No agreed diagnostic criteria were identified during the scoping process.

#### Interventions that may be used

Interventions identified during the scoping process that could be considered for reviews were:

- Surgical techniques

#### Current evidence base and uncertainties in treatment effect

As no guidelines exist, we were unable to identify widely acknowledged treatment uncertainties in this disorder.

#### Priority status

It was not listed as a priority topic during the existing prioritisation exercises.

### Persistent postural perceptual dizziness

This recently defined disorder is characterized by persistent dizziness, exacerbated by standing, motion and visual stimuli, and is often precipitated by other balance problems<sup>38</sup>. No clinical guidelines were identified which relate to this disorder.

#### Diagnostic criteria

The Bárány Society have proposed diagnostic criteria for PPPD<sup>39</sup> (see Appendix C).

#### Interventions that may be used

Interventions identified during the scoping process that could be considered for reviews were:

- Vestibular rehabilitation
- Cognitive behavioural therapy
- Pharmacological management
  - SSRIs and SNRIs

#### Current evidence base and uncertainties in treatment effect

As no guidelines exist, we were unable to identify widely acknowledged treatment uncertainties in this disorder.

#### Priority status

It was not listed as a priority topic during the existing prioritisation exercises.

### General topics

Scoping searches identified that many trials included participants with a specific presentation or symptom, rather than the diagnosis of a specific underlying disorder. For example, some studies assessed individuals with acute onset of vertigo (regardless of cause). It is well recognised that balance disorders are challenging to diagnose, and patients often wait for many months before a definitive diagnosis is reached. For some individuals, the precise cause of their balance disorder is never elucidated. Therefore, we consider that it may be relevant for Cochrane to address these broader topics in the field of balance, as well as (or instead of) some of the individual disorders.

## Unilateral peripheral vestibular dysfunction

This term describes a state which can exist in individuals with a variety of underlying disorders, including unilateral Ménière's disease or unilateral vestibular loss following surgery. The condition may be acute or chronic. The only clinical guideline of relevance to this condition was published by the American Physical Therapy Association and specifically considers vestibular rehabilitation<sup>40</sup>.

### Diagnostic criteria

No diagnostic criteria were identified, as this term may include individuals with a variety of underlying diagnoses.

### Current evidence base and uncertainties in treatment effect

Although the guideline identified recommended the use of vestibular rehabilitation, it also identified some areas of uncertainty. This included:

- the optimal timing of the intervention (early versus delayed)
- the effectiveness in children,
- the comparative effectiveness of different vestibular rehabilitation techniques, and
- the optimal duration of treatment.

One Cochrane review considers vestibular rehabilitation for unilateral peripheral vestibular dysfunction<sup>41</sup>. This concludes that there is evidence of efficacy for this intervention.

### Priority status

This has not currently been identified as a priority topic in the existing documents, although the research priorities listed below under "chronic vertigo and dizziness" may also be relevant for individuals with chronic unilateral peripheral vestibular dysfunction.

## Bilateral vestibulopathy

Bilaterally impaired vestibular function may be due to a number of underlying causes. It may be secondary to medication (such as aminoglycosides, or chemotherapeutic agents), surgery or idiopathic. No clinical guidelines were identified which consider this topic.

### Diagnostic criteria

The Bárány Society have developed diagnostic criteria for "definite" and "probable" bilateral vestibulopathy<sup>42</sup> (see Appendix C).

### Interventions that may be used

Interventions identified during the scoping process that could be considered for reviews were:

- Vestibular rehabilitation
- Sensory prosthetics

### Current evidence base and uncertainties in treatment effect

As no guidelines exist, we were unable to identify widely acknowledged treatment uncertainties in this disorder.

### Priority status

It was not listed as a priority topic during the existing prioritisation exercises.

## Post-traumatic vertigo and dizziness

Scoping searches identified a number of studies considering post-traumatic vertigo and dizziness, including injuries such as concussion and whiplash. No existing guidelines were identified which relate to this.

### Diagnostic criteria

No diagnostic criteria were identified.

### Interventions that may be used

Interventions identified during the scoping process that could be considered for reviews were:

- Vestibular rehabilitation
- Sensory prosthetics
- Pharmacological management
  - betahistine

### Current evidence base and uncertainties in treatment effect

As no guidelines exist, we were unable to identify widely acknowledged treatment uncertainties for these conditions.

### Priority status

It was not listed as a priority topic during the existing prioritisation exercises.

## Acute vertigo

A number of studies identified through the scoping searches considered the initial treatment of acute vertigo – both in primary care and emergency care settings. No guidelines were identified which address this topic – the NICE CKS on vertigo considers all aspects of vertigo, including acute management.

### Diagnostic criteria

No diagnostic criteria were identified.

### Interventions that may be used

Interventions identified during the scoping process that could be considered for reviews were:

- Pharmacological management
  - Benzodiazepines, antihistamines, betahistine, antimuscarinics, antiemetics
- Acupuncture
- Chinese herbal medicine

### Current evidence base and uncertainties in treatment effect

As no guidelines exist, we were unable to identify widely acknowledged treatment uncertainties for this condition.

### Priority status

Acute vertigo was not listed as a priority topic during the existing prioritisation exercises.

## Chronic vertigo or dizziness

This broad category includes people with a wide array of underlying vestibular problems (and – possibly – other conditions) which lead to persistent, chronic imbalance (rather than discrete episodes of vertigo/dizziness).

### Diagnostic criteria

No diagnostic criteria were identified.

### Interventions that may be used

Interventions identified during the scoping process that could be considered for reviews were:

- Vestibular rehabilitation
  - Generic or individualised, with or without computer assistance (virtual reality, balance gaming, app based)
- Pharmacological management
  - Betahistine, antihistamines, calcium antagonists, benzodiazepines, atypical antipsychotics, antiemetics
- Acupuncture
- Chinese herbal medicine
- Complementary therapies
  - Ginkgo biloba
- Movement therapies
  - Tai chi, yoga
- Psychological interventions
  - Cognitive behavioural therapy, psychotherapy

### Current evidence base and uncertainties in treatment effect

One Cochrane review considers the efficacy of betahistine for vertigo, and concludes that it may reduce symptoms, although the majority of evidence was considered to be low quality<sup>43</sup>.

### Priority status

Both priority setting documents include some aspects of chronic balance problems.

The research priorities from GENERATE included

- How can patients be empowered to self-manage their balance problems and how does this impact on their outcomes?

The James Lind Alliance identified the following priority questions:

- Are the home-based exercises given to patients with balance disorders effective?
- Are stress management techniques helpful in patients with balance disorders?
- What are the best interventions to improve balance/minimize symptoms in daily activities such as supermarkets, escalators etc.?

## Dizziness in the elderly

The aging population means that balance disorders in the elderly are increasingly important. Dizziness in the elderly is often multifactorial, but is strongly associated with falls<sup>44</sup>, hospitalisations and morbidity.

### Interventions that may be used

Interventions identified during the scoping process that could be considered for reviews were:

- Vestibular rehabilitation
  - Generic or individualised, with or without computer assistance (virtual reality, balance gaming, app based)

- Movement therapy
  - Tai chi, yoga
- Pharmacological management
  - Antihistamines, ergot derivatives
- Complementary/alternative therapies
  - Gingko biloba, homeopathy

Current evidence base and uncertainties in treatment effect

No guidelines were identified which specifically relate to dizziness in the elderly.

Known priority status?

GENERATE identified the following as priorities for the ENT research agenda:

- What is the optimum design for 'balance pathways' in older people with balance problems?
  - How and where can older people with balance problems and with multiple medical conditions and decreased mobility best be managed?
  - How can self-management strategies be built in these pathways and what is their impact on patient outcome?

### Dizziness and vertigo in children

Symptoms of dizziness and vertigo appear to be less prevalent in children, and have not been as well studied. Although there is some overlap with specific diagnoses in children and adults, the prevalence of particular disorders is different. Vestibular migraine and benign paroxysmal vertigo of childhood (often regarded as a migraine variant) are the leading causes of dizziness and vertigo in children<sup>45</sup>.

Current evidence base and uncertainties in treatment effect

No guidelines were identified which relate to this topic.

Known priority status?

Dizziness and vertigo in children was not listed as a priority topic during the existing prioritisation exercises.

### Consultation with stakeholders

We made contact with a variety of stakeholders with an interest in balance disorders, to collect their opinions on the disorders and topics that should be prioritised by Cochrane ENT. We asked them to read the balance scoping document, and complete the feedback table (appendix). Individuals were identified via word of mouth, through affiliates of Cochrane ENT, via contact with professional organisations with an interest in balance, and through patient groups.

We received 13 responses through the consultation exercise. Not all individuals selected ten topics to prioritise; some used the same rank for multiple disorders/topics and others did not provide a consecutive list of rankings, but instead selected some ranks. It was therefore not possible to create an ordered list of priority topics. Instead, we categorised the results for an individual respondent into high priorities (e.g. ranked 1-5 for those who rated 10 topics/disorders), medium priorities (e.g. ranked 6-10 for those rating 10 disorders), and not prioritised (i.e. not ranked) We then calculated how many individuals had given the topic a high, medium or no priority to identify a prioritised list. The results were as follows:

Disorder/topic	High priority (number of respondents)	Medium priority (number of respondents)	Not prioritised (number of respondents)
Vestibular migraine	10	1	2
Ménière's disease/syndrome	8	5	0
Persistent postural perceptual dizziness	8	2	3
Chronic vertigo or dizziness	6	6	1
Dizziness in the elderly	5	6	2
Vestibular neuritis/neuronitis	4	7	2
Benign paroxysmal positional vertigo	4	4	5
Acute vertigo	4	3	6
Bilateral vestibular hypofunction	3	4	6
Motion sickness including <i>mal de débarquement</i> syndrome	2	6	5
Post-traumatic vertigo or dizziness	2	3	8
Labyrinthitis	2	3	8
Superior semi-circular canal dehiscence	2	1	10
Cervical dizziness	1	3	9
Dizziness or vertigo in children	0	8	5
Microvascular loops	0	4	9
Unilateral peripheral vestibular dysfunction	0	4	9
Vertebrobasilar insufficiency	0	2	11
Perilymph fistula	0	0	13

To ensure that the method of analysis was appropriate, we also analysed the results in two different ways (see appendix E). This demonstrates that the eight highest priority topics are unchanged regardless of the analysis method, although the precise ranking of each topic/disorder may move slightly.

### [Next steps](#)

For the topics that have been prioritised by this process, we will now identify the reviews that are most urgently required, with a focus on which aspects of the population, interventions, comparators and outcomes are relevant for each topic.

## Appendix A: Search Strategies

Search strategy for guidelines and systematic reviews relevant to balance disorders:

The Cochrane ENT Information Specialist searched Ovid MEDLINE(R) Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) (1946 to 25 November 2019) using the following strategy:

1	exp Dizziness/	5132
2	exp Labyrinth Diseases/	24174
3	(NEUROLABYRINTHITIDES or NEUROLABYRINTHITIS or LABYRINTHITIS).ti.	312
4	(migrain* adj3 (vertig* or dizz* or vestibul* or spinning)).ti.	360
5	nystagmus.ti.	5362
6	(vestibular adj3 (neuronitis or neuritides or neuritis)).ti.	406
7	(vertig* or dizziness or dizzy or imbalance).ti.	13026
8	(meniere* or meniere's or menieres or BPPV or UPVD or imbalance).ti.	10096
9	((vesibular or balance or labyrinth or "inner ear" or cochlear*) adj3 (disease* or disorder* or dysfunction or disturbance or hypofunction or impair* or disabilit* or deficit*)).ti.	1878
10	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9	41160
11	(review or review,tutorial or review, academic).pt.	2583114
12	(medline or medlars or embase or pubmed or cochrane).tw,sh.	204067
13	(scisearch or psychinfo or psycinfo).tw,sh.	32635
14	(psychlit or psyclit).tw,sh.	919
15	cinahl.tw,sh.	25378
16	((hand adj2 search\$) or (manual\$ adj2 search\$)).tw,sh.	12499
17	(electronic database\$ or bibliographic database\$ or computeri?ed database\$ or online database\$).tw,sh.	34376
18	(pooling or pooled or mantel haenszel).tw,sh.	99593
19	(peto or dersimonian or der simonian or fixed effect).tw,sh.	6994
20	(retraction of publication or retracted publication).pt.	14606
21	12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20	324144
22	11 and 21	152539
23	meta-analysis.pt.	107489
24	meta-analysis.sh.	107489
25	(meta-analys\$ or meta analys\$ or metaanalys\$).tw,sh.	187762
26	(systematic\$ adj5 review\$).tw,sh.	183217
27	(systematic\$ adj5 overview\$).tw,sh.	2051
28	(quantitativ\$ adj5 review\$).tw,sh.	7610
29	(quantitativ\$ adj5 overview\$).tw,sh.	308
30	(quantitativ\$ adj5 synthesis\$).tw,sh.	2714
31	(methodologic\$ adj5 review\$).tw,sh.	6057
32	(methodologic\$ adj5 overview\$).tw,sh.	411
33	(integrative research review\$ or research integration).tw.	137

34	23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33	299277
35	22 or 34	354458
36	10 and 35	472

Search strategy for RCTs relevant to balance disorders:

The Cochrane ENT Information Specialists searched the Cochrane ENT Register<sup>1</sup> via the Cochrane Register of studies to 6 December 2019 using the following search strategy:

1	MESH DESCRIPTOR Dizziness EXPLODE ALL AND INREGISTER	114
2	MESH DESCRIPTOR Labyrinth Diseases EXPLODE ALL AND INREGISTER	447
3	((migrain* adj3 (vertig* or dizzy or dizziness or vestibul* or spinning))):AB,EH,KW,KY,MC,MH,TI,TO AND INREGISTER	31
4	(nystagmus):AB,EH,KW,KY,MC,MH,TI,TO AND INREGISTER	169
5	(vestibular adj3 (neuronitis or neuritides or neuritis or loss or damage*)):AB,EH,KW,KY,MC,MH,TI,TO AND INREGISTER	74
6	((vesibular or balance or labyrinth or "inner ear" or cochlear*) adj3 (disease* or disorder* or dysfunction or disturbance or hypofunction or impair* or disabilit* or deficit* or symptom*)) AND INREGISTER	210
7	(vertig* or dizziness or dizzy or balance or imbalance):TI,TO AND INREGISTER	748
8	(VESTIBULOPATH*):AB,EH,KW,KY,MC,MH,TI,TO AND INREGISTER	19
9	NEUROLABYRINTHITI* or LABYRINTHITI* AND INREGISTER	9
10	(meniere* or meniere's or BPPV or UPVD or PPPD or UVD) AND INREGISTER	444
11	(lightheaded* or disorientat* or (self adj3 motion) or (illusion* adj3 movement*)) AND INREGISTER	43
12	(positional or paroxysmal or visual) adj3 vertig* AND INREGISTER	283
13	(peripheral or systemic or chronic or postural) adj3 (vertig* or balance or imbalance or dizzy or dizziness) AND INREGISTER	237
14	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 AND INREGISTER	1361
15	(motion or car or air* or travel* or sea or space or auto* or aviat* or flight or simulator or vehicle or passenger* or train or trains or bus or coach or ship):AB,EH,KW,KY,MC,MH,TI,TO AND INREGISTER	2934
16	(virtual AND reality):AB,EH,KW,KY,MC,MH,TI,TO AND INREGISTER	59
17	(computer AND simulat*):AB,EH,KW,KY,MC,MH,TI,TO AND INREGISTER	53
18	((video OR computer) AND game):AB,EH,KW,KY,MC,MH,TI,TO AND INREGISTER	16
19	((three or 3) next dimensional) AND (film* or movi* or image*)):AB,EH,KW,KY,MC,MH,TI,TO AND INREGISTER	25

<sup>1</sup> The Cochrane ENT Register is populated using the strategy outlined on the Cochrane ENT website: <https://ent.cochrane.org/resources/searching-studies/cochrane-ent-trials-register>

20	(3D AND (film* or movi* or image*)):AB,EH,KW,KY,MC,MH,TI,TO AND INREGISTER	21
21	#15 OR #16 OR #17 OR #18 OR #19 OR #20 AND INREGISTER	3014
22	(sick* or nausea or vomit*):AB,EH,KW,KY,MC,MH,TI,TO AND INREGISTER	1881
23	#21 AND #22 AND INREGISTER	442
24	(carsick* or airsick* or seasick* or motionsick* or travelsick* or spacesick*):AB,EH,KW,KY,MC,MH,TI,TO AND INREGISTER	49
25	(kinetosis):AB,EH,KW,KY,MC,MH,TI,TO AND INREGISTER	1
26	#23 OR #24 OR #25 AND INREGISTER	448
27	#26 OR #14 AND INREGISTER	1743

Appendix B: Existing Cochrane Reviews

Title of Review	Number of included studies	Date of last search	Number of new abstracts to screen	Conclusions of review
<b>Ménière's disease/syndrome</b>				
Betahistine for Ménière's disease or syndrome	7	2011	n/a <sup>2</sup>	"There is insufficient evidence to say whether betahistine has any effect on Ménière's disease."
Restriction of salt, caffeine and alcohol intake for the treatment of Ménière's disease or syndrome	0	2018	53	Insufficient evidence for efficacy (no studies)
Diuretics for Ménière's disease or syndrome	0	2009	100	Insufficient evidence for efficacy (no studies)
Intratympanic gentamicin for Ménière's disease or syndrome	2	2011	129	"Based on the results of the two included studies, intratympanic gentamicin seems to be an effective treatment for vertigo complaints in Ménière's disease, but carries a risk of hearing loss."
Intratympanic steroids for Ménière's disease or syndrome	1	2011	326	"The results of a single trial provide limited evidence to support the effectiveness of intratympanic steroids in patients with Ménière's disease."
Positive pressure therapy for Ménière's disease or syndrome	5	2014	51	"There is no evidence, from five included studies, to show that positive pressure therapy is effective for the symptoms of Ménière's disease."

<sup>2</sup> This review is currently being updated

Surgery for Ménière's disease	2	2012	380	"The two trials included in this review provide insufficient evidence of the beneficial effect of endolymphatic sac surgery in Ménière's disease."
<b>BPPV</b>				
The Epley (canalith repositioning) manoeuvre for benign paroxysmal positional vertigo (BPPV)	11	2014	1200	"There is evidence that the Epley manoeuvre is a safe, effective treatment for posterior canal BPPV, based on the results of 11, mostly small, randomised controlled trials with relatively short follow-up."
Modifications of the Epley (canalith repositioning) manoeuvre for posterior canal benign paroxysmal positional vertigo (BPPV)	11	2011	1809	"There is evidence supporting a statistically significant effect of post-Epley postural restrictions in comparison to the Epley manoeuvre alone. However, it important to note that this statistically significant effect only highlights a small improvement in treatment efficacy."
<b>Vestibular migraine</b>				
Pharmacological agents for the prevention of vestibular migraine	0	2015	418	Insufficient evidence for efficacy (no studies)
<b>Vestibular neuritis</b>				
Corticosteroids for the treatment of idiopathic acute vestibular dysfunction (vestibular neuritis)	4	2010	2087	"Overall, there is currently insufficient evidence from these trials to support the administration of corticosteroids to patients with idiopathic acute vestibular dysfunction."
<b>Motion sickness</b>				
Antihistamines for motion sickness	In development			
Scopolamine (hyoscine) for preventing and treating motion sickness	14	2011	200	"The use of scopolamine versus placebo in preventing motion sickness has been shown to be effective."
<b>Unilateral peripheral vestibular dysfunction</b>				
Vestibular rehabilitation for unilateral peripheral vestibular dysfunction	39	2015	1295	"There is moderate to strong evidence that vestibular rehabilitation is a safe, effective management for unilateral peripheral vestibular dysfunction..."

**Vertigo**

Betahistine for symptoms of vertigo

17

2015

188

“Low quality evidence suggests that in patients suffering from vertigo from different causes there may be a positive effect of betahistine in terms of reduction in vertigo symptoms.”

## *Appendix C: Diagnostic criteria for balance disorders*

### **Ménière's Disease**

The Bárány Society, The Japan Society for Equilibrium Research, the European Academy of Otolaryngology and Neurotology (EAONO), the Equilibrium Committee of the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS) and the Korean Balance Society have jointly agreed the following diagnostic criteria<sup>18</sup>:

#### DEFINITE Ménière's disease

1. Two or more spontaneous episodes of vertigo, each lasting 20 minutes to 12 hours.
2. Audiometrically documented low- to medium-frequency sensorineural hearing loss in one ear, defining the affected ear on at least one occasion before, during or after one of the episodes of vertigo.
3. Fluctuating aural symptoms (hearing, tinnitus or fullness) in the affected ear.
4. Not better accounted for by another vestibular diagnosis

#### PROBABLE Ménière's disease

1. Two or more episodes of vertigo or dizziness, each lasting 20 minutes to 24 hours.
2. Fluctuating aural symptoms (hearing, tinnitus or fullness) in the affected ear.
3. Not better accounted for by another vestibular diagnosis.

### **Posterior canal BPPV**

The AAO-HNS guideline<sup>26</sup> provides diagnostic criteria for posterior canal BPPV:

1. Repeated episodes of vertigo with changes in head position relative to gravity
2. Vertigo associated with torsional (rotatory), upbeat (toward the forehead) nystagmus is provoked by the Dix-Hallpike test
3. There is a latency period between the completion of the Dix-Hallpike manoeuvre and the onset of vertigo and nystagmus
4. The provoked vertigo and nystagmus increase and then resolve within 60 seconds from the onset of the nystagmus

Similar diagnostic criteria have also been proposed by the Bárány Society<sup>46</sup>:

1. Recurrent attacks of positional vertigo or positional dizziness provoked by lying down or turning over in the supine position.
2. Duration of attacks < 1 min
3. Positional nystagmus elicited after a latency of one or few seconds by the Dix-Hallpike manoeuvre or side-lying manoeuvre (Semont diagnostic manoeuvre). The nystagmus is a combination of torsional nystagmus with the upper pole of the eyes beating toward the lower ear combined with vertical nystagmus beating upward (toward the forehead) typically lasting < 1 minute
4. Not attributable to another disorder

### **Vestibular migraine**

The Bárány Society and the International Headache Society have proposed the following diagnostic criteria<sup>31</sup>:

1. At least 5 episodes with vestibular symptoms of moderate or severe intensity, lasting 5 min to 72 hours
2. Current or previous history of migraine with or without aura according to the International Classification of Headache Disorders (ICHD)
3. One or more migraine features with at least 50% of the vestibular episodes:
  - headache with at least two of the following characteristics: one sided location, pulsating quality, moderate or severe pain intensity, aggravation by routine physical activity
  - photophobia and phonophobia
  - visual aura
4. Not better accounted for by another vestibular or ICHD diagnosis

The Bárány Society criteria also includes a category for “probable” vestibular migraine, which involves:

1. At least 5 episodes with vestibular symptoms of moderate or severe intensity, lasting 5 min to 72 hours
2. Only one of the criteria 2 and 3 for vestibular migraine is fulfilled (migraine history *or* migraine features during the episode)
3. Not better accounted for by another vestibular or ICHD diagnosis

To note: relevant vestibular symptoms are given as “spontaneous vertigo, positional vertigo, visually-induced vertigo, head motion-induced vertigo or head motion induced dizziness with nausea”. Moderate or severe symptoms are those which interfere with, and may prohibit, daily activities.

### **Motion Sickness and *mal de débarquement* syndrome**

The Bárány Society have recently presented diagnostic criteria for motion sickness (<http://www.jvr-web.org/images/ICVD-MotionSickness-Diagnostic-Criteria-Chaetal.pdf>) and *mal de débarquement* syndrome (<http://www.jvr-web.org/images/ICVD-MaldeDebarquement-Syndrome-DiagnosticCriteria%20Cha-etal.pdf>).

An episode of motion sickness requires:

1. One or more of the following symptoms triggered by passive or active head motion
  - Nausea
  - Stomach awareness
  - Sweating
  - Headache
  - Drowsiness
2. Symptom or symptoms develop during the motion exposure
3. Symptom(s) onset is gradual
4. Symptom(s) eventually stop after cessation of motion
5. Not better accounted for by another disease or disorder

Similar criteria are also presented for visually induced motion sickness, which requires the symptoms to be triggered by visual motion.

Motion sickness disorder is diagnosed with the following features:

1. Recurrent episodes of motion sickness triggered by the same class of motion stimuli
  2. Symptoms are reliably triggered by the same class of motion stimuli
  3. Symptom severity does not significantly decrease after repeated exposure to the same class of motion stimuli
  4. Symptoms lead to one or more of the following behavioural responses:
    - Activity modification to abort sickness symptoms
    - Avoidance of motion stimuli that trigger sickness
    - Negative anticipatory emotions prior to exposure to motion stimuli
  5. Not better accounted for by another disease or disorder
- Definite MSD requires five or more episodes, whilst probable MSD requires two to four episodes.

Diagnostic criteria for *Mal de débarquement* syndrome (MdDS) are:

1. Non-spinning vertigo characterized by an oscillatory sensation present continuously or for most of the day
2. Onset occurs within 48-hours after the end of exposure to passive motion
3. Symptoms temporarily reduce with exposure to passive motion
4. Symptoms continue for >48 hours
  - in evolution (>48 hours, when observation time <1 month)
  - transient MdDS (>48 hours to ≤1 month)
  - persistent MdDS (>1 month)
5. Symptoms not better accounted for by another disease or disorder.

### **Persistent Postural Perceptual Dizziness**

The Bárány Society have proposed the following diagnostic criteria for PPPD<sup>39</sup>:

1. One or more symptoms of dizziness, unsteadiness, or non-spinning vertigo are present on most days for 3 months or more.
  - Symptoms are persistent, but wax and wane.
  - Symptoms tend to increase as the day progresses, but may not be active throughout the entire day.
  - Momentary flares may occur spontaneously or with sudden movements
2. Symptoms are present without specific provocation, but are exacerbated by:
  - Upright posture,
  - Active or passive motion without regard to direction or position, and
  - Exposure to moving visual stimuli or complex visual patterns, although these three factors may not be equally provocative.
3. The disorder usually begins shortly after an event that causes acute vestibular symptoms or problems with balance, though less commonly, it develops slowly. Precipitating events include acute, episodic, or chronic vestibular syndromes, other neurologic or medical illnesses, and psychological distress.
  - a) When triggered by an acute or episodic precipitant, symptoms typically settle into the pattern of criterion 1 as the precipitant resolves, but may occur intermittently at first, and then consolidate into a persistent course.
  - b) When triggered by a chronic precipitant, symptoms may develop slowly and worsen gradually.

4. Symptoms cause significant distress or functional impairment.
5. Symptoms are not better attributed to another disease or disorder

### **Bilateral vestibulopathy**

The Bárány Society have developed diagnostic criteria as follows<sup>42</sup>:

#### **BILATERAL VESTIBULOPATHY**

1. Chronic vestibular syndrome with at least three of the following symptoms:
  - postural imbalance
  - unsteadiness of gait
  - movement-induced blurred vision or oscillopsia during walking or quick head/body movements
  - worsening of postural imbalance or unsteadiness of gait in darkness and/or on uneven ground
2. No symptoms while sitting or lying down under static conditions
3. Bilaterally reduced or absent angular VOR function documented by
  - bilaterally pathological horizontal angular VOR gain  $< 0.6$ , measured by the video-HIT5 or scleral-coil technique and/or
  - reduced caloric response<sup>6</sup> (sum of bithermal max. peak SPV on each side  $< 6^\circ/\text{sec}$ ) and/or
  - reduced horizontal angular VOR gain  $< 0.1$  upon sinusoidal stimulation on a rotatory chair (0.1 Hz,  $V_{\text{max}} = 50^\circ/\text{sec}$ ).
4. Not better accounted for by another disease

#### **PROBABLE BILATERAL VESTIBULOPATHY**

1. Chronic vestibular syndrome with at least two of the following symptoms
  - postural imbalance
  - unsteadiness of gait
  - movement-induced blurred vision or oscillopsia during walking or quick head/body movements
  - worsening of postural imbalance or unsteadiness of gait in darkness and/or on uneven ground
2. No symptoms while sitting or lying down under static conditions
3. Bilaterally pathological horizontal bedside head impulse test
4. Not better accounted for by another disease

*Appendix D: Feedback table*

We appreciate that many people will be unfamiliar with certain disorders/topics areas – please check the first box if you feel unable to comment, and simply move to the next row.

Please select a maximum of ten topics which you feel should be prioritised, and rate these (1 = highest priority).

We also understand that many participants will not feel able to comment on the existing evidence, treatment uncertainty or availability of new evidence. However - even if you are unable to comment on these - please do add comments to the “general importance” column, to help us understand which topics are important to you, and why.

	Please tick if you feel unable to comment on the disorder/ topic listed	General importance		Availability of existing evidence		Uncertainty in treatment effects	Availability of new evidence
		I consider this to be <b>one of the most important topics</b> within the area of balance disorders (maximum of ten)  Y/N	If yes, please rate 1-10 (where 1 is of the highest importance), explaining briefly why you consider this topic should be prioritised for updated/new Cochrane reviews	There are few existing guidelines or systematic reviews on this topic  Y/N	Any existing reviews and guidelines are out of date, and may not include all relevant evidence  Y/N	It is unclear how best to treat this disorder, or how to treat certain aspects of this disorder  Y/N	I am aware of recent evidence that may change the conclusions of existing reviews, or warrants a new systematic review  Y/N
<b>Specific disorders</b>							
Ménière’s disease/syndrome							
BPPV							
Vestibular migraine							

	Please tick if you feel unable to comment on the disorder/ topic listed	General importance		Availability of existing evidence		Uncertainty in treatment effects	Availability of new evidence
		I consider this to be <b>one of the most important topics</b> within the area of balance disorders (maximum of ten)  Y/N	If yes, please rate 1-10 (where 1 is of the highest importance), explaining briefly why you consider this topic should be prioritised for updated/new Cochrane reviews	There are few existing guidelines or systematic reviews on this topic  Y/N	Any existing reviews and guidelines are out of date, and may not include all relevant evidence  Y/N	It is unclear how best to treat this disorder, or how to treat certain aspects of this disorder  Y/N	I am aware of recent evidence that may change the conclusions of existing reviews, or warrants a new systematic review  Y/N
Vestibular neuritis/neuronitis							
Labyrinthitis							
Cervical vertigo							
Vertebrobasilar insufficiency							
Motion sickness <ul style="list-style-type: none"> <li>including <i>mal de debarquement syndrome</i></li> </ul>							
Superior semi-circular canal dehiscence							
Perilymph fistula							

	Please tick if you feel unable to comment on the disorder/ topic listed	General importance		Availability of existing evidence		Uncertainty in treatment effects	Availability of new evidence
		I consider this to be <b>one of the most important topics</b> within the area of balance disorders (maximum of ten)  Y/N	If yes, please rate 1-10 (where 1 is of the highest importance), explaining briefly why you consider this topic should be prioritised for updated/new Cochrane reviews	There are few existing guidelines or systematic reviews on this topic  Y/N	Any existing reviews and guidelines are out of date, and may not include all relevant evidence  Y/N	It is unclear how best to treat this disorder, or how to treat certain aspects of this disorder  Y/N	I am aware of recent evidence that may change the conclusions of existing reviews, or warrants a new systematic review  Y/N
Microvascular loops							
Persistent postural perceptual dizziness							
<b>General topics</b>							
Unilateral peripheral vestibular dysfunction							
Bilateral vestibular hypofunction							
Post-traumatic vertigo or dizziness							
Acute vertigo							
Chronic vertigo or dizziness							

	Please tick if you feel unable to comment on the disorder/ topic listed	General importance		Availability of existing evidence		Uncertainty in treatment effects	Availability of new evidence
		I consider this to be <b>one of the most important topics</b> within the area of balance disorders (maximum of ten)  <b>Y/N</b>	If yes, please rate 1-10 (where 1 is of the highest importance), explaining briefly why you consider this topic should be prioritised for updated/new Cochrane reviews	There are few existing guidelines or systematic reviews on this topic  <b>Y/N</b>	Any existing reviews and guidelines are out of date, and may not include all relevant evidence  <b>Y/N</b>	It is unclear how best to treat this disorder, or how to treat certain aspects of this disorder  <b>Y/N</b>	I am aware of recent evidence that may change the conclusions of existing reviews, or warrants a new systematic review  <b>Y/N</b>
Dizziness or vertigo in the elderly							
Dizziness or vertigo in children							

Are there any additional disorders or topics which you feel have been omitted from the above list, which should be considered for Cochrane ENT reviews (within the field of balance disorders)?

*Appendix E: Alternative analyses of feedback results*

1. We also assessed the priority status by only considering whether topics were ranked as a priority or not, disregarding their ranking. This produced the following rankings:

<i>Disorder/topic</i>	<i>Prioritised (number of respondents)</i>	<i>Not prioritised (number of respondents)</i>
Ménière's disease/syndrome	13	0
Chronic vertigo or dizziness	12	1
Vestibular migraine	11	2
Vestibular neuritis/neuronitis	11	2
Dizziness in the elderly	11	2
Persistent postural perceptual dizziness	10	3
Benign paroxysmal positional vertigo	8	5
Motion sickness including <i>mal de débarquement</i> syndrome	8	5
Dizziness or vertigo in children	8	5
Acute vertigo	7	6
Bilateral vestibular hypofunction	7	6
Post-traumatic vertigo or dizziness	5	8
Labyrinthitis	5	8
Unilateral peripheral vestibular dysfunction	4	9
Microvascular loops	4	9
Cervical dizziness	4	9
Superior semi-circular canal dehiscence	3	10
Vertebrobasilar insufficiency	2	11
Perilymph fistula	0	13

2. Finally, we analysed the results by summing the ranks for each condition – the top priority scored 1, to the tenth priority scoring 10 for each individual. All unranked topics were given a score of 11. Where individuals had responded “yes” to the questions – “Is this a priority topic”, but not provided a ranking, the topic was allocated the average score of any ranks omitted by that individual. The lowest total score thus represented the most highly ranked topic/disorder, with a possible range of 13 to 143. The results were as follows:

<i>Disorder/topic</i>	<i>Priority</i>	<i>Total score</i>
Ménière's disease/syndrome	1 (tied)	48
Vestibular migraine	1 (tied)	48
Persistent postural perceptual dizziness	2	67
Chronic vertigo or dizziness	3	80
Dizziness in the elderly	4	83
Vestibular neuritis/neuronitis	5	91
Benign paroxysmal positional vertigo	6 (tied)	99
Acute vertigo	6 (tied)	99
Motion sickness	7	108

including <i>mal de debarquement</i> syndrome		
Dizziness or vertigo in children	8 (tied)	110
Bilateral vestibular hypofunction	8 (tied)	110
Post-traumatic vertigo or dizziness	9	114
Unilateral peripheral vestibular dysfunction	10 (tied)	122
Superior semi-circular canal dehiscence	10 (tied)	122
Microvascular loops	11	124
Labyrinthitis	12	127
Cervical dizziness	13	129
Vertebrobasilar insufficiency	14	137
Perilymph fistula	15	143

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