

Initial Evaluation of Vertigo

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Benign paroxysmal positional vertigo, acute vestibular neuronitis, and Ménière's disease cause most cases of vertigo; however, family physicians must consider other causes including cerebrovascular disease, migraine, psychological disease, perilymphatic fistulas, multiple sclerosis, and intracranial neoplasms. Once it is determined that a patient has vertigo, the next task is to determine whether the patient has a peripheral or central cause of vertigo. Knowing the typical clinical presentations of the various causes of vertigo aids in making this distinction. The history (i.e., timing and duration of symptoms, provoking factors, associated signs and symptoms) and physical examination (especially of the head and neck and neurologic systems, as well as special tests such as the Dix-Hallpike maneuver) provide important clues to the diagnosis. Associated neurologic signs and symptoms, such as nystagmus that does not lessen when the patient focuses, point to central (and often more serious) causes of vertigo, which require further work-up with selected laboratory and radiologic studies such as magnetic resonance imaging. (*Am Fam Physician* 2006;73:244-51, 254. Copyright © 2006 American Academy of Family Physicians.)



ILLUSTRATION BY SCOTT BODELL

► **Patient information:** A handout on vertigo, written by the author of this article, is provided on page 254.

One of the most common and frustrating complaints patients bring to their family physicians is dizziness. There are four types of dizziness: vertigo, lightheadedness, presyncope, and dysequilibrium.¹ The most prevalent type is vertigo (i.e., false sense of motion), which accounts for 54 percent of reports of dizziness in primary care.² The differential diagnosis of vertigo (*Table 1*¹⁻⁶) includes peripheral vestibular causes (i.e., those originating in the peripheral nervous system), central vestibular causes (i.e., those originating in the central nervous system), and other conditions. Ninety-three percent of primary care patients with vertigo have benign paroxysmal positional vertigo (BPPV), acute vestibular neuronitis, or Ménière's disease.⁷ Other causes include drugs (e.g., alcohol, aminoglycosides, anticonvulsants [phenytoin (Dilantin)], antidepressants, antihypertensives, barbiturates, cocaine, diuretics [furosemide (Lasix)], nitroglycerin, quinine, salicylates, sedatives/hypnotics),^{8,9} cerebrovascular disease, migraine, acute labyrinthitis, multiple sclerosis, and intracranial neoplasms. Much confusion surrounds the nomenclature of acute vestibular

neuronitis because the term "labyrinthitis" often is used interchangeably with it. Labyrinthitis (i.e., inflammation of the labyrinthine organs caused by infection) is distinct from acute vestibular neuronitis (i.e., inflammation of the vestibular nerve), and the terms are not interchangeable.¹

Because patients with dizziness often have difficulty describing their symptoms, determining the cause can be challenging. An evidence-based approach using knowledge of key historic, physical examination, and radiologic findings for the causes of vertigo can help family physicians establish a diagnosis and consider appropriate treatments in most cases (*Figure 1*).

History

History alone reveals the diagnosis in roughly three out of four patients complaining of dizziness, although the proportion in patients specifically complaining of vertigo is unknown.¹⁰ When collecting a patient's history, the physician first must determine whether the patient truly has vertigo versus another type of dizziness. This can be done by asking, "When you have dizzy spells, do you feel light-headed or

SORT: KEY RECOMMENDATIONS FOR PRACTICE

<i>Clinical recommendations</i>	<i>Evidence rating</i>	<i>References</i>	<i>Comments</i>
Use the Dix-Hallpike maneuver to diagnose BPPV.	C	7, 10	The Dix-Hallpike maneuver has a positive predictive value of 83 percent and negative predictive value of 52 percent for the diagnosis of BPPV.
Do not use laboratory tests to initially identify the etiology of dizziness.	C	10	Laboratory tests identify the etiology of vertigo in less than 1 percent of patients with dizziness.
Consider radiologic studies in patients with neurologic signs and symptoms, risk factors for cerebrovascular disease, or progressive unilateral hearing loss.	C	19	—
Use MRI for diagnosing vertigo when neuroimaging is needed.	C	26	MRI is superior to computed tomography for the diagnosis of vertigo because of its superior ability to visualize the posterior fossa.

BPPV = benign paroxysmal positional vertigo, MRI = magnetic resonance imaging.

A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, see page 196 or <http://www.aafp.org/afpsort.xml>.

do you see the world spin around you?" An affirmative answer to the latter part of this question has been shown to accurately detect patients with true vertigo.¹¹

PERIPHERAL OR CENTRAL CAUSE OF VERTIGO

The next task is to determine whether the patient has a peripheral or central cause of vertigo. Key information from the history that can be used to make this distinction includes the timing and duration of the vertigo (*Table 2*^{3,6,12}); what provokes or aggravates it (*Table 3*^{1,3,5,12,13}); and whether any associated symptoms exist, especially neurologic symptoms and hearing loss (*Tables 4*^{1,6,12-14} and *5*^{9,12,13}).¹⁰ Characteristics distinguishing peripheral and central causes of vertigo are listed in *Table 6*.^{14,15} Rotatory illusions are highly associated with peripheral vestibular disorders, especially when nausea or vomiting accompanies the vertigo.¹ Nystagmus in peripheral vertigo usually is horizontal and rotational, lessens or disappears when the patient focuses the gaze, and usually is triggered by some provoking factor. In central vertigo, nystagmus is purely horizontal, vertical, or rotational; does not lessen when the patient focuses the gaze; and persists for a longer period.¹⁴ The duration of each episode also has significant diagnostic value; generally, the longer symptoms last, the greater the likelihood that there is a central cause of vertigo.³ In one study,¹⁶ the presence of vertigo upon awakening in the morning was

suggestive of peripheral vestibular disorders. Peripheral vertigo generally has a more sudden onset than vertigo of central nervous system origin, except for acute cerebrovascular events.³

SEVERITY

Knowing the severity of vertigo over time also is helpful. For example, in acute vestibular neuronitis, initial symptoms typically are severe but lessen over the next few days. In Ménière's disease, attacks of vertigo initially increase in severity, then lessen in severity later on. Patients complaining of constant vertigo lasting for weeks may have a psychological cause for their symptoms.

PROVOKING FACTORS

Provoking factors and circumstances around the onset of vertigo may prove useful in narrowing the differential diagnosis to a peripheral vestibular condition. If symptoms occur only with positional changes, such as turning over in bed,¹⁷ bending over at the waist and then straightening up, or hyperextending the neck, BPPV is the most likely cause.¹ A recent viral upper respiratory infection may precede acute vestibular neuronitis or acute labyrinthitis. Factors that provoke migraine headaches can cause vertigo if the patient experiences this as a symptom associated with migraine.

Vertigo can be caused by perilymphatic fistula (i.e., breach between the inner ear

TABLE 1
Differential Diagnosis of Vertigo

Cause	Description
Peripheral causes	
Acute labyrinthitis	Inflammation of the labyrinthine organs caused by viral or bacterial infection
Acute vestibular neuronitis (vestibular neuritis)*	Inflammation of the vestibular nerve, usually caused by viral infection
Benign positional paroxysmal vertigo (benign positional vertigo)	Transient episodes of vertigo caused by stimulation of vestibular sense organs by canalith; affects middle-age and older patients; affects twice as many women as men
Cholesteatoma	Cyst-like lesion filled with keratin debris, most often involving the middle ear and mastoid
Herpes zoster oticus (Ramsay Hunt syndrome)	Vesicular eruption affecting the ear; caused by reactivation of the varicella-zoster virus
Ménière's disease (Ménière's syndrome, endolymphatic hydrops)	Recurrent episodes of vertigo, hearing loss, tinnitus, or aural fullness caused by increased volume of endolymph in the semicircular canals
Otosclerosis	Hardening or thickening of the tympanic membrane caused by age or recurrent infections of the ear
Perilymphatic fistula	Breach between middle and inner ear often caused by trauma or excessive straining
Central causes	
Cerebellopontine angle tumor	Vestibular schwannoma (i.e., acoustic neuroma) as well as infratentorial ependymoma, brainstem glioma, medulloblastoma, or neurofibromatosis
Cerebrovascular disease such as transient ischemic attack or stroke	Arterial occlusion causing cerebral ischemia or infarction, especially if affecting the vertebrobasilar system
Migraine	Episodic headaches, usually unilateral, with throbbing accompanied by other symptoms such as nausea, vomiting, photophobia, or phonophobia; may be preceded by aura
Multiple sclerosis	Demyelination of white matter in the central nervous system
Other causes	
Cervical vertigo	Vertigo triggered by somatosensory input from head and neck movements
Drug-induced vertigo	Adverse reaction to medications
Psychological	Mood, anxiety, somatization, personality, or alcohol abuse disorders

*—Acute vestibular neuronitis often is erroneously called acute or viral labyrinthitis.

Information from references 1 through 6.

and middle ear).¹⁸ Perilymphatic fistula may be caused by trauma from a direct blow, or from activities such as scuba diving (from barotrauma) and heavy weight bearing or excessive straining with bowel movements.^{3,12} Sneezing or movements that place the affected ear downward also can provoke vertigo in patients with perilymphatic fistulas.¹⁹

The presence of Tullio's phenomenon (i.e., nystagmus and vertigo caused by loud noises or sounds at a particular frequency) suggests a peripheral cause for vertigo.¹²

Significant psychosocial stress can cause patients to complain of vertigo. Asking about psychological stressors or psychiatric history may be important, especially in patients whose history does not necessarily fit the usual presentation of physical causes of vertigo. For example, a history of anxiety or panic attacks associated with vertigo may point to hyperventilation as a cause.¹²

ASSOCIATED SYMPTOMS

Hearing loss, pain, nausea, vomiting, or neurologic symptoms can help differentiate the

cause of vertigo. Most causes of vertigo with hearing loss are peripheral, the main exception being a cerebrovascular event involving the internal auditory artery or anterior inferior cerebellar artery. Pain accompanying vertigo may occur with acute middle ear disease, invasive disease of the temporal bone, or meningeal irritation.¹² Vertigo often is associated with nausea or vomiting in acute vestibular neuronitis and in severe episodes of Ménière's disease and BPPV.^{1,20} In central causes of vertigo, nausea and vomiting tend to be less severe.¹⁴ Neurologic symptoms such as weakness, dysarthria, vision or hearing changes, paresthesia, altered level of consciousness, ataxia, or other changes in sensory and motor function favor the presence of a central cause of vertigo such as cerebrovascular disease, neoplasm, or multiple sclerosis. Patients with migrainous vertigo may experience other symptoms related to the migraine, including a typical headache (often throbbing, unilateral, sometimes preceded by an aura), nausea, vomiting, photophobia, and phonophobia. Twenty-one to 35 percent of patients with migraine suffer vertigo.²¹

MEDICAL HISTORY

Other important clues to the diagnosis of vertigo may come from the patient's medical history, including medications, trauma, or exposure to toxins.¹⁸ Age is associated with some underlying conditions that can cause vertigo. For example, older patients, especially those with diabetes or hypertension, are at higher risk of cerebrovascular causes of vertigo.¹² Patients should be asked about family history including hereditary conditions such as migraine and risk factors for cerebrovascular disease.

Physical Examination

Physicians should pay particular attention to physical findings of the neurologic, head and neck, and cardiovascular systems.

NEUROLOGIC EXAMINATION

The cranial nerves should be examined for signs of palsies, sensorineural hearing loss, and nystagmus. Vertical nystagmus is 80 percent sensitive for vestibular nuclear or cerebellar

vermis lesions.² Spontaneous horizontal nystagmus with or without rotatory nystagmus is consistent with acute vestibular neuronitis. Patients with peripheral vertigo have impaired balance but are still able to walk, whereas patients with central vertigo have more severe instability and often cannot walk or even stand without falling.¹⁴ Although Romberg's sign is consistent with a vestibular or proprioceptive

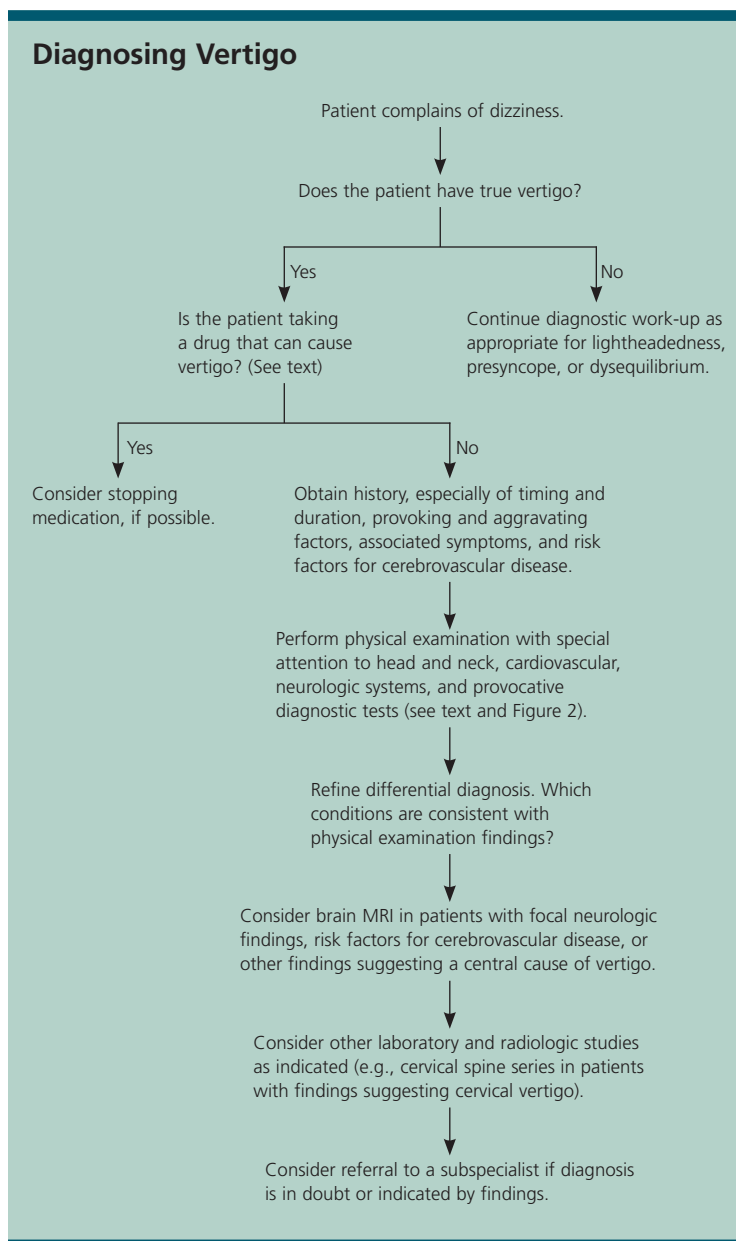


Figure 1. Algorithm for an initial approach for diagnosing the cause of vertigo. (MRI = magnetic resonance imaging.)

TABLE 2
Typical Duration of Symptoms for Different Causes of Vertigo

<i>Duration of episode</i>	<i>Suggested diagnosis</i>
A few seconds	Peripheral cause: unilateral loss of vestibular function; late stages of acute vestibular neuronitis; late stages of Ménière's disease
Several seconds to a few minutes	Benign paroxysmal positional vertigo; perilymphatic fistula
Several minutes to one hour	Posterior transient ischemic attack; perilymphatic fistula
Hours	Ménière's disease; perilymphatic fistula from trauma or surgery; migraine; acoustic neuroma
Days	Early acute vestibular neuronitis*; stroke; migraine; multiple sclerosis
Weeks	Psychogenic (constant vertigo lasting weeks without improvement)

*—Vertigo with early acute vestibular neuritis can last as briefly as two days or as long as one week or more.

Information from references 3, 6, and 12.

TABLE 3
Provoking Factors for Different Causes of Vertigo

<i>Provoking factor</i>	<i>Suggested diagnosis</i>
Changes in head position	Acute labyrinthitis; benign positional paroxysmal vertigo; cerebellopontine angle tumor; multiple sclerosis; perilymphatic fistula
Spontaneous episodes (i.e., no consistent provoking factors)	Acute vestibular neuronitis; cerebrovascular disease (stroke or transient ischemic attack); Ménière's disease; migraine; multiple sclerosis
Recent upper respiratory viral illness	Acute vestibular neuronitis
Stress	Psychiatric or psychological causes; migraine
Immunosuppression (e.g., immunosuppressive medications, advanced age, stress)	Herpes zoster oticus
Changes in ear pressure, head trauma, excessive straining, loud noises	Perilymphatic fistula

Information from references 1, 3, 5, 12, and 13.

problem, it is not particularly useful in the diagnosis of vertigo. In one study,²² it was only 19 percent sensitive for peripheral vestibular disorders and did not correlate with more serious causes of dizziness (not limited to vertigo) such as drug-related dizziness, seizure, arrhythmia, or cerebrovascular events.

The Dix-Hallpike maneuver (*Figure 2*)^{1,3,19} may be the most helpful test to perform on patients with vertigo. It has a positive predictive value of 83 percent and a negative predictive value of 52 percent for the diagnosis of BPPV.^{7,10} After the initial test, the intensity of induced symptoms typically wanes with repeated maneuvers in peripheral vertigo but does so less often in central vertigo.¹⁵ The combination of a positive Dix-Hallpike maneuver and a history of vertigo or vomiting suggests a peripheral vestibular disorder.²² If the maneuver provokes purely vertical (usually downbeat) or torsional nystagmus without a latent period of at least a few seconds, and does not wane with repeated maneuvers, this suggests a central cause for vertigo such as a posterior fossa tumor or hemorrhage.^{14,15}

Hyperventilation for 30 seconds may assist in ruling out psychogenic causes of vertigo associated with hyperventilation syndrome.²² It rarely can cause true vertigo in patients with perilymphatic fistulas or acoustic neuromas.¹²

HEAD AND NECK EXAMINATION

The tympanic membranes should be examined for vesicles (i.e., herpes zoster oticus [Ramsay Hunt syndrome]) or cholesteatoma. Hennebert's sign (i.e., vertigo or nystagmus caused by pushing on the tragus and external auditory meatus of the affected side) indicates the presence of a perilymphatic fistula.¹² Pneumatic otoscopy may cause similar findings.³ The Valsalva maneuver (i.e., forced exhalation with nose plugged and mouth closed to increase pressure against the eustachian tube and inner ear) may cause vertigo in patients with perilymphatic fistulae¹² or anterior semicircular canal dehiscence^{12,23}; its clinical diagnostic value, however, is limited.²²

CARDIOVASCULAR EXAMINATION

Orthostatic changes in systolic blood pressure (e.g., a drop of 20 mm Hg or more) and pulse (e.g., increase of 10 beats per minute) in patients with vertigo upon standing may identify problems with dehydration or autonomic dysfunction.¹⁰ Carotid sinus

TABLE 4
Associated Symptoms for Different Causes of Vertigo

<i>Symptom</i>	<i>Suggested diagnosis</i>
Aural fullness	Acoustic neuroma; Ménière's disease
Ear or mastoid pain	Acoustic neuroma; acute middle ear disease (e.g., otitis media, herpes zoster oticus)
Facial weakness	Acoustic neuroma; herpes zoster oticus
Focal neurologic findings	Cerebellopontine angle tumor; cerebrovascular disease; multiple sclerosis (especially findings not explained by single neurologic lesion)
Headache	Acoustic neuroma; migraine
Hearing loss	Ménière's disease; perilymphatic fistula; acoustic neuroma; cholesteatoma; otosclerosis; transient ischemic attack or stroke involving anterior inferior cerebellar artery; herpes zoster oticus
Imbalance	Acute vestibular neuronitis (usually moderate); cerebellopontine angle tumor (usually severe)
Nystagmus	Peripheral or central vertigo
Phonophobia, photophobia	Migraine
Tinnitus	Acute labyrinthitis; acoustic neuroma; Ménière's disease

Information from references 1, 6, and 12 through 14.

stimulation should not be performed; it has been shown to be not useful diagnostically²² and potentially is dangerous.

Laboratory Evaluation

Laboratory tests such as electrolytes, glucose, blood counts, and thyroid function tests identify the etiology of vertigo in fewer than 1 percent of patients with dizziness.¹⁰ They may be appropriate when patients with vertigo exhibit signs or symptoms that suggest the presence of other causative conditions. Audiometry helps establish the diagnosis of Ménière's disease.²⁰

Radiologic Studies

Physicians should consider neuroimaging studies in patients with vertigo who have neurologic signs and symptoms, risk factors for cerebrovascular disease, or progressive unilateral hearing loss.¹⁹ In one study,²⁴ 40 percent of patients with dizziness and neurologic signs had relevant abnormalities suggesting central nervous system lesions on magnetic resonance imaging of the head. In patients with isolated vertigo who also were at risk for cerebrovascular disease, 25 percent had caudal cerebellar infarcts.²⁵ In general, magnetic resonance imaging is more appropriate than computed tomography for diagnosing vertigo because of its superiority in visualizing the posterior fossa, where most central nervous system disease that

causes vertigo is found.²⁶ Magnetic resonance or conventional angiography of the posterior fossa vasculature may be useful in diagnosing vascular causes of vertigo such as vertebrobasilar insufficiency, thrombosis of the labyrinthine artery, anterior or posterior inferior cerebellar artery insufficiency, and subclavian steal syndrome.²⁶

Neuroimaging studies can be used to rule out extensive bacterial infections, neoplasms, or developmental abnormalities if

TABLE 5
Causes of Vertigo Associated with Hearing Loss

<i>Diagnosis</i>	<i>Characteristics of hearing loss</i>
Acoustic neuroma	Progressive, unilateral, sensorineural
Cholesteatoma	Progressive, unilateral, conductive
Herpes zoster oticus (i.e., Ramsay Hunt syndrome)	Subacute to acute onset, unilateral
Ménière's disease	Sensorineural, initially fluctuating, initially affecting lower frequencies; later in course: progressive, affecting higher frequencies
Otosclerosis	Progressive, conductive
Perilymphatic fistula	Progressive, unilateral
Transient ischemic attack or stroke involving anterior inferior cerebellar artery or internal auditory artery	Sudden onset, unilateral

Information from references 9, 12, and 13.

TABLE 6

Distinguishing Characteristics of Peripheral vs. Central Causes of Vertigo

Feature	Peripheral vertigo	Central vertigo
Nystagmus	Combined horizontal and torsional; inhibited by fixation of eyes onto object; fades after a few days; does not change direction with gaze to either side	Purely vertical, horizontal, or torsional; not inhibited by fixation of eyes onto object; may last weeks to months; may change direction with gaze towards fast phase of nystagmus
Imbalance	Mild to moderate; able to walk	Severe; unable to stand still or walk
Nausea, vomiting	May be severe	Varies
Hearing loss, tinnitus	Common	Rare
Nonauditory neurologic symptoms	Rare	Common
Latency following provocative diagnostic maneuver	Longer (up to 20 seconds)	Shorter (up to 5 seconds)

Information from references 14 and 15.

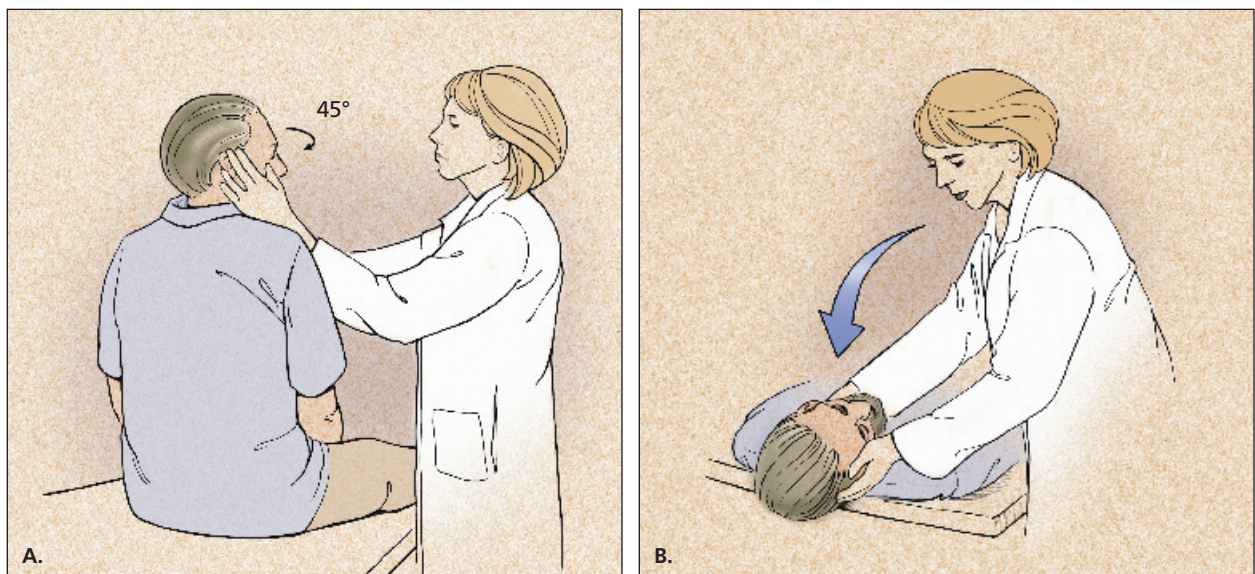


Figure 2. To perform the Dix-Hallpike maneuver, the patient initially sits upright. The examiner should warn the patient that the maneuver may provoke vertigo. The examiner turns the patient's head 30 to 45 degrees to the side being tested (A). The patient keeps his or her eyes open and focused on the examiner's eyes or forehead. Then, as the examiner supports the patient's head, the patient quickly lies supine (within two seconds), allowing the neck to hyperextend slightly and hang off the edge of the examining table 20 to 30 degrees past horizontal (B). After a two- to 20-second latent period, the onset of torsional upbeat or horizontal nystagmus denotes a positive test for benign paroxysmal positional vertigo. The episode can last 20 to 40 seconds. Nystagmus changes direction when the patient sits upright again.

Information from references 1, 3, and 19.

other symptoms suggest one of those diagnoses.^{26,27} However, they are not indicated in patients who have BPPV,²⁶ usually are not necessary to diagnose acute vestibular neuronitis or Ménière's disease, and are poor routine screening tests for cerebellopontine angle tumors causing vertigo.²⁷

Conventional radiographs or cross-sectional imaging procedures may aid in the

diagnosis of cervical vertigo (i.e., vertigo triggered by somatosensory input from head and neck movements) in patients with a history suggestive of this diagnosis²⁶; however, the existence of this disorder remains controversial, and most patients in whom this diagnosis is considered should have other, more well-established conditions investigated.⁴

Referral

Not all patients with vertigo need to be referred to a subspecialist. Family physicians should consider referral to the appropriate subspecialist (e.g., otolaryngologist, head and neck surgeon, neurologist, neurosurgeon) if the diagnosis of vertigo is unclear or if the patient has a medical problem requiring further subspecialty care.

Members of various family medicine departments develop articles for "Problem-Oriented Diagnosis." This is one in a series from the Department of Family Medicine at the University of Southern California, Los Angeles. Coordinator of the series is Ricardo G. Hahn, M.D.

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