Abstract
Physiotherapists play a significant role in the management of the dizzy patient. More specifically their roles include screening patients for vestibular rehabilitation (VR) and assessing the multidimensional factors of disability associated with dizziness and balance disorders. Physiotherapists aim to capitalise on the information obtained during screening and assessment processes in order to formulate customised VR exercise programmes. Customised programmes compare favourably to preset exercise regimens such as the adapted Cawthorne programme developed in the 1940s. However, generic exercises may provide a starting point for patients in the subacute period after a vestibular deficit. A low threshold for referral to physiotherapy should be adopted for any patient who fails to progress within the first two months after a vestibular deficit, especially if preset exercises have been trialled. The interlinked roles of the physiotherapist are complementary to those of ENT clinicians but can only be fully realised when there is close multi-disciplinary team working.

Keywords
Physiotherapy, vestibular rehabilitation, dizziness, multi-disciplinary, scope of practice.

Introduction
Vestibular rehabilitation (VR) in the form of a physical exercise regime stems from the 1940s, and was originally conceived by Sir Terence Cawthorne FRCS and Dr Frank S. Cooksey MD. They devised a multi-disciplinary programme of physical, cognitive and occupational therapies for ‘the post-concussion syndrome as a whole as well as for the particular problem of vestibular injury’.1 This programme was based on their observations of improved functional outcome in patients encouraged to mobilise, compared to those who remained sedentary following surgical or traumatic lesions involving the vestibular system. From the outset, physiotherapists were charged with overseeing these physical exercises.

The application of exercises, particularly those described by Cawthorne,2 grew in the 1970s alongside greater theoretical understanding of vestibular compensation. Use of the Cawthorne exercises is still widespread in otological circles but physiotherapy input for the dizzy patient has progressed significantly compared to that of the 1940s. Due to the progress of rehabilitation science, the role of the physiotherapist is no longer merely a matter of administering an exercise session. The following article will consider the modern systematic role of this profession in the management of the dizzy patient.

Screening patients for VR
Most Physiotherapy Departments receive referrals for patients requiring VR from a wide range of sources, including ENT surgeons, general practitioners, neurologists, and gerontologists. Diagnostic certainty can be highly variable. Therefore, the vestibular physiotherapist is duty-bound to screen patients prior to implementing VR. Given the array of problems that can give rise to dizziness, spanning otological, neurological and general medical conditions, screening for sinister or ‘red flag’ pathology is key at the outset. Initial objective assessment will therefore include a metered cranial nerve exam, with focus on ocular motility, as well as limb coordination and long tract screening.

A review of the subjective history is also an integral part of the physiotherapy assessment. This is important in confirming the diagnosis. Indeed, a fair degree of certainty about the underlying aetiology is necessary for efficacious vestibular rehabilitation to be
planned and implemented. Most research points towards best outcomes of VR in patients with unilateral peripheral vestibulopathies. The recently updated Cochrane review concluded that there is moderate to strong supporting evidence for VR with these particular conditions. Less compelling results have also emerged following VR in those with central disorders. Irrespective of the site of the lesion, it is also held that stable, non-fluctuating conditions are the most appropriate for vestibular rehabilitation. Patients with peripheral disorders such as active Meniere’s disease, or those with central disorders such as refractory migraine, are not as suitable candidates for VR.

Detailing the past medical and drug histories can aid the physiotherapist in delineating other potential factors that may negate the progress of VR. Patients with psychiatric disorders, e.g. panic disorders, may require psychiatric treatment to run concurrently with VR if the latter is to be beneficial. A drug history is pertinent as vestibular suppressants have been shown to delay vestibular compensation.

Finally, the timing of VR is an issue which physiotherapists need to consider in order to screen patients effectively. Following an abrupt but isolated and stable vestibular lesion e.g. vestibular neuritis, the authors proffer that the implementation of formal vestibular exercises is not necessarily indicated in the acute phase. Early and progressive mobilisation and ambulation should be the main focus at this stage while robust central adaptive processes are taking place. These may in fact result in exaggerated vestibular loss in order to reduce the focal vestibular tone asymmetry.

After the first post-morbid week, there is great variability in recovery not necessarily related to the extent or nature of the lesion. Hence, it may be prudent to initiate simple vestibular exercises at this point in order to stem movement-avoidance or secondary neuro-musculoskeletal problems, such as cervical spine stiffening.

### Assessing the multi-dimensional factors of disability associated with balance disorders

Subjective (or self-report) and objective (or observed performance) measures are commonly undertaken during the initial physiotherapy assessment (see Table 1).

The majority of these are disease-specific measures, designed or validated specifically for insight into the impact of balance disorders. However, some non-disease-specific subjective measures, e.g. HADS, are also useful in determining the effects of balance disorders on an individual. Research has shown that specific items on the DHI can predict the presence of benign paroxysmal positional vertigo (BPPV). Some useful interpretability values have also been defined for both objective measures listed in Table 1. For example, scores below 22 out of 30 on the FGA have been shown to correlate with people who have unexplained falls. The FGA can therefore be utilised by physiotherapists as a means of sign-posting patients who might benefit more from multi-component falls interventions than from VR.

The outcome measures used provide both diagnostic and prognostic insights. They enable a comprehensive evaluation of a patient’s baseline function and problem profile, such that the progress of the balance disorder or the effectiveness of therapy can be gauged on subsequent re-evaluation.

### Designing a VR exercise regime

The screening and assessment processes described above provide a wealth of information on which an exercise programme, tailored to the specific needs of balance-disordered individuals, could be founded. However, popular versions of the Cawthorne programme are preset, serialized exercise routines, which do not allow for much tailoring of exercises. As a rule, patients start at the beginning of the Cawthorne exercises, practicing up to three exercises at a time, several times per day. When an exercise no longer challenges the patient or provokes symptoms, that exercise is replaced by the next one in the series. This sort of preset programme does not capitalise on physiotherapists’ capacity to hone exercises to the very specific needs of each patient.

A common and pragmatic approach, that physiotherapists use to initiate a customised vestibular exercise programme, is to take relevant Cawthorne exercises and add those that address outstanding rehabilitation needs. Popular versions of the Cawthorne exercises are essentially bipartite. The initial series of exercises challenges one’s spatial orientation during repetitive movements of the eyes, head or body. These are appropriate for patients who have developed self-motion hypersensitivities due to the vestibular disorder. However, the preset exercises may not tackle the most relevant planes, frequencies or amplitudes of movement, so it is the role of the physiotherapist to extend the exercise programme to include the necessary movement variables based on the subjective and objective assessments already undertaken.

The latter series of exercises in the Cawthorne programme is directed at challenging postural stability. There is a degree of sensory manipulation in that patients have to maintain stability, first with eyes open and then with eyes closed. The latter may aid in decreasing patients’ over-reliance on visual cues for balance, which can be a result of peripheral vestibular disorders. However, customised programmes will often pursue this with more rigour by introducing patients to

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**Table 1:** Summary of typical outcome measures (see for further details).

<table>
<thead>
<tr>
<th>Self Report (Subjective) Measures</th>
<th>Observed Performance (Objective) Measures</th>
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<tbody>
<tr>
<td>Dizziness Handicap Inventory</td>
<td>Functional Gait Assessment</td>
</tr>
<tr>
<td>Vertigo Symptom Scale</td>
<td>Dynamic Visual Acuity Test</td>
</tr>
<tr>
<td>Situational Characteristics Questionnaire</td>
<td></td>
</tr>
<tr>
<td>Vestibular Disorders Activities of Daily Living Scale</td>
<td></td>
</tr>
<tr>
<td>Hospital Anxiety and Depression Scale</td>
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</table>

Summary of typical outcome measures (see for further details).
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variably compliant surfaces such that somatosensory cues are also less dependable. This approach may not be appropriate for all patients, for example those with bilateral vestibular failure, in whom it is key to up-regulate the other balance senses to achieve optimal ambulatory safety and functional status. Driving sensory substitution in this manner can be better accommodated in customised exercise programmes than in preset ones.

Popular versions of the Cawthorne programme do not tend to address the problem of oscillopsia. In contrast, customised exercise programmes consist of gaze stabilisation exercises to improve movement-induced visual problems patients may have. Patients are instructed to move their heads in specified directions and at certain speeds while focusing on a fixed target. This places a demand on the vestibulo-ocular reflex (VOR) and other gaze stabilising mechanisms and the resultant retinal slip serves as an error signal to modify eye movement control. Such gaze stabilisation exercises have even been shown to improve dynamic visual acuity in patients with bilateral vestibular hypofunction.

During the last decade, customised programmes have also started to include exercises which aim to tackle patients’ spatial disorientation resulting from a vestibular lesion. These exercises, which do not feature in preset programmes, are particularly aimed at reducing dizziness caused by exposure to visually rich environments or motion of the full visual field. Patients with chronic balance symptoms who were exposed to optokinetic stimuli were found to have reduced levels of motion hypersensitivity as well as improvements in psychological burden.

There are obvious limitations relating to the added cost and resources (both human and equipment) of adopting a customised VR service. Therefore, at Guy’s Hospital, the Physiotherapy team implement customised exercises but in a group setting. Exercise stations have been formulated to incorporate all of the rehabilitation strategies outlined above. There is a therapist:patient ratio of approximately 1:3. We believe we are still able to remain responsive to patients’ individual needs despite the increased patient throughput. We also believe this group approach may benefit patients’ anxiety levels through peer support and reduced isolation, although this is yet to be proven. What is clear is that physiotherapists have a major role to play in designing customised exercise programmes that have proven added benefit over preset ones.

Before embarking on any format of VR, it is important to ensure that the goals of the treatment are realistic and achievable. In cases of bilateral vestibular hypofunction or cerebellar disease with significant comorbidity, for example, the physiotherapist needs to ensure there is mutual understanding that a modest outcome may only be achievable. More specifically, in these instances, the relatively short episode of supervised, formal VR provided by most NHS services may be merely a starting point to a long term and ongoing management strategy of exercises, designed primarily to stem deterioration in function rather than drive vestibular compensation and functional recovery to completion.

Supervising VR exercises

One of the main differences between the present day prescription of Cawthorne-Cooksey exercises and their prescription in the 1940s relates to the degree of supervision given to patients. Some clinicians will choose to give the Cawthorne exercises to patients as a handout with the simple instruction to ‘go home and do these’. In this situation, there is limited supervision of exercises which, by their very design, trigger dizziness – for some, the most distressing symptom they are likely to have experienced. Adherence to the correct exercise technique, if at all, is likely to be questionable therefore.

Several studies have tried to define whether supervision is indeed an important influence on therapy outcome. In a recent study, there was a very high rate of attrition (55% drop-out) of subjects who were given a home exercise programme without subsequent guidance. However, other research has shown that subjects who received a one-off, 30 minute exercise instruction session by nurses trained in vestibular rehabilitation, improved significantly more than a control group receiving standard primary care treatment. There were gains in static postural stability, symptomatic severity and in quality of life measures meaning that this nurse-delivered form of VR could be extremely cost-effective. However, participants were largely a self-selected sub-population of those with vestibular symptoms in primary care. Furthermore, assessments of gaze instability and dynamic postural stability were not undertaken, so it is not clear as to whether key vestibular impairments were addressed and remediated.

Overall, studies indicate that some form of supervision is required for patients to engage in vestibular exercises. Supervision from physiotherapists, whose practice is founded in motor control and behaviour, is more likely to ensure that the spectrum of vestibular impairments is addressed, as compared to when VR input is lead by other healthcare professionals.

Managing BPPV

Benign paroxysmal positional vertigo (BPPV) is one of the few pathologies that can be cured, by one-off physical interventions performed during a single clinical interaction. From an historical perspective, physical treatments for BPPV initially comprised of exercises designed to bring about habituation to the condition, culminating in the Epley and Semont manoeuvres. These remain the gold standard treatments for posterior canal BPPV.

Given this evolution of physical treatments physiotherapists, as well as ENT Clinicians and Audiologists, have typically been involved in the management of BPPV, although the extent of this involvement may vary between local management pathways. Some patients may have contact with physiotherapy first, rather than ENT, after a primary care referral. Perhaps the unique selling points of physiotherapy management of BPPV relates to the profession’s founding in manual techniques. The larger treatment couches combined with the greater space available in most physiotherapy units mean physiotherapists are well-placed to undertake positional manoeuvres both for assessment and treatment purposes on the full range of patients, including those with restrictive biomechanical constraints e.g. endomorphic habitus or marked spinal stiffness.

At Guy’s Hospital, the physiotherapy team and wider multidisciplinary (MD) balance team have an established management pathway for patients with BPPV which is founded on the AAO HNS 2008 BPPV guideline. All dizzy patients assessed in the MD clinic undergo Dix-Hallpike testing as standard with either the classical or side-lying manoeuvres. The choice of assessment manoeuvre is dependent in part
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Figure 1: Guy’s Balance Clinic management pathway for assessing and treating BPPV
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Table 2: Characteristic presentations of positioning nystagmus.

<table>
<thead>
<tr>
<th>BPPV Variant</th>
<th>Latency</th>
<th>Duration</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posterior canal BPPV</td>
<td>Yes</td>
<td>5-30s</td>
<td>Torsional towards lower ear + lesser vertical component</td>
</tr>
<tr>
<td>Anterior canal BPPV</td>
<td>Probably</td>
<td>Short</td>
<td>Downbeat + lesser torsional component; fast phases of torsion pointing towards the affected side which does not necessarily correlate with the side the Hallpike was performed to</td>
</tr>
<tr>
<td>Horizontal canal BPPV</td>
<td>Possibly</td>
<td>&lt;1min</td>
<td>Horizontal, beating TOWARDS the ground in BOTH head turned positions</td>
</tr>
<tr>
<td>Central positional vertigo / nystagmus</td>
<td>Usually no</td>
<td>Usually persistent</td>
<td>Often pure upbeat or downbeat; any position may provoke it and nystagmus might change direction</td>
</tr>
</tbody>
</table>

on patients’ biomechanical constraints. The remainder of the pathway is shown in Figure 1.

Posterior canal BPPV is the most common variant. It is important, therefore, to know the characteristic nystagmic presentation of posterior canal BPPV following a provocative Dix-Hallpike manoeuvre. Key features to observe for, and document, include: the short latency before onset of the nystagmus; the torsional and up-beating plane of the nystagmus; the geotropic direction of the fast phase (i.e. towards the under-most ear); and the complete nystagmic fatigue usually within one minute of onset. However, other variants of BPPV will be encountered by physiotherapists or ENT surgeons referred dizzy patients, and these should ideally be differentiated from central positional nystagmus (Table 2).

Novel developments in physiotherapy scope of practice

The White Paper: The New NHS Modern, Dependable and The NHS Plan signalled a relatively new governmental stance in support of the reconfiguration of professional roles within the healthcare sector. Thereafter, the Department of Health’s Action on ENT Balance programme emerged, which promoted the re-design of services for balance-disordered patients so that they might be more responsive to patients’ needs than the pre-existing models. This balance project involved three primary pilot sites, specifically in York, Leicester and King’s Lynn, each with a unique and novel configuration of healthcare staff that was ‘fit for practice’. In the York model particularly, there was extension of the physiotherapist’s role beyond normal scope of practice whereby the physiotherapist undertook the initial assessment of all patients when previously an ENT clinician would have done this.

The more recent DH document ‘Provision of Adult Balance Services: A Good Practice Guide’ further defines an optimal vision for adult balance services based on evidence, consensus clinical opinion and experience from these and other pilot sites that participated in the Action on ENT Balance programme. Although the Good Practice Guide also promulgated a re-think of the design of regional balance services, there was less emphasis on changing the historical practices or roles of the implicated Allied Health Professionals (AHPs) such as physiotherapists or audiologists.

During 2006, a quality improvement programme undertaken within Guy’s and St Thomas’ NHS Foundation Trust revealed a disjointed pathway for balance-disordered patients with excessive waiting times for VR, and the Guy’s Multi-Disciplinary Balance Clinic was therefore piloted in 2008/2009 based on the York model. As per that model, a physiotherapist and audiologist jointly assess all new patients rather than an ENT clinician. A comprehensive history is taken by the physiotherapist, followed by a clinical examination involving cranial nerve testing, long tract and limb coordination screening, gait and posture assessments, and positioning testing. The audiologist then completes an audiological assessment and vestibular function tests. However, if BPPV is identified on positioning testing, the physiotherapist treats the condition with the relevant particle repositioning manoeuvre (PRM), and the vestibular function tests are deferred.

Every patient’s case is discussed routinely in the weekly multi-disciplinary (MD) review meeting (‘virtual clinic’) following the patient’s initial assessment. The meeting is attended by the physiotherapist and audiologist as well as an ENT consultant who has ultimate responsibility for clinical decision making and overall governance of the clinic. Clinical decisions include diagnostic categorisation and appropriate triage including the referral for VR, discharge; organisation of further diagnostic tests; and/or re-appointment to see the ENT Consultant directly. The latter option is selected for patients with indeterminate diagnoses or features suspicious of sinister or unstable pathology. Patients entering VR following the virtual clinic are once more seen by the physiotherapist and a customised VR programme is implemented. If the outcome of VR transpires to be poor with respect to the treatment expectations and goals, those patients are re-discussed at the virtual clinic, which is another novel aspect of the MD clinic and represents a further safety net in the patients’ pathways through it.

The Guy’s Balance Clinic model is summarised in Figure 2. This model is not typical of what would be expected of a “specialist balance centre” within the balance service network, using DH parlance. However, we have shown the model, like York has, to be both lean and safe. The therapists involved in the clinic with the unusually expansive role of assessing patients, for diagnostic rather than rehabilitative purposes, have to date demonstrated that physiotherapists can be ‘fit for practice’ in this capacity.

Conclusion

This article has detailed many of the interlinked roles physiotherapists have in the management of the dizzy patient. There is a good evidence base for many of the physical
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Figure 2: Schematic of the patient pathway through the Guy’s Balance Clinic.
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interventions that physiotherapists undertake, as well as for the outcome measures they utilise. Although exercises and positioning manoeuvres can be readily undertaken by any of the main disciplines involved in the care of balance-disordered patients, the physiotherapist’s scope of practice is particularly suited to lead on implementing many of these interventions. There is no doubt that the role of the physiotherapist has evolved substantially since the 1940s when VR was first introduced. ENT clinicians should certainly consider adopting a low threshold for referral to physiotherapy, particularly for those dizzy patients who have not progressed with self-directed Cawthorne exercises at home.

Conflict of Interest
All authors have no conflict of interest to declare. No extraneous funding was obtained.

Key Points Summary:
- Physiotherapists play a significant role in the management of the dizzy patient.
- More specifically their roles include screening patients for vestibular rehabilitation (VR) and assessing the multi-dimensional factors of disability associated with dizziness and balance disorders.
- Physiotherapists aim to capitalise on the information obtained during screening and assessment processes in order to formulate customised VR exercise programmes.
- Customised programmes compare favourably to preset exercise regimens such as the adapted Cawthorne programme developed in the 1940s. However, generic exercises may provide a starting point for patients in the subacute period after a vestibular deficit.
- A low threshold for referral to physiotherapy should be adopted for any patient who fails to progress within the first two months after a vestibular deficit, especially if preset exercises have been trialled.
- The interlinked roles of the physiotherapist are complementary to those of ENT clinicians but can only be fully realised when there is close multi-disciplinary team working.

References
The role of physiotherapy in the management of the dizzy patient

Single Best Option questions:
1. A negative Dix–Hallpike test in a patient who complains of positionally-evoked dizziness:
   a. Indicates orthostatic hypotension
   b. Indicates bilateral vestibular hypofunction
   c. Rules out posterior canal BPPV
   d. May be accounted for by nystagmic adaptation
   e. Indicates no further positioning tests are required

2. Which of the following manoeuvres has been shown to treat posterior canal BPPV with a similar success rate to the Epley manoeuvre:
   a. Gufoni
   b. Appiani
   c. Semont
   d. Stenger
   e. Supine roll

3. Prochlorperazine and diazepam:
   a. Limit vestibular compensation
   b. Should be continued during vestibular rehabilitation in order to prevent emesis from the vestibular-stimulating exercises
   c. Have continued benefit for patients with dizziness if administered long-term
   d. Are not vestibular suppressants
   e. Enhance vestibular adaptation

4. Which of the following strategies should usually be adopted in the management of BPPV:
   a. Older adults should not undergo particle repositioning manoeuvres due to the risk of vertebrobasilar insufficiency
   b. Prochlorperazine prescription is the first line strategy
   c. Particle repositioning manoeuvres are no better than a watchful wait approach given that BPPV spontaneously resolves
   d. The Epley manoeuvre should be undertaken after a positive Dix–Hallpike manoeuvre
   e. The Brandt-Daroff exercises or Epley can be used interchangeably

5. Vestibular rehabilitation is least indicated in the case of:
   a. Remitted BPPV with concomitant ipsilateral vestibular hypofunction following neuronitis
   b. Dizziness with unmanaged migraine triggered by exertion
   c. Bilateral vestibular hypofunction
   d. Hemispheric cerebellar stroke
   e. Vestibular rehabilitation is not indicated in any of the above

6. The popularised Cawthorne exercise programme:
   a. Is best given as a self-directed programme for home use by patients
   b. Enables tailoring of exercises to address the specific needs of patients
   c. Tackles postural instability particularly by diminishing somatosensory cues for balance
   d. Is a new and progressive approach to dizziness
   e. Is not characterised by any of the above

Extended Matching question:
1. Theme: vestibular rehabilitation exercise components
   Options:
   a. Cawthorne exercises
   b. Progressive ambulation
   c. Gaze stabilisation exercises
   d. Optokinetic stimulation
   e. Strengthening exercises
   f. Cervical proprioception exercises
   g. Sustained lean against a wall
   h. Cervical manipulation
   i. Brandt-Daroff exercises
   j. Substitution exercises for proprioceptive up-regulation

For each scenario, please select the SINGLE most pertinent exercise component from the list provided. Each option may be used once, more than once or not at all.
1. A 76-year-old lady complains of positional dizziness over the past 3 months. The dizziness is particularly noticeable when she stands up, and she has to hold on to furniture for a minute or so before ambulating. Her blood pressure medications and dosages have been changed on several occasions by the Syncope clinic.

2. A 60-year-old gentleman has been wheelchair-bound since he recovered from coronary artery bypass grafting that was complicated by a dehiscent, infected sternotomy and ischaemic lower limb. The latter necessitated below knee amputation. He has regained some independence but experiences shuddering of his vision when he brushes his teeth or while being pushed along in the wheelchair.

3. A 54-year-old gentleman experienced decompression sickness during a sea-diving accident. He was vertiginous after surfacing. A subsequent MRI scan revealed involutorial change of the operculum and insular cortices in the distribution of the right middle cerebral artery. His balance has recovered well except for disequilibrium when in crowds or supermarkets. Recently, he had to leave early from a wedding reception due to this.

4. A 29-year-old female was involved in a motor vehicle accident some 3 months ago. Her neck remains a little sore despite analgesia and previous massage. More especially, she complains of vague disorientation, particularly when she turns her head in gait or when she maintains a static head position during her desk-based occupation. Brain imaging and a full audio-vestibular assessment were normal.

Diagnostic questions:

1. A 52-year-old female had marked positional dizziness some months ago. Although her symptoms are improved, she still has a tendency for dizziness on movement of her head in the pitch plane. A right Dix–Hallpike manoeuvre reveals downbeating nystagmus with a lesser torsion that is ageotropic. There is simultaneous vertigo. Signs and symptoms last under 30 seconds. The most likely diagnosis is:
   a. Central positional nystagmus
   b. Left posterior canal BPPV
   c. Right horizontal canal cupulolithiasis BPPV
   d. Right anterior canal BPPV
   e. Left anterior canal BPPV

2. A right Dix Hallpike manoeuvre on an 83-year-old gentleman provoked symptomatic torsional geotropic nystagmus lasting 15 seconds after a latency of 3 seconds. He has marked cervical stiffness and had a right endarterectomy 4 years ago. You decide to proceed with an Epley manoeuvre. On rolling his head to the left there is a sudden and marked exacerbation of his symptoms accompanied by florid geotropic horizontal nystagmus which changes direction when you roll his head back to the right. What is the most likely diagnosis of this exacerbation:
   a. Cervicogenic dizziness
   b. Right horizontal canal canalithiasis BPPV
   c. Brainstem TIA
   d. Vertebrobasilar insufficiency
   e. Left posterior canal BPPV