DEFENSE CENTERS OF EXCELLENCE
For Psychological Health & Traumatic Brain Injury

Clinical Recommendation:

Assessment and Management of Dizziness Associated with Mild TBI

DVBIC
Defense and Veterans Brain Injury Center

DHCC
Deployment Health Clinical Center

National Center for Telehealth & Technology

Learning Objectives

- Understand an overview of dizziness response following mild TBI
- Differentiate between three types of dizziness
- Provide practical application of clinical algorithm
- Identify focused specific exams for each types of dizziness
- Distinguish between seven different specialty referrals

Scope of Clinical Recommendation

This clinical recommendation is intended for use in the care of patients with persistent dizziness symptoms following mild TBI (mTBI).

This recommendation is relevant for healthcare professionals conducting assessment and management for patients with mTBI in any Department of Defense (DoD) healthcare setting, including both primary and specialty care.

DoD Photo
Source: DefenseImagery.mil

Introduction

This education slide deck contains introductory materials for those who are new to the subject of dizziness following mTBI. However it is assumed that the reader has a principal knowledge of TBI, including assessment, treatment, and differentiation between mild, moderate, and severe TBI.

Source : The DCoE Blog http://www.dcoe.health.mil/blog/article.aspx?id=1&postid=196

Additional resources related to mild TBI can be obtained by completing the Mild TBI Web-based Case Study, Case Study 1: Diagnosing Mild TBI, which is available on MHS Learn DoD staff portal for DoD providers, MHS Learn civilian provider portal for civilian providers, and on the Department of Veterans Affairs (VA) Talent Management System (TMS) for VA providers.

Traumatic Brain Injury

- With more than 244,000 traumatic brain injuries (TBIs) in DoD from 2000 to 2012, TBI is a major concern that can negatively impact service members' health, unit readiness and mission accomplishment
- TBI is a disruption of brain function resulting from a blow or jolt to the head
- TBIs are classified as mild, moderate, severe or penetrating
- More than 75% of all brain injuries documented by DoD are mTBI

DoD Photo
Source: DefenseImagery.mil

Closed TBI Classification

Severity	Mild (Concussion)	Moderate	Severe
Structural imaging	Normal	Normal or abnormal	Normal or abnormal
Loss of consciousness (LOC)	0 to 30 minutes	30 minutes and < 24 hours	> 24 hours
Alteration of consciousness (AOC)	a moment up to 24 hours	> 24 hours Severity based on other criteria	
Post traumatic amnesia (PTA)	= 0 to 1 day	> 1 day < 7 days	> 7 days

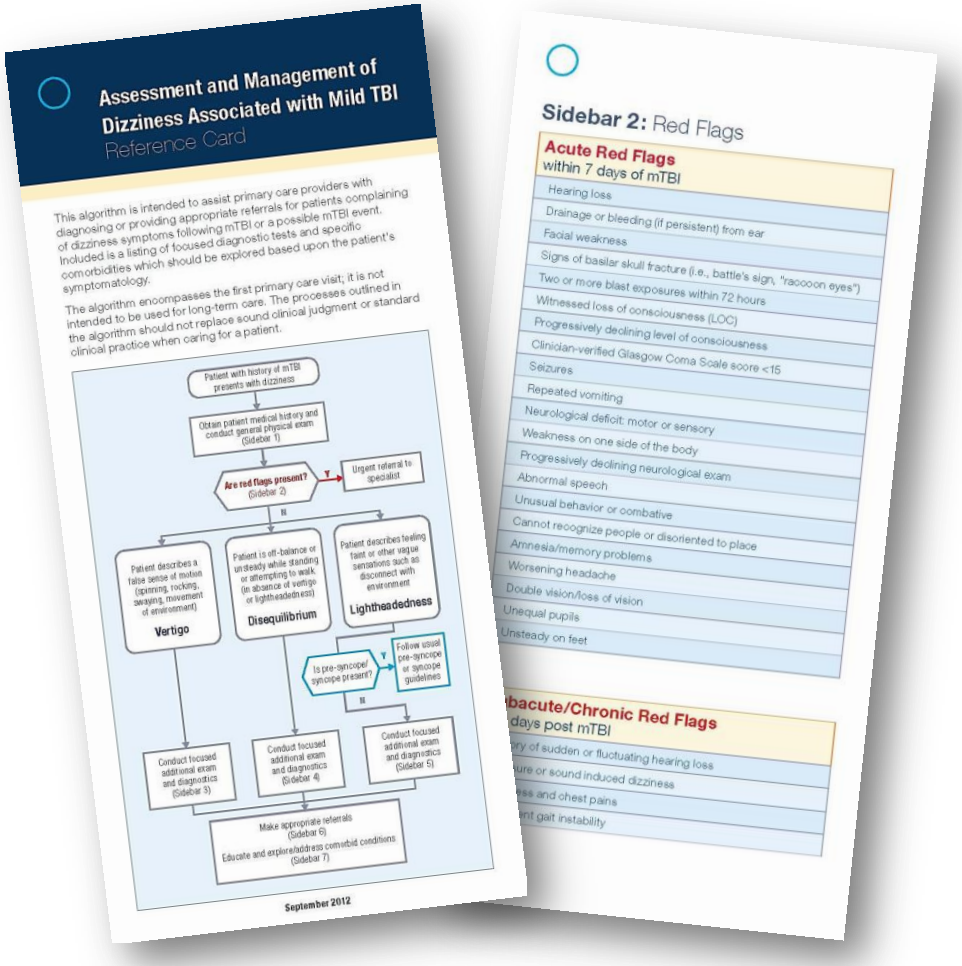
Source: Assistant Secretary of Defense for Health Affairs. Health Affairs Memorandum (October 1, 2007). Traumatic Brain Injury: Definition and Reporting

- This classification refers to severity at the time of injury, not symptoms experienced
- Mild TBI is also known as concussion

Clinical Algorithms

- This presentation is best reviewed with a copy of the *Assessment and Management of Dizziness Associated with Mild TBI* algorithm cards in hand

To obtain these pocket cards contact:
DCoEProducts@tma.osd.mil



Dizziness Symptoms Following mTBI

Pathophysiology

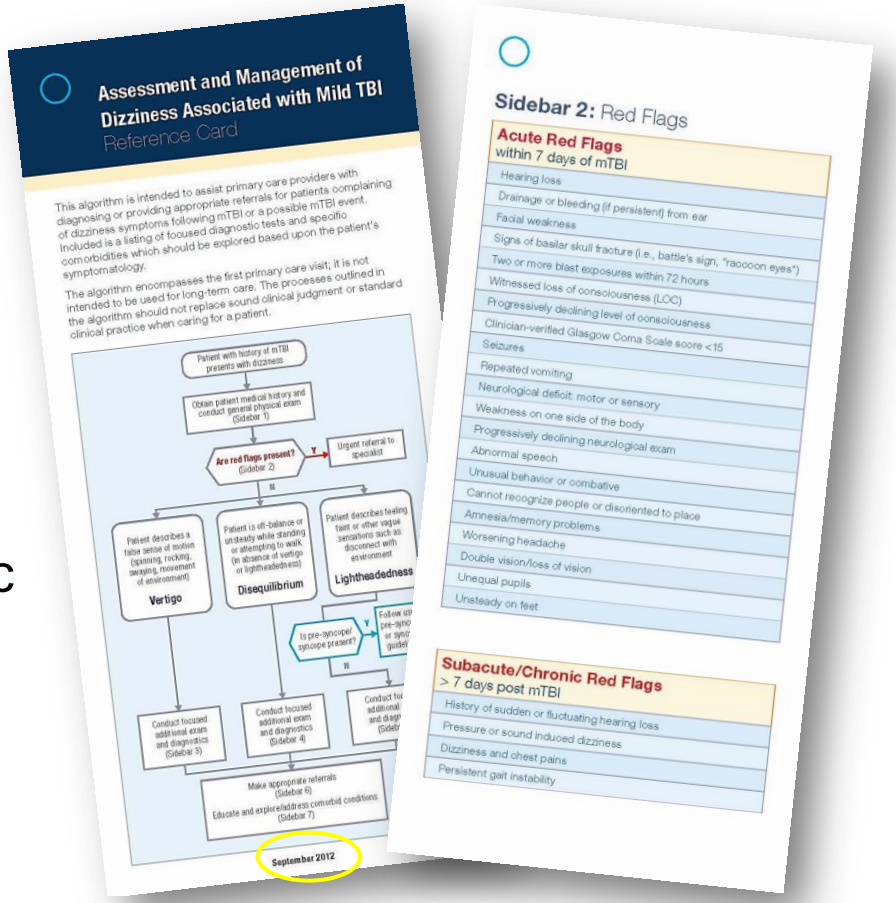
- Dizziness is a common symptom following TBI and it can have a significant impact on the quality of life of service members

- Common causes of dizziness include:
  - Temporal bone fractures
  - Labyrinthine concussion
  - Benign paroxysmal positional vertigo (BPPV)
  - Central lesions

- Other otologic conditions such as superior canal dehiscence can also contribute to dizziness after mTBI

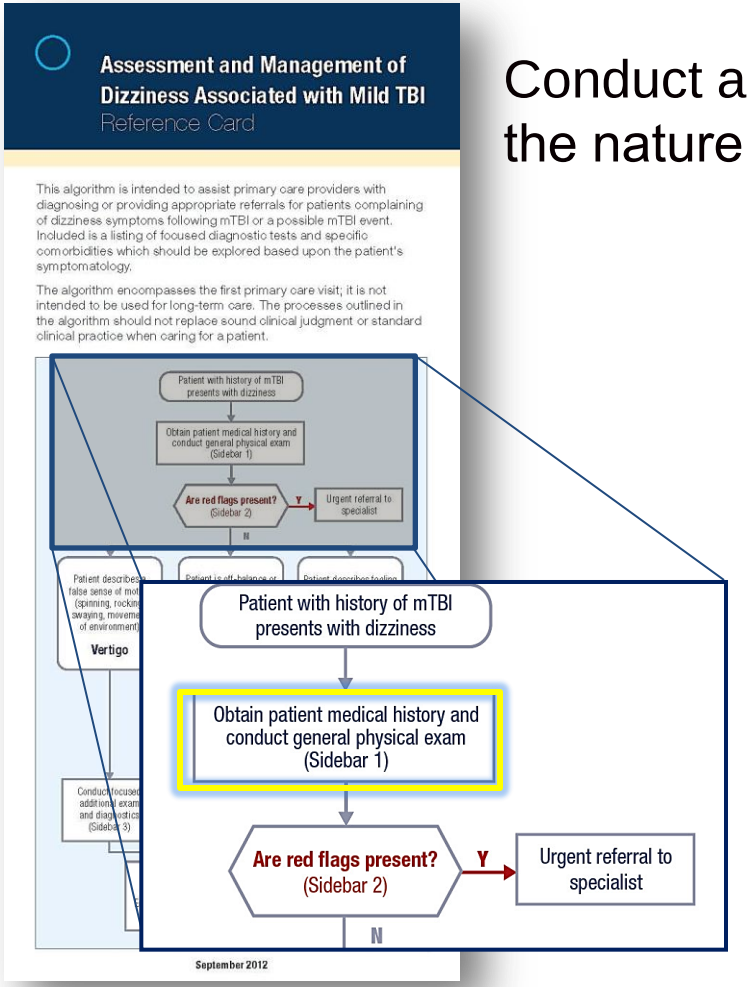
Role of Clinical Algorithm

- Assessment of patients presenting with a complaint of dizziness following an mTBI or possible mTBI event include:
  - Obtain a patient history specific to dizziness
  - Assess for any red flags
  - Conduct focused diagnostic exams for vertigo, disequilibrium, and lightheadedness
  - Diagnose or provide appropriate referrals



September 2012

Medical History and Exam



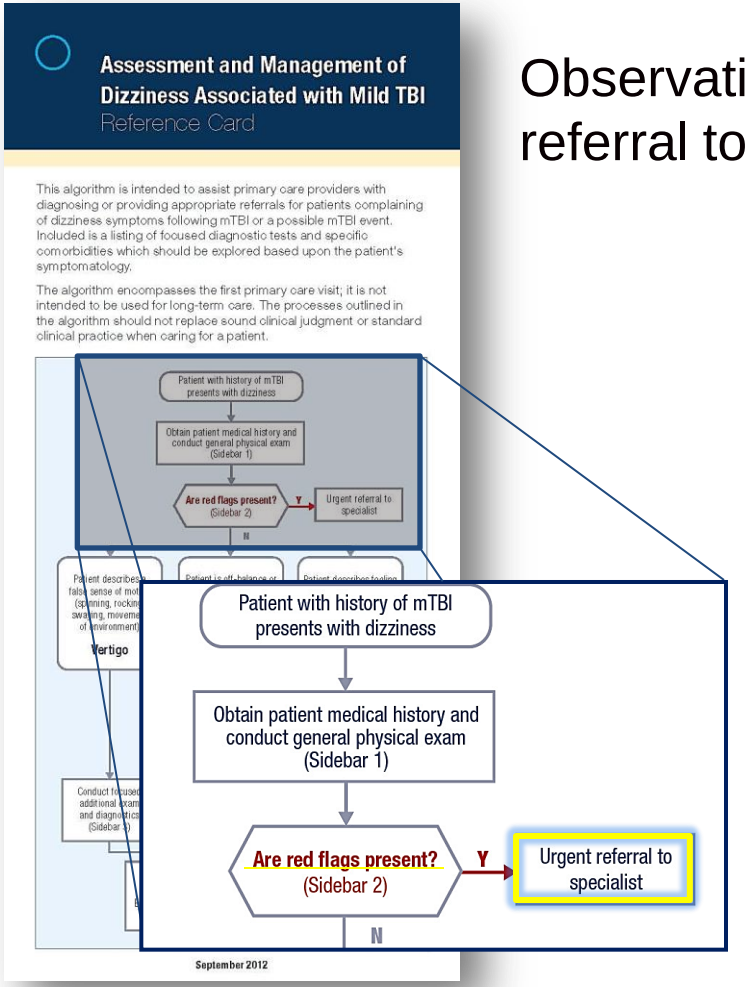
Conduct a thorough history and exam to understand the nature of patient's dizziness, including:

- Characteristics of dizziness symptoms
  - Onset, continuous versus episodic, duration and frequency, precipitating factors such as positional or postural effects and effects of exertion
- Associated symptoms with dizziness
  - Hearing loss, tinnitus, aural pressure or pain, headache, oscillopsia, diplopia or other neurological symptoms, or loss of consciousness
- Pertinent past medical history
- Assessment of comorbidities
- Medication history
- Fall history

Medication Side Effects and Polypharmacy

- Medication side effects and drug to drug interactions are known causes of dizziness
- Common types of medications that can be associated with dizziness include:
    - Stimulants
    - Non steroidal anti-inflammatory drugs (NSAIDs)
    - Abortive agents for migraine headaches
    - Prophylactic headache agents
    - Anti-hypertensives
    - Anti-depressants
    - Anti-epileptics
    - Hypnotic and sleep medications
    - Analgesics
    - Psychotropic medications
    - Anxiolytics
- Patients should be weaned off these medications prior to testing

Red Flags



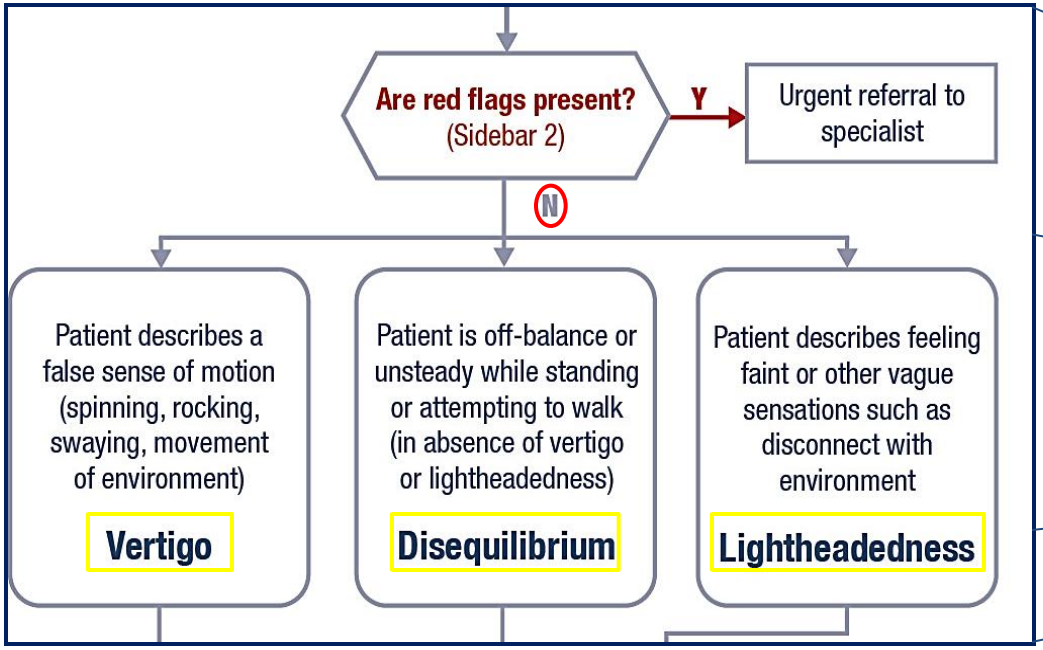
Observation of following red flags requires urgent referral to an appropriate specialist:

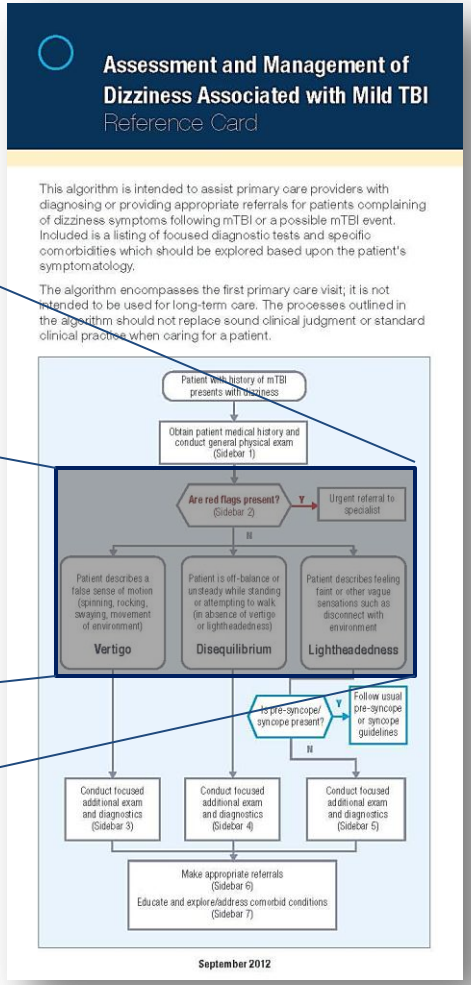
Acute Red Flags (within 7 days of mTBI)	
Hearing loss	Neurological Deficit: Motor or Sensory
Drainage or bleeding (if persistent) from ear	Weakness on one side of the body
Facial weakness	Progressively declining neurological exam
Signs of basilar skull fracture (i.e., battle's sign, "raccoon eyes")	Abnormal speech
Two or more blast exposures within 72 hours	Unusual behavior or combative
Witnessed loss of consciousness (LOC)	Cannot recognize people or disoriented to place
Progressively declining level of consciousness	Amnesia/memory problems
Clinician verified Glasgow Coma Scale score <15	Worsening headache
Seizures	Double vision/Loss of vision
Repeated vomiting	Unequal pupils or unsteady on feet

Sub-Acute/Chronic Red Flags (more than 7 days of mTBI)	
History of sudden or fluctuating hearing loss	Dizziness and chest pain
Pressure or sound induced dizziness	Persistent gait instability

Assessing for Dizziness

- If NO red flags are present, proceed with dizziness examination




Assessment and Management of Dizziness Associated with Mild TBI
Reference Card

This algorithm is intended to assist primary care providers with diagnosing or providing appropriate referrals for patients complaining of dizziness symptoms following mTBI or a possible mTBI event. Included is a listing of focused diagnostic tests and specific comorbidities which should be explored based upon the patient's symptomatology.

The algorithm encompasses the first primary care visit; it is not intended to be used for long-term care. The processes outlined in the algorithm should not replace sound clinical judgment or standard clinical practice when caring for a patient.

September 2012

Types of Dizziness

- Dizziness is broadly identified as a sensation of imbalance, instability or altered spatial orientation. It is typically categorized into one of the following three subtypes:

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

Focused Diagnostic Exams

- Conduct focused diagnostic exams for all three types of dizziness
- Appropriate referrals may include:
  - Cardiology
  - Neurology
  - Otolaryngology (ENT)
  - Audiology
  - Physical Therapy
- Address existing comorbidities
- Provide patient education

DoD Photo by Sgt Aaron LaBlanc
Source: DefenseImagery.mil

Vertigo

Focused Diagnostic Exams for Vertigo

- Recommended exams for vertigo and recommended referrals

Table 4: Focused Diagnostic Exams to Consider for Vertigo (Sidebar 3)	
Vertigo 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

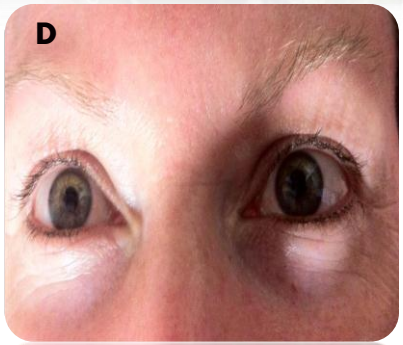
*Examinations used to diagnose benign paroxysmal positional vertigo BPPV, including the Dix-Hallpike test, must be done carefully to avoid over diagnosis.

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

ENT = Ear, Nose and Throat

Dix-Hallpike Test

- Dix-Hallpike test
  A. Performed with the patient sitting upright with the legs extended
  B. Patient's head is then rotated to the right to 45 degrees
  C. Clinician helps the patient to lie down backwards quickly with the head held in approximately 20 degrees of extension
  D. The patient's eyes are then observed for up to 45 seconds for characteristic nystagmus
  E. Same should be repeated on the left
- Onset of nystagmus indicates a positive Dix-Hallpike test



DCoE Photos

Dix-Hallpike Test

- Dix-Hallpike Test
  - Video presentation
  - When using the Dix-Hallpike test, the basic patterns of nystagmus for central or peripheral vestibulopathy must be properly identified
  - Consider Epley maneuver or other canalith repositioning maneuvers to treat benign paroxysmal positional vertigo (BPPV)
  - Refer to neurology, ENT, or audiology if symptoms persist

Credits:
Open Source:
http://www.youtube.com/watch?v=kEM9p4EX1jk

Disequilibrium

Focused Diagnostic Exams for Disequilibrium

- Recommended exams and referrals for disequilibrium

Table 5: Focused Diagnostic Exams to Consider for Disequilibrium. Sidebar 4	
Disequilibrium Assessment	**Action if Positive**
Gait assessment (native and tandem)	Refer to neurology and PT
Spontaneous/positional nystagmus tests	Refer to neurology or ENT
Neuropathy	Refer to neurology
Rhomberg Test	Refer to neurology
Standard HEENT	Refer to ENT
Musculoskeletal exam	Refer to PT or physiatry
Dix-Hallpike Test	Refer to neurology, ENT, audiology, or PT

ENT = Ear, Nose and Throat; HEENT = Head, Eye, Ear, Nose and Throat; PT = Physical Therapy

If there are no objective exam findings, focus on comorbid conditions (Sidebar 7) which can often cause feelings of disequilibrium. Consider referral to physical therapy for further evaluation and/or rehabilitation

Nystagmus Tests

- Nystagmus is characterized by involuntary movement of the eyes
  - **Positional nystagmus** occurs when a person's head is in a specific position
  - **Spontaneous nystagmus** is nystagmus that occurs randomly, regardless of the position of the patient's head

Credits:
Open Source: www.wikipedia.com

- Refer patient to neurology and ENT for presence of either positional or spontaneous nystagmus

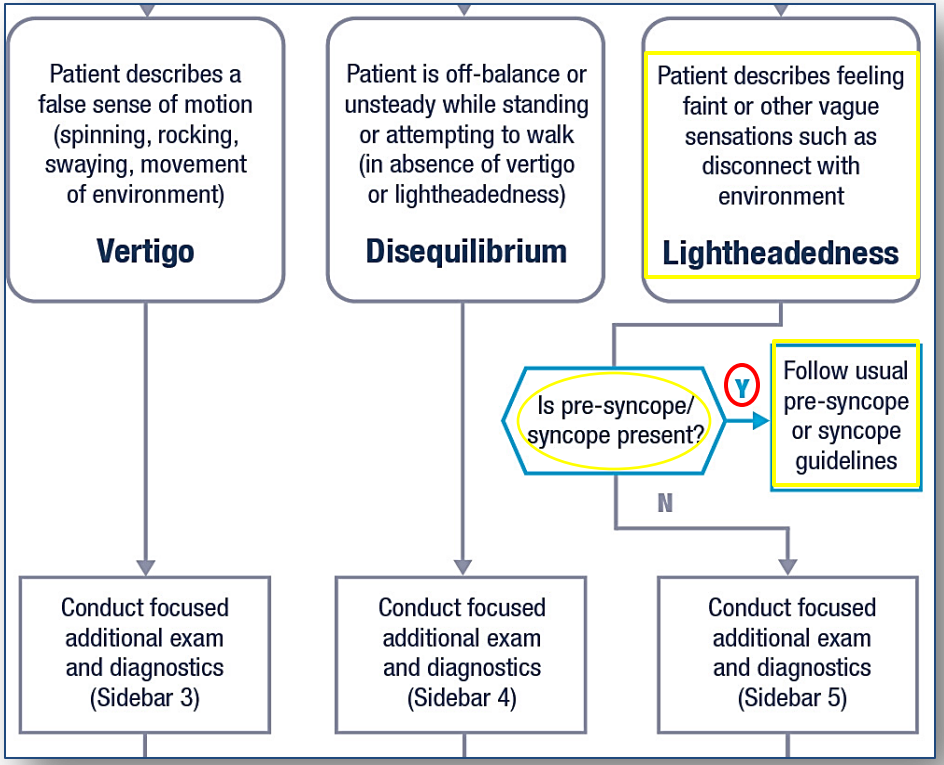
Rhomberg Test

- Rhomberg test is used to measure proprioception and vestibular function
- Rhomberg test can be performed using arms out or by patient's side
- Consider tandem Rhomberg for improved sensitivity
  - Observe any loss of balance
  - Excessive swing
- Any sign of ataxia will indicate a positive finding and should be referred to Neurology

DCoE Photos

Lightheadedness

Pre-Syncope/ Syncope



- Pre-syncope and syncope are common causes of lightheadedness
- Focused exam should include:
  - Orthostatic vital signs
  - Auscultation of carotids for bruits
  - Blood pressure measurements bilaterally to rule out subclavian steal syndrome
- If pre-syncope/syncope is present, follow usual guidelines for work-up and management

Focused Diagnostic Exams for Lightheadedness

- Recommended exams for lightheadedness and pre-syncope/ syncope, and recommended referrals

Table 6: Focused Diagnostic Exams to Consider for Lightheadedness and Pre-syncope/Syncope (Sidebar 5)	
Lightheadedness	**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	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 and possible referral to neurology
Diagnostic Neuroimaging	In conjunction with appropriate specialty referral

Laboratory Examination

- Laboratory exams include
  - Toxicology screening
  - Thyroid function
  - Glucose tolerance test (GTT)
  - Complete blood count (CBC)
  - Urinalysis
  - Serum chemistry

Other Considerations

- Assess patient for orthostatic hypotension
- Review patient's current medication for side effects
- Pre-syncope/syncope may mask the signs of lightheadedness
- Provider should follow usual practice guidelines if either condition is present

DoD Photo
Source: DefenseImagery.mil

Referral Recommendations

Immediate Referral Recommendations

- Immediate referral for patients within 7 days of mTBI with following symptoms or signs
  - Hearing loss
  - Focal neurological deficit
  - Persistent drainage from one or both ears
  - Signs of basilar skull fracture (battle's sign, raccoon eyes)
- Acute life-threatening conditions are rare

DoD Photo by TSgt Sean Worrell
Source: DefenseImagery.mil

Referral Recommendations

- Referrals specific to **vertigo** include:
  - Neurology
  - Audiology
  - ENT
  - Physical Therapy

Sidebar 6: Referral Matrix Tool

Dx	Diagnostic Exams	Neurology	Audiology	ENT	Physical Therapy*	Cardiology	Standard Practice	Psychologist or Psychiatrist
Vertigo	Neurological exam with attention to nystagmus	x						
	Primary position and gaze-evoked nystagmus	x		x				
	Gait Assessment	x			x			
	Dix-Hallpike Test	x	x	x	x			
	Otologic exam		x	x				
	Oculomotor exam	x						
	Rhomberg Test	x						

Sidebar 6 continues on next page

Referral Recommendations Cont.

- Referrals specific to **disequilibrium** include:
  - Neurology
  - Audiology
  - ENT
  - Physical Therapy

Sidebar 6 continued

Dx	Diagnostic Exams	Neurology	Audiology	ENT	Physical Therapy*	Cardiology	Standard Practice	Psychologist or Psychiatrist
Disequalibrium	Gait Assessment (native and tandem)	x			x			
	Spontaneous/positional nystagmus tests	x		x				
	Neuropathy	x						
	Rhomberg Test	x						
	Standard HEENT			x				
	Musculoskeletal exam**				x			
	Dix-Hallpike Test	x	x	x	x			

Referral Recommendations Cont.

- Referrals specific to **lightheadedness** include:
  - Neurology
  - Cardiology
  - Standard Practice
  - Behavioral Health

Sidebar 6 continued

Dx	Diagnostic Exams	Neurology	Audiology	ENT	Physical Therapy*	Cardiology	Standard Practice	Psychologist or Psychiatrist
Lightheadness	Positional blood pressure					x		
	Tilt test					x		
	Laboratory work including thyroid function, GTT and CBC-chem panel						x	
	Toxicology screen						x	
	Cognitive/neuropsychological exam	x						x
	Hyperventilation test	x				x		

General Management of Dizziness

DO

- Ensure appropriate headache management
- Prescribe antiemetics for nausea
- Consider Epley maneuver (or other canalith repositioning maneuvers) for BPPV
- Refer to physical therapy if no positive test results (in cases of disequilibrium)
- Consider referral to neurology and behavioral health for patients with multiple comorbidities

General Management of Dizziness

DO NOT

- 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

Patient Education

Educate patient on the following:

- Minimizing alcohol and caffeine
- Maintaining proper sleep hygiene
- Maintaining a dizziness/headache diary
- Performing physical activity/exercise to tolerance (avoid treadmills and running outdoors if dizzy)
- Fall prevention techniques

DoD Photo
Source: DefenseImagery.mil

Summary

- Overview of assessment and management of dizziness associated with mTBI:
  - Three types of dizziness include lightheadedness, vertigo, and disequilibrium
  - Assess for acute and subacute red flags
  - Conduct focused diagnostic exams for each type of dizziness
  - Provide appropriate specialty referrals including cardiology, neurology, ENT, audiology, physical therapy, or behavioral health

Case Study

Dizziness Case Study

On his third tour of duty in Afghanistan, SSGT Nowakowski sustained a concussion when his patrol truck was hit by an IED. His MACE score was 22/Red/B (nystagmus and balance problems), and multiple symptoms including headaches, unsteady balance, nausea vomiting, dizziness and ringing in the ears after the blast.

The unit medic identifies no red flags, obtains provider consultation, and gives him 24 hours mandatory rest with education on post-concussive care.

After 24 hours of rest, he was reevaluated and his MACE is 28. The symptoms of nausea, vomiting, ringing in the ears have subsided but he continues to complain of headache, unsteady balance, and dizziness.

Dizziness Case Study

The symptoms persist for four days at which point he is transferred to a level 2 facility. At level 2, he is reevaluated by occupational therapy and is given seven additional days of rest. He is prescribed Tylenol for headaches.

After seven days of rest and treatment with Tylenol, his headaches have improved, but he continues to experience dizziness symptoms, and is able to further describe the symptoms as:

- Continuous dizziness: “I feel a rocking motion as if I am in a boat”
- Gets worse with position changes and lifting backpack
- New onset of intermittent ringing in the right ear

He is then transferred to a level 3 facility at Bagram Air Field Hospital for specialty evaluation.

Dizziness Case Study

At level 3, he is evaluated by a primary care provider. The provider obtains a medical history and conducts a general physical examination along with CT scan. Pertinent history includes:

- Normal or negative head CT
- No prior head injuries, pre-injury vertigo, ear diseases, visual disturbances or migraines
- Orthostatic vital signs include: Supine blood pressure (BP) 124/70 mmHg, heart rate (HR) 72 beats/min (bpm) sitting BP 124/72 mmHg, HR 80 bpm, standing BP 128/74 mmHg, HR 84 bpm
- Respiratory rate 20/min
- Afebrile

- Past medical history:
  - Excellent health
  - No comorbid conditions, current medications or history of falls
  - No medications except Tylenol for HA
  - No sleep disorders, anxiety, visual disturbances or substance use disorders
- General appearance, expression, and speech all normal

Dizziness Case Study

The provider considers further medical evaluation with differential diagnosis including post-concussive syndrome and types of dizziness. The physical examination determines that there are no acute or subacute red flags.

Focused Diagnostic exam findings for Disequilibrium were:

- Positive Dix-Hallpike test
- Positive primary position and gaze-evoked nystagmus
- Positive Rhomberg test
- Positive Right ear tinnitus during otologic exam

Dizziness Case Study

Due to persistent dizziness complaints, nystagmus and the positive Dix-Hallpike test, SGT Nowakowski was referred to Neurology, Audiology, and ENT. He was also referred to physical therapy for vestibular and balance rehabilitation.

He was provided education on the management of dizziness and no pharmacological treatment was prescribed at this time.

Knowledge Test

Question 1:

In the case of SGT Nowakowski, what clinical findings helped differentiate disequilibrium from other types of dizziness?

a) Describes experiencing a false sense of motion (spinning, rocking, swaying, movement of environment).
b) Describes being off balance or unsteady when attempting to walk
c) Describes feeling faint while standing up and immediately being off balance
d) Describes feeling faint or vague sensation of disconnect with the environment.
e) None of the above are characteristics of disequilibrium

Answer: b: off-balance or unsteady to walk are characteristic signs of disequilibrium. Whereas, false sense of motion indicates vertigo, and feeling faint or vague sensation of disconnect with the environment would indicate lightheadedness. Feeling of faint when standing up could indicate pre-syncope.

Knowledge Test

Question 2:

Based on SGT Nowakowski's dizziness examination, what clinical finding would warrant a referral to Neurology?

a) Negative Dix-Hallpike test
b) Orthostatic Hypotension
c) Positive gaze-evoked nystagmus
d) Findings of right ear tinnitus Otologic exam
e) None of the above

Answer: c) A positive primary position and gaze-evoked nystagmus would warrant a referral to Neurology

Knowledge Test

Question 3:

If SGT Nowakowski presented post hospitalization with seizures and hearing loss what should the PCM obtain next?

a) Medication and fall history

b) Urgent referral to neurologist - acute red flag

c) Referral to neurologist- subacute red flags

d) a & b

e) a & c

Answer: d) A seizure would be considered an acute red flag, and would warrant an urgent referral to neurology.

Knowledge Test

Question 4:

All of the following are acute red flags for dizziness following mTBI except:

a) Weakness on one side of the body

b) Persistent gait instability

c) Unsteady on feet

d) Hearing loss

e) Amnesia

Answer: b) Persistent gait instability is considered a subacute/chronic red flag. All others are acute red flags.

Knowledge Test

Question 5:

Tilt table test, orthostatic vital signs, and toxicology screening are focused diagnostic exams that should be considered for which type of dizziness?

a) Vertigo
b) Spinning
c) Lightheadedness
d) Disequilibrium

Answer: c) All three diagnostic exams are performed to rule out pre-syncope/syncope from unexplained lightheadedness.