

Assessment and Management of Dizziness Associated with Mild TBI

Introduction and Background

More than 244,000 service members sustained a traumatic brain injury (TBI) between 2000 and the first quarter of 2012. The majority of these, 77 percent, were classified as mild TBI (mTBI), also known as concussion.¹ While most patients with mTBI completely recover within weeks to months, a small subset of individuals experience persistent symptoms and difficulty in rehabilitation. This is particularly true for mTBI with co-occurring disorders.

Dizziness is a common symptom following TBI and can have a significant impact on a service member's quality of life.² Temporal bone fractures, labyrinthine concussion, benign paroxysmal positional vertigo (BPPV) or central lesions are commonly implicated as causes of vestibular pathology; including the complaint of dizziness after head trauma.¹⁷ Other otologic conditions such as superior canal dehiscence can contribute to dizziness after mTBI.

This clinical recommendation provides the primary care provider an approach to evaluating dizziness following mTBI and guidance regarding referral for further vestibular evaluation and care. The recommendation is based on a review of currently published literature and the proceedings of a consensus conference convened by Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury (DCoE) in collaboration with the Hearing Center of Excellence in November 2011. The consensus panel included clinical subject matter experts representing the services, Department of Veterans Affairs (VA), DCoE and civilian sectors. The Defense Department's TBI Quad Services Cell, which includes Army, Navy, Marine Corps, Air Force, Defense and Veterans Brain Injury Center (DVBIC), National Intrepid Center of Excellence, VA, U.S. Central Command and Force Health Protection and Readiness, reviewed the resulting recommendation.

Clinical Recommendation

This clinical recommendation is designed to assist providers in the diagnostic process. It provides pathways for specialty referrals for patients complaining of dizziness symptoms following an mTBI or a blast event. Included in this document is the clinical algorithm addressing red flags, medication side effects and polypharmacy issues, patient management and referral options.

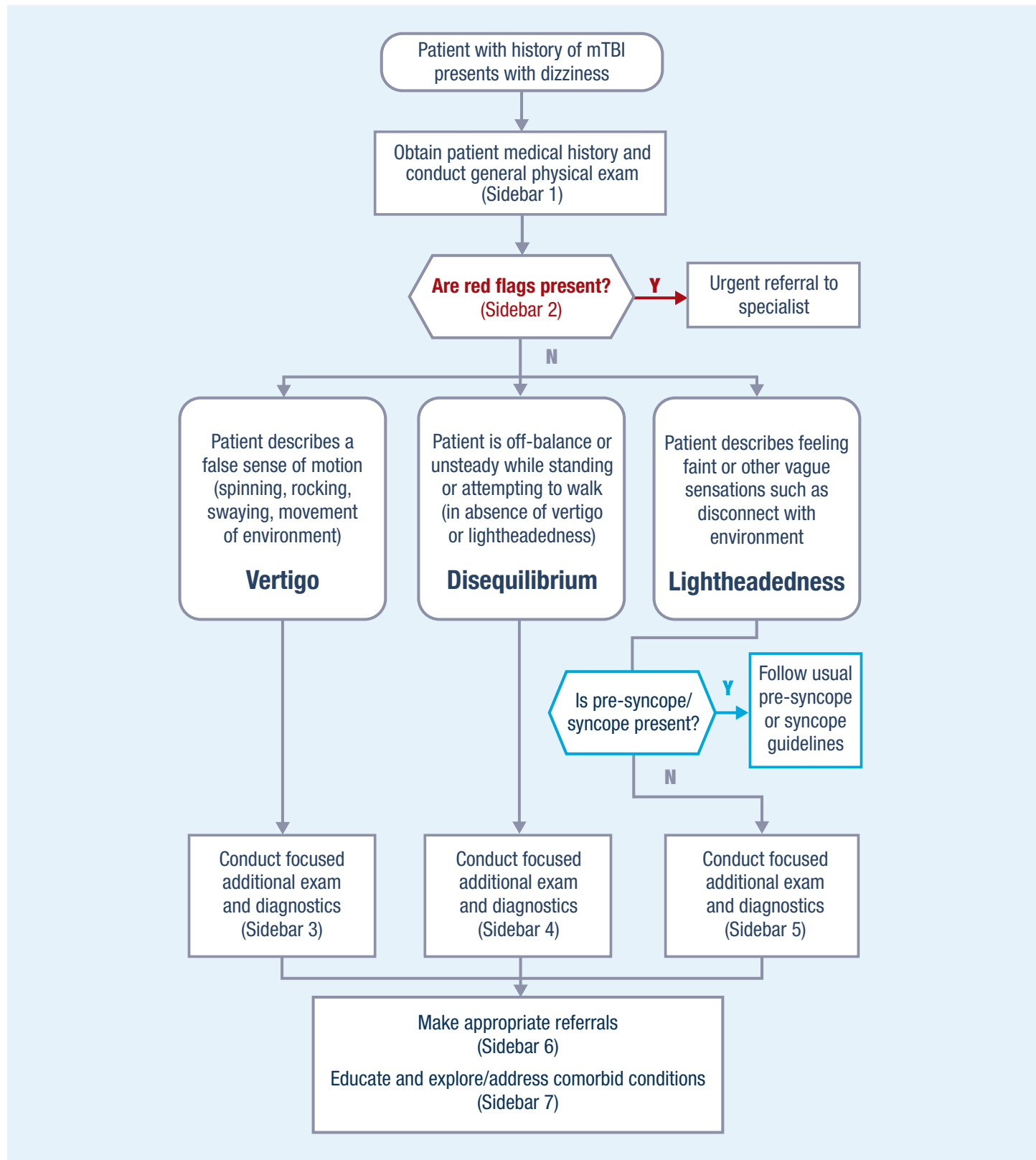
Physical Examination

A comprehensive primary care physical examination for complaints of dizziness should include vital signs, otoscopic, cardiovascular, neurologic and musculoskeletal examinations. Orthostatic vital signs should be measured as a simple screening assessment to detect postural hypotension as a possible etiology for dizziness. Orthostatic hypotension is defined as a systolic blood pressure decrease of at least 20 mmHg, a diastolic blood pressure decrease of at least 10 mmHg, or a pulse increase of 30 beats or more per minute with associated signs or symptoms of cerebral hypoperfusion. Evaluation of general appearance, expression and communication is also crucial because facial asymmetry, hoarseness and dysarthria may increase the likelihood that a tumor or cerebrovascular accident may be the primary cause of dizziness.³ A bedside otologic exam can evaluate foreign objects in the ear canal and signs of middle ear disease, such as fluid build-up behind the eardrum and tympanic membrane perforation or scarring as the cause for dizziness or vestibular dysfunction.

Diagnostic exams that can be performed in the course of the physical examination include primary position and gaze-evoked nystagmus, assessment of gait, Dix-Hallpike Test, otologic and oculomotor exam, and Rhomberg Test. Routine blood tests are not typically beneficial for patients with dizziness symptoms.^{3,4,5}

Clinical Algorithm

The following algorithm guides primary care providers through the examination and management of patients with dizziness, referral to specialists, further evaluation of comorbid conditions and patient education:



Patient History and Exam (Diagnostic Approach)

A thorough patient history and exam is needed to understand the nature of the dizziness and to provide appropriate treatment or referral.

The patient history should include the following:

- **Characteristics of symptoms**
(onset, continuous versus episodic, duration and frequency, precipitating factors such as positional or postural effects and effect of exertion)
- **Associated symptoms**
(hearing loss, tinnitus, aural pressure or pain, headache, visual sensation that stationary objects are swaying back and forth or oscillopsia, diplopia or other neurologic symptoms, incontinence or loss of consciousness)
- **Pertinent past medical history**
(prior vertigo, previous ear disease or surgery, head injury, general health)
- **Assessment of comorbidities**
- **Medication history**
(medications and other substances that can contribute to complaints of dizziness include stimulants such as caffeine and over-the-counter supplements, nonsteroidal anti-inflammatory drugs (NSAIDs), abortive and prophylactic agents for migraines and migraine-like headaches, anti-hypertensive drugs, antidepressants, anti-epileptics, hypnotic and sleep medications, analgesics, alcohol, psychotropic and anxiolytic medications)
- **Fall history**

All patients should receive standard exams including:

- **Vital signs**
(measurements, including sitting and standing blood pressure and heart rate, which may detect postural hypotension as a possible etiology for dizziness)
- **Basic cardiovascular exam**
- **Otoscopic exam**
- **Neurological exam**
- **Musculoskeletal exam**

Red Flags Requiring Urgent Referral

Two different groups of patients may present to primary care providers:

Acute — An individual presenting within seven days of an mTBI.

Subacute or chronic — An individual presenting more than seven days after an mTBI and who may or may not have already seen a provider. Most patients presenting to the provider will be in the subacute or chronic group.

Observing any of the following red flags requires urgent referral to an appropriate specialist. **Table 1** lists red flags for acute presentation, as identified by the panel members, previous clinical practice guidelines and Directive Type Memorandum (DTM 09-033) for TBI.^{6,7,8,9,10,11} **Table 2** lists red flags for subacute/chronic presentation.

Table 1: Acute Red Flags (Sidebar 2)

Hearing loss
Drainage or bleeding (if persistent) from ear
Facial weakness
Signs of basilar skull fracture (i.e., battle’s sign, “raccoon eyes”)
Two or more blast exposures within 72 hours
Witnessed loss of consciousness (LOC)
Progressively declining level of consciousness
Clinician-verified Glasgow Coma Scale score <15
Seizures
Repeated vomiting
Unsteady on feet
Neurological deficit: motor or sensory
Weakness on one side of the body
Progressively declining neurological exam
Abnormal speech
Unusual behavior or combative
Cannot recognize people or disoriented to place
Amnesia/memory problems
Worsening headache
Double vision/loss of vision
Unequal pupils

Table 2: Subacute/Chronic Red Flags (Sidebar 2)

History of sudden or fluctuating hearing loss
Pressure or sound induced dizziness
Dizziness and chest pain
Persistent gait instability

Table 3: Medications with Potential Dizziness Side Effects

Stimulants for fatigue
NSAIDs for headache
Abortive agents for migraine or migraine-like headaches
Prophylactic headache agents
Anti-hypertensives
Antidepressants
Anti-epileptic medications
Sedative-hypnotics
Sleep medications
Analgesics
Psychotropic medications
Anxiolytics

Note this is not an all-inclusive list.

Assessment of Medication Side Effects and Polypharmacy

Medication side effects and drug-drug interactions are frequent contributing or causative factors to dizziness.^{3,12,13,14,15} Providers should carefully examine the patient’s medication profile as a potential etiology. **Table 3** provides a list of medications commonly prescribed for conditions that co-occur with mTBI and may cause dizziness. The provider should also consider the patient’s alcohol and caffeine intake as possible causes of dizziness.

Meclizine is frequently prescribed as a vestibular suppressant for short-term relief of nausea, vomiting and dizziness and can be used for short periods of time to relieve severe incapacitating symptoms. However, it should be noted that this may interfere with vestibular assessments. Additionally, meclizine and other vestibular suppressants may delay vestibular compensation and adversely affect neurovestibular and other diagnostic testing.¹¹ Patients should be weaned off these medications prior to testing.

Types of Dizziness

A patient’s description of symptoms helps providers to initially discriminate between three basic categories of dizziness: vertigo, disequilibrium and lightheadedness. Accurately categorizing the patient’s symptoms will allow for a focused assessment.

Vertigo	Disequilibrium	Lightheadedness
a false sense of motion (spinning, rocking, swaying, movement of environment)	being off-balance or unsteady while standing or attempting to walk (in absence of vertigo or orthostatic hypotension)	feeling faint or other vague sensations such as disconnect with environment

Vertigo

Recommended exams for the assessment of vertigo and recommended specialty referrals when positive.^{3,4,12,14,16,17}

Table 4: Focused Diagnostic Exams — Vertigo (Sidebar 3)

Assessment	Action if Positive
Neurological exam with attention to nystagmus	Refer to neurology
Primary position and gaze-evoked nystagmus	Refer to neurology and ENT
Gait assessment	Refer to neurology and physical therapy
Dix-Hallpike Test*	Refer to neurology, ENT, audiology or physical therapy
Otologic exam	Refer to ENT or audiology
Oculomotor exam	Refer to neurology
Rhomberg Test**	Refer to neurology

*Examinations used to diagnose BPPV, including the Dix-Hallpike Test, must be done carefully to avoid overdiagnosis.

** Rhomberg Test may not be consistent with vestibular laboratory tests.

When using the Dix-Hallpike Test, the basic patterns of nystagmus for central or peripheral vestibulopathy must be properly identified.⁴ If the provider has received adequate training, the Epley maneuver or other canalith repositioning maneuvers can be used to treat BPPV.¹² If symptoms persist or if BPPV is associated with signs of peripheral vestibular pathology, the patient should be referred to a specialist (neurology, ENT or audiology).¹⁸

Disequilibrium

A focused assessment of comorbidities is essential in the assessment of patients with disequilibrium.¹⁴ To aid with diagnosis, **Table 5** lists recommended exams for the assessment of disequilibrium and recommended specialty referrals when positive.

Table 5: Focused Diagnostic Exams — Disequilibrium (Sidebar 5)

Assessment	Action if Positive
Gait assessment (native and tandem)	Refer to neurology and physical therapy
Spontaneous/positional nystagmus tests	Refer to neurology or ENT

continued

Table 5: Focused Diagnostic Exams — Disequilibrium (Sidebar 5)

Assessment	Action if Positive
Neuropathy	Refer to neurology
Rhomberg Test	Refer to neurology
Standard Head, Eye, Ear, Nose and Throat exam (HEENT)	Refer to ENT
Musculoskeletal exam	Refer to physical therapy or physiatry
Dix-Hallpike Test	Refer to neurology, ENT, audiology or physical therapy

Lightheadedness

In cases of clear syncope or pre-syncope, the provider should follow the usual practice for syncope or pre-syncope. Although dizziness or lightheadedness from orthostatic hypotension can sometimes lead to pre-syncope or syncope, the evaluation of pre-syncope and syncope is beyond the scope of this clinical recommendation. **Table 6** provides a list of specific exams for lightheadedness in the setting of mTBI. Additionally, the provider should specifically address medications, diet and life stressors, which may cause or contribute to symptoms.

Table 6: Focused Diagnostic Exams — Lightheadedness: Pre-syncope or Syncope (Sidebar 5)

Assessment	Action if Positive
Orthostatic vital signs	Refer to cardiology if etiology not apparent
Tilt table test	Refer to cardiology
Hyperventilation test	Refer to cardiology and/or neurology
12-lead electrocardiogram and other cardiac testing as clinically indicated	Refer to cardiology
Laboratory testing including thyroid function, glucose tolerance test (GTT), complete blood count (CBC), urinalysis and serum chemistry	Standard practice for identified disorder
Toxicology screen	Standard practice for identified agents
Allergy testing if history suggests anaphylaxis	Refer to allergy/internal medicine
Cognitive/neuropsychological exam	Refer to behavioral health specialist (psychologist or psychiatrist) and possible referral to neurology
Diagnostic neuroimaging	In conjunction with appropriate specialty referral

Note this is not an all-inclusive list.

Referral Recommendations

Acute life-threatening conditions are relatively rare in patients presenting with dizziness.¹⁹ For patients presenting within seven days of an mTBI, immediate referral is indicated in the presence of hearing loss, focal neurological deficits to include facial weakness, persistent drainage or bleeding from one or both ears, and signs of a basilar skull fracture (battle’s sign, raccoon eyes). Any other evidence of deteriorating neurologic function (focal neurologic findings, alterations in consciousness, memory problems, confusion, disorientation, diplopia, Glasgow Coma Scale <15, repeated vomiting, seizures, limb weakness, etc.), may also warrant urgent referral for specialty evaluation and/or neuroimaging.^{6,7,8}

For patients presenting with complaints of dizziness more than seven days after an mTBI, urgent referral should be considered for those with a history of sudden or fluctuating hearing loss, pressure or sound induced dizziness, dizziness associated with chest pain, or persistent gait abnormality.

The underlying cause of dizziness remains unknown in as many as 20 percent of patients with chronic or recurrent episodes.¹⁴ Patients with persistent dizziness symptoms with no diagnosis should be referred to neurology or ENT and physical therapy for further evaluation and/or rehabilitation. Referral to physical therapy, in parallel with referral to neurology or ENT, may also be considered for confirmed vertigo. Referrals should be made based on the availability of resources. For example, if physical therapy is not available, occupational therapy may be used to rehabilitate patients with vestibular pathology. In cases of suspected hearing loss, an audiogram should be requested and the patient should be referred to audiology or ENT.

Addressing Comorbidities

Co-occurring or comorbid conditions following mTBI may exacerbate acute as well as subacute or chronic dizziness symptoms. **Table 7** lists typical comorbidities that may contribute to dizziness.

By addressing comorbidities, symptoms can improve for individuals dealing with a concussion. Patient handouts, such as fact sheets developed by DVBIC and available at dvbic.org, can provide important information about dealing with their symptoms.

Table 7: Comorbidities (may apply to patients with vertigo, disequilibrium or lightheadedness) (Sidebar 7)

Migraines/headaches	Psychological health disorders
Medication side effects or polypharmacy	Substance use disorders (drugs/alcohol)
Sleep disorders	Vision disturbances
Stressors/anxiety	

Note this list is not an all-inclusive list.

General Patient Management

Table 8: General Patient Management with Dizziness Following mTBI

DO	DON'T
<ul style="list-style-type: none"> ▶ Minimize alcohol and caffeine ▶ Maintain proper sleep hygiene ▶ Maintain a dizziness/headache diary ▶ Encourage physical activity/exercise to tolerance (avoid treadmills and running outdoors if dizzy) ▶ Educate on fall prevention techniques 	<ul style="list-style-type: none"> ▶ Use vestibular suppressants for longer than five days ▶ Overuse analgesics ▶ Minimize patient's symptoms (i.e., underestimate potential critical nature of symptoms) ▶ Inhibit physical activity once red flags are addressed
<ul style="list-style-type: none"> ▶ Ensure appropriate headache management ▶ Prescribe antiemetics for nausea ▶ Consider Epley maneuver (or other canalith repositioning maneuvers) for BPPV ▶ Refer to PT if no positive test results (in cases of disequilibrium) ▶ Consider referral to neurology and behavioral health for patients with multiple comorbidities 	

Conclusion

This clinical recommendation is based on literature review and consensus of expert opinion. It provides a guide for the initial primary care assessment and management of dizziness following mTBI.

Support Tools for Providers

Dix-Hallpike testing videos

www.youtube.com/watch?v=vRpwf2ml3SU

www.youtube.com/watch?v=ttgaqplv_wM&feature=fvwrel

References

1. Defense Medical Surveillance System and the Theater Medical Data Store (DMSS-TMDS). (2012). Prepared by the Armed Forces Health Surveillance Center. www.dvbic.org/dod-worldwide-numbers-tbi
2. Terrio, H., Brenner, L. A., Ivins, B. J., Cho, J. M., Helmick, K., Schwab, K., et al. (2009). Traumatic brain injury screening: Preliminary findings in a US Army brigade combat team. *The Journal of Head Trauma Rehabilitation*, 24(1), 14-23. doi:10.1097/HTR.0b013e31819581d8
3. Kutz, J. W. (2010). The dizzy patient. *The Medical Clinics of North America*, 94(5), 989-1002. doi:10.1016/j.mcna.2010.05.011
4. Labuguen, R. H. (2006). Initial evaluation of vertigo. *American Family Physician*, 73(2), 244-251.
5. Dix, M.R., Hallpike, C.S. (1952). The pathology symptomatology and diagnosis of certain common disorders of the vestibular system. *Proc R Soc Med*. 45(6):341-354.
6. Defense and Veterans Brain Injury Center. (2008). Joint theater trauma system clinical practice guideline: Management of mild traumatic brain injury (mTBI)/concussion in the deployed setting (pp. 7-8). Washington, D.C.: Department of Defense.
7. Directive-Type Memorandum (DTM) 09-033. (2010, June 21). Policy guidance for management of concussion/mild traumatic brain injury in the deployed setting (pp. 12-13). Washington, D.C.: Department of Defense.
8. Management of Concussion/mTBI Working Group. (2009). VA/DoD clinical practice guideline for management of concussion/mild traumatic brain injury. *Journal of Rehabilitation Research and Development*, 46(6), CP1-68.
9. Herbella, F. A., Mudo, M., Delmonti, C., Braga, F. M., & Del Grande, J. C. (2001). "Raccoon eyes" (periorbital haematoma) as a sign of skull base fracture. *Injury*, 32(10), 745-747.
10. Tubbs, R. S., Shoja, M. M., Loukas, M., Oakes, W. J., & Cohen-Gadol, A. (2010). William Henry Battle and Battle's sign: mastoid ecchymosis as an indicator of basilar skull fracture. *Journal of Neurosurgery*, 112(1), 186-188. doi:10.3171/2008.8.JNS08241.
11. Wheelless, C. R., & Duke University. Medical Center. Division of Orthopaedic Surgery. (1996). *Wheelless' Textbook of orthopaedics*. Retrieved March 9, 2012, from www.wheellessonline.com.
12. Chawla, N., & Olshaker, J. S. (2006). Diagnosis and management of dizziness and vertigo. *The Medical Clinics of North America*, 90(2), 291-304. doi:10.1016/j.mcna.2005.11.003
13. Tusa, R. J. (2009). Dizziness. *The Medical Clinics of North America*, 93(2), 263-271, vii. doi:10.1016/j.mcna.2008.09.005
14. Post, R. E., & Dickerson, L. M. (2010). Dizziness: A diagnostic approach. *American Family Physician*, 82(4), 361-368, 369
15. Dizziness and Vertigo Causes, Symptoms, Diagnosis, Treatment — Diseases and Conditions - PDR Health. (n.d.). PDRhealth. Retrieved March 9, 2012 from www.pdrhealth.com/diseases/dizziness-and-vertigo.
16. Luxon, L. M. (2004). Evaluation and management of the dizzy patient. *Journal of Neurology, Neurosurgery, and Psychiatry*, 75(Suppl. 4), iv45-52. doi:10.1136/jnnp.2004.055285
17. Scherer, M. R., & Schubert, M. C. (2009). Traumatic brain injury and vestibular pathology as a comorbidity after blast exposure. *Physical Therapy*, 89(9), 980-992. doi:10.2522/ptj.20080353
18. Bhattacharyya, N., Baugh, R. F., Orvidas, L., Barrs, D., Bronston, L. J., Cass, S., et al. (2008). Clinical practice guideline: Benign paroxysmal positional vertigo. *Otolaryngology — Head and Neck Surgery*, 139(5 Suppl. 4), S47-81. doi:10.1016/j.otohns.2008.08.022
19. Dros, J., Maarsingh, O. R., van der Horst, H. E., Bindels, P. J., Ter Riet, G., & van Weert, H. C. (2010). Tests used to evaluate dizziness in primary care *CMAJ: Canadian Medical Association Journal*, 182(13), E621-631. doi:10.1503/cmaj.080910