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. 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. 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. 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 Recommendation

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. 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 Romberg Test. Routine blood tests are not typically beneficial for patients with dizziness symptoms.
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:

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Patient with history of mTBI presents with dizziness

Obtain patient medical history and conduct general physical exam (Sidebar 1)

Are red flags present? (Sidebar 2)
  Y  Urgent referral to specialist
  N

Patient describes a false sense of motion (spinning, rocking, swaying, movement of environment)
  Vertigo

Patient is off-balance or unsteady while standing or attempting to walk (in absence of vertigo or lightheadedness)
  Disequilibrium

Patient describes feeling faint or other vague sensations such as disconnect with environment
  Lightheadedness

Is pre-syncope/syncope present?
  Y  Follow usual pre-syncope or syncope guidelines
  N

Conduct focused additional exam and diagnostics (Sidebar 3)

Conduct focused additional exam and diagnostics (Sidebar 4)

Conduct focused additional exam and diagnostics (Sidebar 5)

Make appropriate referrals (Sidebar 6)
Educate and explore/address comorbid conditions (Sidebar 7)
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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. 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

### 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

**Assessment of Medication Side Effects and Polypharmacy**

Medication side effects and drug-drug interactions are frequent contributing or causative factors to dizziness. 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. Patients should be weaned off these medications prior to testing.

Note this is not an all-inclusive list.
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.

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

Vertigo

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

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Action if Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neurological exam with attention to nystagmus</td>
<td>Refer to neurology</td>
</tr>
<tr>
<td>Primary position and gaze-evoked nystagmus</td>
<td>Refer to neurology and ENT</td>
</tr>
<tr>
<td>Gait assessment</td>
<td>Refer to neurology and physical therapy</td>
</tr>
<tr>
<td>Dix-Hallpike Test*</td>
<td>Refer to neurology, ENT, audiology or physical therapy</td>
</tr>
<tr>
<td>Otologic exam</td>
<td>Refer to ENT or audiology</td>
</tr>
<tr>
<td>Oculomotor exam</td>
<td>Refer to neurology</td>
</tr>
<tr>
<td>Romberg Test**</td>
<td>Refer to neurology</td>
</tr>
</tbody>
</table>

*Examinations used to diagnose BPPV, including the Dix-Hallpike Test, must be done carefully to avoid overdiagnosis.
** Romberg 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. If the provider has received adequate training, the Epley maneuver or other canalith repositioning maneuvers can be used to treat BPPV. 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).

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>
<thead>
<tr>
<th>Assessment</th>
<th>Action if Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gait assessment (native and tandem)</td>
<td>Refer to neurology and physical therapy</td>
</tr>
<tr>
<td>Spontaneous/positional nystagmus tests</td>
<td>Refer to neurology or ENT</td>
</tr>
</tbody>
</table>
Table 5: Focused Diagnostic Exams — Disequilibrium (Sidebar 5)

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Action if Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuropathy</td>
<td>Refer to neurology</td>
</tr>
<tr>
<td>Romberg Test</td>
<td>Refer to neurology</td>
</tr>
<tr>
<td>Standard Head, Eye, Ear, Nose and Throat exam (HEENT)</td>
<td>Refer to ENT</td>
</tr>
<tr>
<td>Musculoskeletal exam</td>
<td>Refer to physical therapy or physiatry</td>
</tr>
<tr>
<td>Dix-Hallpike Test</td>
<td>Refer to neurology, ENT, audiology or physical therapy</td>
</tr>
</tbody>
</table>

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)

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

Note this is not an all-inclusive list.

Referral Recommendations

Acute life-threatening conditions are relatively rare in patients presenting with dizziness. 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.
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.\(^1\) 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.dcoe.mil, can provide important information about dealing with their symptoms.

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

<table>
<thead>
<tr>
<th>Migraines/headaches</th>
<th>Psychological health disorders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication side effects or polypharmacy</td>
<td>Substance use disorders (drugs/alcohol)</td>
</tr>
<tr>
<td>Sleep disorders</td>
<td>Vision disturbances</td>
</tr>
<tr>
<td>Stressors/anxiety</td>
<td></td>
</tr>
</tbody>
</table>

*Note this list is not an all-inclusive list.*

### General Patient Management

#### Table 8: General Patient Management with Dizziness Following mTBI

**DO**
- 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
- 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

**DON’T**
- 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
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=vRpwf2mI3SU

References