

Defense Health Agency
Deputy Assistant Director – Medical Affairs



DoD/VA Vision Center of Excellence

DHA Practice Recommendation:
Post-Concussion/Mild Traumatic Brain Injury (mTBI)
Assessment and Management of
Vision and Oculomotor Dysfunctions
for Eye Care Providers

Edition: 1
Date: June 2024



Defense Health Agency Falls Church, Virginia

**Post-Concussion/Mild Traumatic Brain Injury (mTBI)
Assessment and Management of
Vision and Oculomotor Dysfunctions
for Eye Care Providers
Edition: 1**

2024

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DHA Practice Recommendation: Overview and Disclaimer

DHA Practice Recommendations (PRs) are developed by experts utilizing the best information available at the time of publication. In some instances, some recommendations are expert opinion provided to users in the absence of definitive, well-designed and executed randomized control trials. DHA's PRs provide the field with an authoritative source of carefully synthesized clinical information. They are intended to assist clinical care teams with real-time decision making based on best available evidence.

While the DHA sponsors this PR, its endorsement of the findings and recommendations are limited to validation of expert opinion and compiled evidence of the sponsoring subject matter expert (SME) body. This PR should be used to augment the practitioner's best clinical judgment. It may not account for local or structural conditions (i.e., resourcing, staffing, equipment, or Health Protection Conditions) impacting clinical decision making in the field by the practitioner.

DHA PRs are separate and distinct from jointly developed Department of Veterans Affairs (VA) / DoD Clinical Practice Guidelines that are the product of rigorous, systematic literature review and synthesis. In contrast, DHA PRs provide the MHS practitioner with a synopsis of relevant clinical evidence tailored to the military medicine setting and TRICARE beneficiary population.

DHA PRs provide standardized evidence-informed guidelines that MHS practitioners should refer to when addressing patients with specific clinical conditions. Clinical practitioners must be mindful of the emergence of supervening clinical evidence published in the academic press not yet incorporated into the guideline.

This guideline is not intended to define a standard of care and should not be construed as such, nor should it be interpreted as prescribing an exclusive course of management for said condition or disease process. Variations in practice will inevitably and appropriately occur when clinicians consider the needs of individual patients, available resources, and limitations unique to an institution or type of practice. Every healthcare professional making use of this guideline is responsible for evaluating the appropriateness of applying it in the setting of any particular clinical situation.

This guideline is not intended to represent TRICARE policy. Further, inclusion of recommendations for specific testing and/or therapeutic interventions in this guide does not guarantee coverage of civilian sector care. Additional information on current TRICARE benefits may be found at www.tricare.mil or by contacting the regional TRICARE Managed Care Support Contractor.

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Assessment and Management of Vision and Oculomotor Dysfunctions after mTBI/Concussion for Eye Care Providers, Edition #1

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Algorithm

The use of this Practice Recommendation (PR) algorithm assumes a prior comprehensive eye exam and refraction were performed by an eye care provider, prior examination notes have been reviewed, the patient has been clinically diagnosed with a TBI, and other acute and chronic medical eye care conditions have been identified and/or are being managed appropriately (see [VCE Eye and Vision Care Following Blast Exposure and/or Possible Traumatic Brain Injury](#)). Patients should be advised to complete all questionnaires prior to the date of examination.

The recommendations included in this document should not replace sound clinical judgment or standard practice when caring for a patient.

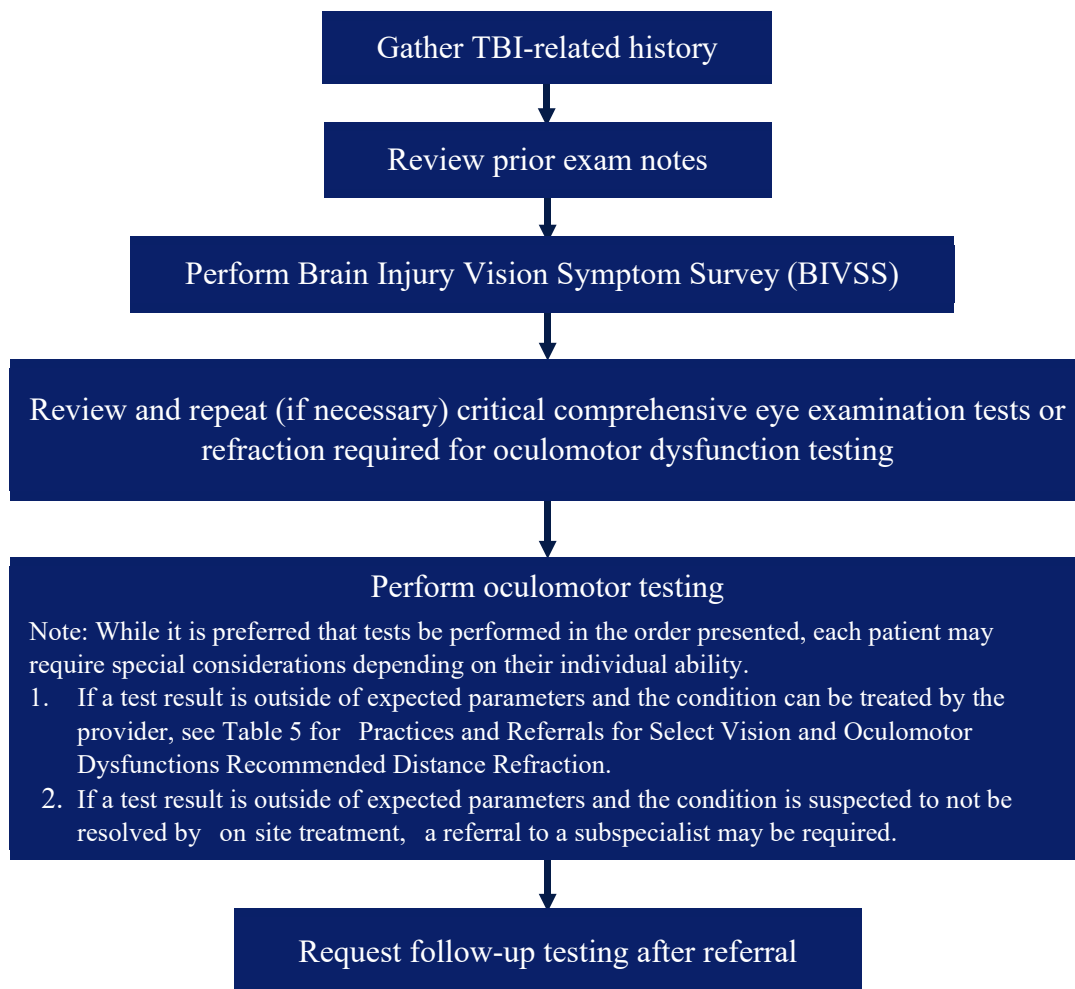


Figure 1. Algorithm for the Assessment and Management of Vision and Oculomotor Dysfunctions after mTBI/Concussion for the Eye Care Provider

Purpose

Concussion/mTBI can occur at any age in both military and civilian environments, resulting from a variety of situations including deployments, military training, falls, motor vehicle accidents, and as sequelae from sports injuries.¹ A significant portion of the brain is involved in vision, and it is not surprising that vision dysfunctions are common consequences of concussion/mTBI.^{2,3} According to the [Traumatic Brain Injury Center of Excellence \(TBICoE\)](#), from 2000 through 2022, more than 450,000 Service members were diagnosed with TBI, with more than 82% being categorized as having mTBI. According to [Visual Deficits and Dysfunctions Associated with Traumatic Brain Injury](#), up to 40% of Service members with mTBI experience visual dysfunctions (see Table 1). Visual dysfunctions following concussion/mTBI can have significant impact on duty requirements, performance, and quality of life for affected Service members and Veterans.^{4,5,6} Visual acuity, the most frequently measured indicator of ocular health, is usually not reduced after concussion/mTBI and, therefore, cannot be used as a single predictor of the impact of concussion/mTBI on the visual system.⁴ Instead, an eye care provider should employ a series of tests to assess the visual functions most frequently affected by concussion/mTBI.^{5,6}

Diagnosis

This PR was developed to enable eye care providers to diagnose and manage all patients of any age, including pediatric patients, experiencing vision and oculomotor problems after concussion/mTBI. This PR includes a supplemental concussion/mTBI history questionnaire and recommended diagnostic and treatment protocols, rehabilitation considerations, and referral suggestions. Patients should be advised to complete the questionnaires prior to the day of the examination. An accompanying step-by-step clinical decision algorithm is provided in Figure 1. The use of this PR assumes that:

- 1) a patient has been clinically diagnosed with concussion/mTBI. If the patient has not been clinically diagnosed or evaluated for a TBI, any health care provider can refer for evaluation and formal TBI diagnosis. Additionally, the patient may self-refer for TBI vision dysfunction evaluation. Patients who do not respond to initial management and have symptoms persisting >15 days may benefit from referral to TBI specialty clinic (e.g., Neuro-optometry or other). This specialty referral can come from any health care provider;
- 2) prior medical examination notes have been reviewed;
- 3) a comprehensive eye examination with refraction was performed by an eye care provider; and
- 4) other acute and chronic medical eye conditions have been identified and are currently being managed (see [VCE Eye and Vision Care Following Blast Exposure and/or Possible Traumatic Brain Injury](#)).

If the patient has not been clinically diagnosed with a concussion/mTBI then they must be referred for a TBI evaluation and formal diagnosis with their Primary Care Manager. At the point of TBI diagnosis, if they are suspected of having visual sequelae, a referral to an eye care provider must be made. If no comprehensive eye examination has been documented, a comprehensive eye examination should be performed first. The recommendations in this document should not replace sound clinical judgment or standard practice when caring for a patient.

Clinical Management: Expanded Patient Injury and Medical History

Additional questions about the history of concussion/mTBI should be asked during the examination to obtain a more complete description of the injury circumstances and to assist with subsequent ocular assessments and diagnoses. The suggested concussion/mTBI history questions are listed in Table 1.

Table 1. TBI History Questions List
When and where did the most recent injury occur (CONUS or OCONUS)?
What caused the concussion/mTBI (blast/blunt/both)?
Did you lose consciousness because of the concussion/mTBI? If so, for how long?
Were you confused or disoriented (alteration of consciousness) after the event? If so, for how long?
Did you experience pre- or post-event amnesia (memory loss) after the concussion/mTBI? If so, for how long?
Have you had a concussion/TBI evaluation and/or diagnosis by a medical professional? If so, when?
Tell me about your vision and balance issues.
Since your last concussion/mTBI, have you had any of the following issues? <ul style="list-style-type: none"> • Headaches after reading or performing visual tasks • Dizziness, nausea, or a spinning feeling • Balance problems • Double vision • Blurry vision • Light sensitivity • Trouble reading • Sensitivity to motion, or struggling in busy locations
Do your current vision issues negatively affect your ability to perform your duties? What is your current duty status or disability rating?

Medications^{7,8}

Because many medications can cause visual disturbances and exacerbate vision dysfunctions associated with concussion/mTBI, reviewing a patient’s medication list is important. Table 2 provides examples of vision and vestibular side effects of several categories of drugs (the list is not exhaustive). In addition, relevant multidisciplinary examination notes should be reviewed for important corroborating clinical findings.^{9,10} For additional information on specific medications, please refer to the U.S. Food and Drug Administration (FDA) approved-drugs website: [FDA-Approved Drugs](#).

Table 2. Medication History Sourced from the TBICoE Assessment and Management of Dizziness and Visual Disturbances Following Concussion/mTBI: Guidance for the Primary Care Manager		
Category	Examples	Dizziness and Vision Effects
Analgesics	Opioids, tramadol	Dizziness, orthostatic hypotension
Antidepressants	Selective serotonin reuptake inhibitors (SSRIs), serotonin and norepinephrine reuptake inhibitors (SNRIs), tricyclic antidepressants (TCAs), bupropion, mirtazapine, trazodone	Dizziness, orthostatic hypotension, sedation, or stimulation TCAs: accommodation difficulties, blurry vision
Anticholinergics, Antihistamines	Dimenhydrinate, diphenhydramine, meclizine, promethazine, scopolamine	Dizziness, orthostatic hypotension Accommodation difficulties, blurry vision, dry eye
Antipsychotics	Olanzapine, quetiapine	Dizziness, orthostatic hypotension, accommodation difficulties, blurry vision
Anxiolytics	Benzodiazepines (e.g., lorazepam), buspirone	Dizziness, drowsiness Benzodiazepines: hypotension, orthostatic hypotension
Central Nervous System (CNS) stimulants	Dextroamphetamine/ amphetamine, methylphenidate, caffeine	Dizziness, stimulation, accommodative difficulties, blurry vision, mydriasis
Migraine medications (prophylactic and abortive)	Anticonvulsants (e.g., topiramate, gabapentin) Beta-blockers (e.g., propranolol), Serotonin receptor agonists (e.g., sumatriptan)	Dizziness, drowsiness Topiramate: acute myopia and secondary angle closure glaucoma can occur days to one month after initiation Beta-blockers: hypotension, orthostatic hypotension
Muscle relaxants	Baclofen, cyclobenzaprine, methocarbamol	Dizziness, drowsiness, blurry vision, increased intraocular pressure
Sleep or sleep-related medications	Sedative-hypnotics (e.g., zolpidem, eszopiclone), prazosin, melatonin	Dizziness, drowsiness Sedative-hypnotics: vision changes Prazosin: ocular migraine, orthostatic hypotension

Testing and Evaluation Considerations of Oculomotor Dysfunctions Post-concussion/mTBI for the Eye Care Provider

Tables 3 and 4 list the most frequent vision dysfunctions associated with concussion/mTBI, tests to be performed to assess vision dysfunction, expected normal ranges, and required equipment. Abnormal results may indicate the need for further assessment, management, and/or referral.

After completing the comprehensive oculomotor evaluation, use the diagnostic criteria in Table 3 to identify whether the patient has normal or abnormal vergence, accommodation, and/or oculomotor function. If vergence, accommodative, and/or oculomotor dysfunction is observed, proceed to treatment or referral to a higher level of care. This information was largely sourced from *Accommodative, and Eye Movement Disorders*, Lippincott Williams & Wilkins; 2019.

Table 3. Diagnostic Criteria for Vergence, Accommodation, and Eye Movement Disorders	
Clinical Diagnosis & Findings with Diagnostic Criteria	
Convergence Insufficiency	
Must have: Exophoria at near: 4 pd greater exophoria than at distance – AND – one of the following: <ul style="list-style-type: none"> • Near point of convergence (NPC):³ 6 centimeter (cm) break • Positive fusional vergence (Convergence is tested with BO prism): ≤ 15 pd break and/or Sheard's* criterion not met • Vergence facility (D or N) (3 pd BI/12 pd BO): ≤ 9 cpm with difficulty fusing BO <i>Note: If the patient has a reduced NPC but does not meet the criterion of exophoria at near greater than 4 pd than at distance, consider noting as a Convergence Deficit in the chart.^{11,12}</i>	
Convergence Excess	
Must have: Esophoria at near: ³ 3 pd – AND – one of the following: <ul style="list-style-type: none"> • Negative fusional vergence (Divergence is tested with BI prism): < 8 pd break or fails Sheard's* criterion • Vergence facility (D or N) (3 pd BI/12 pd BO): ≤ 9 cpm; difficulty fusing BI prism 	
Fusional Vergence Dysfunction	
Has either: <ul style="list-style-type: none"> • Horizontal vergence amplitudes: Positive fusional vergence ≤ 15 pd break and negative fusional vergence: < 8 pd break • Vertical vergence amplitudes at D: Any imbalance of infra and supra vergence – OR – <ul style="list-style-type: none"> • Vergence facility (D or N) (3 pd BI/12 pd BO): ≤ 9 cpm with difficulty fusing BO and BI 	
Accommodative Insufficiency	
Monocular Criteria: Met in each eye: <ul style="list-style-type: none"> • Measured accommodative amplitude which is 2 diopters (or greater) less than the expected accommodative amplitude ($15 - (0.25 \times \text{age})$) • Monocular Accommodative Facility (MAF): ≤ 6 cpm (difficulty with minus lenses) 	
Accommodative Infacility	
Monocular Criteria: Met with each eye <ul style="list-style-type: none"> • MAF: ≤ 6 cpm (difficulty clearing plus or minus lenses) 	

Accommodative Excess
Monocular Criteria: Met with each eye <ul style="list-style-type: none"> MAF: ≤ 6 cpm (difficulty clearing plus lenses)
Accommodative Fatigue (Ill-sustained Accommodation)
Monocular Criteria: Met with each eye <ul style="list-style-type: none"> MAF: ≤ 6 cpm (MAF and Binocular Accommodative Facility deteriorate after 30 seconds. Progressive difficulty clearing minus lenses) Measured accommodative amplitude decreases from baseline with repeated (10x) testing over one minute
pd = prism diopter; BI = base-in; BO = base-out; cpm = cycles per minute; D = Distance; N= Near *Compensating vergence amplitudes (positive or negative fusional vergence) of at least twice the magnitude of the near phoria

**Table 4. Testing and Evaluation
for Vision and Oculomotor Dysfunctions Post-Concussion/mTBI**

**While performing tests in this order is preferable,
patients may require special considerations depending on their individual ability**

Parameter	Testing	Normal Results or Normal Range	Equipment Required
Concussion/mTBI Specific Vision Complaints	Brain Injury Vision Symptom Survey (BIVSS). See Appendix 1.	Score ≤ 31 points	BIVSS survey
Range of Motion	Ductions: monocular in all positions of gaze Versions: binocular in all positions of gaze	<ul style="list-style-type: none"> Lateral gaze: bury the sclera Upgaze: bury of 1/3 of the cornea Downgaze: bury 1/2 of the cornea 	None
Eye Movements ⁺	Saccades and Pursuits testing per Vestibular/Ocular-Motor Screening (VOMS) testing guidelines	Indication for further evaluation is an increase from baseline in: <ul style="list-style-type: none"> Visual symptoms Headache Dizziness Nausea Fogginess Diplopia 	VOMS
Distance Eye Alignment	Distance Unilateral Cover Test (DUCT) - AND - Prism Alternate Cover Test (PACT) in multiple positions of gaze	<ul style="list-style-type: none"> 1 pd esophoria to 3 pd exophoria, no vertical deviation < 5 pd difference in any position of gaze at the same working distance 	<ul style="list-style-type: none"> 20/30 column of letters at 6 m Occluder Horizontal prism bar Vertical prism bar

**Table 4. Testing and Evaluation
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**While performing tests in this order is preferable,
patients may require special considerations depending on their individual ability**

Parameter	Testing	Normal Results or Normal Range	Equipment Required
Distance Vertical Fusional Vergence Ranges	Distance vertical step vergence testing	<ul style="list-style-type: none"> • Base up and base down are balanced • BD OD and OS: 2/1 	<ul style="list-style-type: none"> • 20/30 row of letters at 6 m • Vertical prism bar 0.5 pd steps
Distance Horizontal Fusional Vergence Range	Negative (NFV) and Positive (PFV) fusion step vergence testing (Perform NFV first)	<ul style="list-style-type: none"> • NFV BI: 7/4 • PFV BO: 11/7 	<ul style="list-style-type: none"> • 20/30 column of letters at 6 m • Horizontal prism bar
Distance Fusional Vergence Facility	Distance vergence facility testing	<ul style="list-style-type: none"> • Abnormal: < 12 cpm • Normal: 15 cpm (+/- 3 cpm) 	<ul style="list-style-type: none"> • 20/30 column of letters at 6 m • 12/3 pd BO/BI combination prism
Near Eye Alignment	Near Unilateral Cover Test (NUCT) Prism Alternate Cover Test (PACT) in multiple positions of gaze - OR - Modified Thorington Test	<ul style="list-style-type: none"> • Orthophoria (ortho) to 6 pd exophoria, no vertical deviation • < 5 pd difference in any position of gaze at the same working distance • Near: ortho to 6 pd exophoria • No vertical deviation 	<ul style="list-style-type: none"> • 20/30 column of letters on fixation stick at 40 cm • Horizontal prism bar • Vertical prism bar • Modified Thorington card • Maddox rod • Penlight
Near Horizontal Fusional Vergence Ranges	Negative (NFV) and Positive (PFV) fusion step vergence testing (Perform NFV first)	<ul style="list-style-type: none"> • NFV BI: 13/10 • PFV BO: 19/14 	<ul style="list-style-type: none"> • 20/30 column of letters on fixation stick at 40 cm • Horizontal prism bar
Convergence Amplitude ⁺	Near point of convergence (NPC)/push up (Perform 5 times)	<ul style="list-style-type: none"> • Break: < 6 cm • Recovery: 9 cm 	<ul style="list-style-type: none"> • 20/30 column of letters on fixation stick at 40 cm • 30 cm ruler - OR - • Near point rod or commercially available accommodation rule with 20/30 column of letters at 40 cm

**Table 4. Testing and Evaluation
for Vision and Oculomotor Dysfunctions Post-Concussion/mTBI**

**While performing tests in this order is preferable,
patients may require special considerations depending on their individual ability**

Parameter	Testing	Normal Results or Normal Range	Equipment Required
Near Fusional Vergence Facility	Vergence facility testing	<ul style="list-style-type: none"> • Abnormal: < 12 cpm • Normal: 15 cpm (+/- 3 cpm) 	<ul style="list-style-type: none"> • 20/30 column of letters on fixation stick at 40 cm • 12 BO/3 BI combination prism
Accommodative Amplitude (monocular) ⁺	Push-up method: 10 times testing over one minute	<ul style="list-style-type: none"> • (15 – (0.25 X age)), no decrease in amplitude with repeated testing 	<ul style="list-style-type: none"> • 20/30 column of letters on fixation stick at 40 cm if performed without near point rod • 30 cm ruler <li align="center">- OR - • Near point rod with 20/30 column of letters
Monocular Accommodative Facility (MAF)	Monocular accommodative facility	<ul style="list-style-type: none"> • Abnormal: < 6 cpm • Normal: 11 cpm (+/- 5 cpm) 	<ul style="list-style-type: none"> • 20/30 column of letters on fixation stick at 40 cm +2.00/-2.00 flippers (for < 30 years old) • +1.50/-1.50 (for > 30 years old)
Photophobia	Visual Light Sensitivity Questionnaire (VLSQ-8)	<ul style="list-style-type: none"> • Use score as baseline level for comparison at follow-up visits 	<ul style="list-style-type: none"> • VLSQ-8
⁺ Tests used for rapid screening of oculomotor dysfunctions following TBI (see Additional Resources p.16)			

Treatment and Referral

Many oculomotor dysfunctions in patients with TBIs can be corrected with proper refraction and corresponding distance correction. It is recommended that patients wear new correction for at least a week and then be retested. Conditions identified by testing and evaluation may require oculomotor rehabilitation and/or secondary referral beyond primary treatment protocols. Table 5 lists primary treatments and rehabilitation/referral options for select oculomotor dysfunctions. A detailed description of oculomotor rehabilitation can be found in the text of Scheiman M and Wick B, *Clinical Management of Binocular Vision: Heterophoric, Accommodative, and Eye Movement Disorders*.

Table 5. – Practices and Referrals for Select Vision and Oculomotor Dysfunctions Recommended Distance Refraction: Maximum Tolerated Plus Power Should Be Prescribed Unless Otherwise Indicated		
Condition/Eye Movement Problem	Additional Treatment	Secondary Treatment or Referral
Accommodative insufficiency	Plus lenses	Oculomotor rehabilitation
Accommodative fatigue (Ill-sustained accommodation)	Plus lenses and/or oculomotor rehabilitation	Oculomotor rehabilitation
Accommodative excess	Accommodative oculomotor rehabilitation	Full distance prescription
Accommodative infacility	Accommodative oculomotor rehabilitation	
Convergence insufficiency	Oculomotor rehabilitation	Prism correction
Convergence excess	Plus lenses or prism	Oculomotor rehabilitation
Fusional vergence dysfunction	Oculomotor rehabilitation and/or prism	
Divergence insufficiency	Prism	<ul style="list-style-type: none"> • Oculomotor rehabilitation • Surgical and/or neuroimaging consultation if oculomotor rehabilitation is not effective
Divergence excess	Oculomotor rehabilitation	Surgical consultation if oculomotor rehabilitation is not effective
Basic exophoria	Oculomotor rehabilitation	Surgical consultation if oculomotor rehabilitation is not effective
Basic esophoria	Prism	Oculomotor rehabilitation
Photophobia	Light sensitivity readaptation and/or possible gradual reduction in tinted lens density or time used	Evaluation for migraine/cervicogenic headache and onabotulinumtoxinA (Botox [®]) injection ¹³
Strabismus	Oculomotor rehabilitation and/or prism	Surgical consultation

Red Flags^{7,8}

Conditions after TBI indicating possible ocular, cranial nerve, dizziness, or structural brain injury, which may be sight or life-threatening, require immediate management by the eye care provider as well as a referral to an emergency department and/or more specialized care consultation including neuro-ophthalmology or neurology.

Table 6. Red Flags for Immediate Referral to Emergency Department
Indications for Immediate Referral
Abnormal external eye exam (e.g., evidence of infection or hemorrhage) or acute visual signs and symptoms (e.g., evidence of trauma, severe eye pain, flashes, floaters, ptosis, severe photophobia)
Acute onset of unequal pupils
Acute onset vision loss/visual field deficit
Acute onset double vision
Third nerve palsy with or without pupil involvement
Slurred speech, declining neurological examination, weakness or numbness, poor balance, worsening headache, vomiting

Coding Guidance and Order of Coding

The following link provides coding guidance on a variety of oculomotor dysfunctions and other vision injuries associated with TBI:

[ICD-10 Coding Guidance for Oculomotor Dysfunctions and Other Vision Injuries Associated with TBI](#)

For a DoD eye care provider visit, the order of coding is:

1. The first diagnosis is the symptom that best represents the patient's chief complaint(s) or symptom(s) (headache, photophobia, etc.).**
2. Second in the sequence is the TBI diagnostic code.**
3. Third is the deployment status code (if applicable).
4. Fourth is the external cause of morbidity code(s) which describes how the accident occurred.
5. Other symptoms and diagnoses follow next.
6. Last is the DoD personal history of TBI code.

See the example below for how these codes should look:

- R51.9 – Headache, unspecified; H53.143 – Visual Discomfort, bilateral
- S06.0X0S – Concussion, no LOC, sequela
- Z56.82 – Military Deployment Status – Currently deployed
- Y37.230S – Military operations involving explosion of IED, military personnel, sequela
- H52.13 – Myopia, bilateral
- Any TBI-related personal history code

**For a VA eye care provider visit, TBI diagnostic code should be listed first, followed by the chief complaint.

ICD-10 Codes for TBI-related Vision Conditions

ICD-10 CODING GUIDANCE FOR OCULOMOTOR DYSFUNCTIONS AND OTHER VISION INJURIES ASSOCIATED WITH TRAUMATIC BRAIN INJURY (TBI)

Strabismus Disorders		H49
Paralytic strabismus/ Nerve palsy	H49.XX	
Third [oculomotor] nerve palsy	H49.0	
Third [oculomotor] nerve palsy, unspecified eye	H49.00	
Third [oculomotor] nerve palsy, right eye	H49.01	
Third [oculomotor] nerve palsy, left eye	H49.02	
Third [oculomotor] nerve palsy, bilateral	H49.03	
Fourth [trochlear] nerve bilateral	H49.1	
Fourth [trochlear] nerve palsy, unspecified	H49.10	
Fourth [trochlear] nerve palsy, right eye	H49.11	
Fourth [trochlear] nerve palsy, left eye	H49.12	
Fourth [trochlear] nerve palsy, bilateral	H49.13	
Sixth [abducent] nerve palsy	H49.2	
Sixth [abducent] nerve palsy, unspecified eye	H49.20	
Sixth [abducent] nerve palsy, right eye	H49.21	
Sixth [abducent] nerve palsy, left eye	H49.22	
Sixth [abducent] nerve palsy, bilateral	H49.23	
Other Strabismus		H50
Esotropia	H50.0	
Exotropia	H50.1	
Vertical strabismus, right eye	H50.21	
Vertical strabismus, left eye	H50.22	
Esophoria	H50.51	
Exophoria	H50.52	
Vertical heterophoria	H50.53	
Cyclophoria	H50.54	
Alternating heterophoria	H50.55	
Other Disorders of Binocular Movement		H51
Convergence insufficiency	H51.11	
Internuclear ophthalmoplegia	H51.2	
Internuclear ophthalmoplegia, unspecified eye	H51.20	

Internuclear ophthalmoplegia, right eye	H51.21	
Internuclear ophthalmoplegia, left eye	H51.22	
Internuclear ophthalmoplegia, bilateral	H51.23	
Other specified disorders of binocular movement	H51.8	
Unspecified disorders of binocular movement	H51.9	
Disorders of Refraction and Accommodation		H52
Hypermetropia	H52.0	
Hypermetropia, unspecified eye	H52.00	
Hypermetropia, right eye	H52.01	
Hypermetropia, left eye	H52.02	
Hypermetropia, bilateral	H52.03	
Myopia	H52.1	
Myopia, unspecified eye	H52.10	
Myopia, right eye	H52.11	
Myopia, left eye	H52.12	
Myopia, bilateral	H52.13	
Unspecified astigmatism	H52.0	
Astigmatism	H52.22	
Astigmatism, right eye	H52.201	
Astigmatism, left eye	H52.202	
Astigmatism, bilateral	H52.203	
Astigmatism, unspecified eye	H52.209	
Anisometropia	H52.31	
Aniseikonia	H52.32	
Presbyopia	H52.4	
Accommodative dysfunction (paresis of accommodation)	H52.52	
Paresis of accommodation, right eye	H52.521	
Paresis of accommodation, left eye	H52.522	
Paresis of accommodation, bilateral	H52.523	
Paresis of accommodation, unspecified eye	H52.529	
Accommodative dysfunction (spasm of accommodation)	H52.53	
Spasm of accommodation, right eye	H52.531	
Spasm of accommodation, left eye	H52.532	

Spasm of accommodation, bilateral	H52.533
Spasm of accommodation, unspecified eye	H52.539
Visual Disturbances	H53
Diplopia	H53.2
Unspecified disorder of binocular vision	H53.30
Fusion with defective stereopsis	H53.32
Suppression of binocular vision	H53.34
Visual field defects	H53.4
Visual field defects, unspecified	H53.40
Scotoma involving central area	H53.41
Scotoma involving central area, right eye	H53.411
Scotoma involving central area, left eye	H53.412
Scotoma involving central area, bilateral	H53.413
Scotoma involving central area, unspecified eye	H53.419
Scotoma of blind spot area	H53.42
Scotoma of blind spot area, right eye	H53.421
Scotoma of blind spot area, left eye	H53.422
Scotoma of blind spot area, bilateral	H53.423
Scotoma of blind spot area, unspecified eye	H53.429
Sector or arcuate defects	H53.43
Sector or arcuate defects, right eye	H53.431
Sector or arcuate defects, left eye	H53.432
Sector or arcuate defects, bilateral	H53.433
Sector or arcuate defects, unspecified eye	H53.439
Other localized visual field defect	H53.45
Other localized visual field defect, right eye	H53.451
Other localized visual field defect, left eye	H53.452
Other localized visual field defect, bilateral	H53.453
Other localized visual field defect, unspecified eye	H53.459

Homonymous bilateral field defects	H53.46
Homonymous bilateral field defects, right side	H53.461
Homonymous bilateral field defects, left side	H53.462
Homonymous bilateral field defects, unspecified side	H53.469
Heteronymous bilateral field defects	H53.47
Generalized contraction of the visual field	H53.48
Generalized contraction of the visual field, right eye	H53.481
Generalized contraction of the visual field, left eye	H53.482
Generalized contraction of the visual field, bilateral	H53.483
Generalized contraction of the visual field, unspecified eye	H53.489
Subjective visual disturbances	H53.1
Subjective visual disturbance, unspecified	H53.10
Transient vision loss	H53.12
Transient vision loss, right eye	H53.121
Transient vision loss, left eye	H53.122
Transient vision loss, bilateral	H53.123
Transient vision loss, unspecified eye	H53.129
Sudden vision loss	H53.13
Sudden vision loss, right eye	H53.131
Sudden vision loss, left eye	H53.132
Sudden vision loss, bilateral	H53.133
Sudden vision loss, unspecified eye	H53.139
Visual discomfort	H53.14
Visual discomfort, right eye	H53.141
Visual discomfort, left eye	H53.142
Visual discomfort, bilateral	H53.143
Visual discomfort, unspecified eye	H53.149
Visual distortions of shape and size	H53.15
Psychophysical visual disturbances	H53.16
Glare sensitivity (<i>Photophobia*</i>)	H53.71
Blindness and Low Vision	H54
Blindness, both eyes	H54.0
Blindness, both eyes, different category levels	H54.0X

Blindness right eye, category 3	H54.0X3
Blindness right eye category 3, blindness left eye category 3	H54.0X33
Blindness right eye category 3, blindness left eye category 4	H54.0X34
Blindness right eye category 3, blindness left eye category 5	H54.0X35
Blindness right eye, category 4	H54.0X4
Blindness right eye category 4, blindness left eye category 3	H54.0X43
Blindness right eye category 4, blindness left eye category 4	H54.0X44
Blindness right eye category 4, blindness left eye category 5	H54.0X45
Blindness right eye, category 5	H54.0X5
Blindness right eye category 5, blindness left eye category 3	H54.0X53
Blindness right eye category 5, blindness left eye category 4	H54.0X54
Blindness right eye category 5, blindness left eye category 5	H54.0X55
Blindness, one eye, low vision other eye	H54.1
Blindness, one eye, low vision other eye, unspecified eyes	H54.10
Blindness, right eye, low vision left eye	H54.11
Blindness right eye category 3, low vision left eye	H54.113
Blindness right eye category 3, low vision left eye category 1	H54.1131
Blindness right eye category 3, low vision left eye category 2	H54.1132
Blindness right eye category 4, low vision left eye	H54.114
Blindness right eye category 4, low vision left eye, category 1	H54.1141
Blindness right eye category 4, low vision left eye category 2	H54.1142
Blindness right eye category 5, low vision left eye	H54.115
Blindness right eye category 5, low vision left eye category 1	H54.1151
Blindness right eye category 5, low vision left eye category 2	H54.1152
Blindness, left eye, low vision right eye	H54.12
Low vision right eye category 1, blindness left eye	H54.121
Low vision right eye category 1, blindness left eye category 3	H54.1213

Low vision right eye category 1, blindness left eye category 4	H54.1214
Low vision right eye category 1, blindness left eye category 5	H54.1215
Low vision right eye category 2, blindness left eye	H54.122
Low vision right eye category 2, blindness left eye category 3	H54.1223
Low vision right eye category 2, blindness left eye category 4	H54.1224
Low vision right eye category 2, blindness left eye category 5	H54.1225
Low vision, both eyes	H54.2
Low vision, both eyes, different category levels	H54.2X
Low Vision, right eye, category 1	H54.2X1
Low vision right eye category 1, low vision left eye category 1	H54.2X11
Low vision right eye category 1, low vision left eye category 2	H54.2X12
Low Vision right eye, category 2	H54.2X2
Low vision right eye category 2, low vision left eye category 1	H54.2X21
Low vision right eye category 2, low vision left eye category 2	H54.2X22
Unqualified visual loss, both eyes	H54.3
Blindness, one eye	H54.4
Blindness, one eye, unspecified eye	H54.40
Blindness, right eye, normal vision left eye	H54.41
Blindness, right eye, category 3	H54.413
Blindness right eye category 3, normal vision left eye	H54.413A
Blindness, right eye, category 4	H54.414
Blindness right eye category 4, normal vision left eye	H54.414A
Blindness, right eye, category 5	H54.415
Blindness right eye category 5, normal vision left eye	H54.415A
Blindness, left eye, normal vision right eye	H54.42
Blindness, left eye, category 3-5	H54.42A
Blindness left eye category 3, normal vision right eye	H54.42A3
Blindness left eye category 4, normal vision right eye	H54.42A4
Blindness left eye category 5, normal vision right eye	H54.42A5
Low vision, one eye	H54.5

Low vision, one eye, unspecified eye	H54.50
Low vision, right eye, normal vision left eye	H54.51
Low vision, right eye, category 1	H54.511
Low vision right eye category 1, normal vision left eye	H54.511A
Low vision right eye category 2, normal vision left eye	H54.512A
Low vision, left eye, normal vision right eye	H54.52
Low vision, left eye, category 1-2	H54.52A
Low vision left eye category 1, normal vision right eye	H54.52A1
Low vision left eye, category 2, normal vision right eye	H54.52A2
Unqualified visual loss, one eye	H54.6
Unqualified visual loss, one eye, unspecified eye	H54.60
Unqualified visual loss, right eye, normal vision left eye	H54.61
Unqualified visual loss, left eye, normal vision right eye	H54.62
Unspecified visual loss	H54.7
Legal blindness, USA definition	H54.8
Nystagmus and Other Irregular Eye Movements	H55
Nystagmus	H55.0
Latent nystagmus	H55.02
Visual deprivation nystagmus	H55.03

Dissociated nystagmus	H55.04
Other forms of nystagmus	H55.09
Deficient saccadic eye movements	H55.81
Other irregular eye movements	H55.89
Disorders of Pupil Function	H57
Anomalies of pupillary function	H57.0
Unspecified anomaly of pupillary function	H57.00
Anisocoria	H57.02
Miosis	H57.03
Mydriasis	H57.04
Other anomalies of pupillary function	H57.09
Dizziness (Disorders of Vestibular Function)	H81/R42
Other peripheral vertigo	H81.39
Vertigo of central origin	H81.4
Unspecified disorder of vestibular function	H81.9
Dizziness and giddiness, which includes disequilibrium	R42
Other	
<i>Photophobia*</i> (See Glare sensitivity)	H53.71
Dry eye syndrome	H04.12
Dry eye syndrome of bilateral lacrimal glands	H04.123

*Photophobia has no specific coding under ICD10. Photophobia can be coded using H53.71, Glare sensitivity. Utilizing this coding methodology, H53.71 in the context of TBI will be interpreted as photophobia for surveillance and analysis purposes.

This document is a reference for the International Classification of Disease, Tenth Revision, Clinical Modification (ICD-10-CM) diagnostic medical billing codes effective on FY 2024 - October 1, 2023. <https://icd10cmttool.cdc.gov/?fy=FY2024>

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Appendix

BIVSS

- I have had a medical diagnosis of a brain injury. (check box if true) My brain injury was ____ years ago.
- I suffered a brain injury but was not diagnosed by a medical professional. (Check box if true)
- I have not had a previous brain injury. (Check box if true)

Your age: _____ Today's date: _____ Your zip code: _____

Symptom Checklist

Circle a number below:

Please rate each behavior How often does each behavior occur? (Circle a number)	Never	Seldom	Occasionally	Frequently	Always
Eyesight Clarity					
Distance vision blurred and not cleared – even with lenses	0	1	2	3	4
Near vision blurred and not cleared – even with lenses	0	1	2	3	4
Clarity of vision changes or fluctuates during the day	0	1	2	3	4
Poor night vision/can't see well to drive at night	0	1	2	3	4
Visual Comfort					
Eye discomfort/sore eyes/eyestrain	0	1	2	3	4
Headaches or dizziness after using eyes	0	1	2	3	4
Eye fatigue/very tired after using eyes all day	0	1	2	3	4
Feel "pulling" around eyes	0	1	2	3	4
Doubling					
Double vision – especially when tired	0	1	2	3	4
Have to close or cover one eye to see clearly	0	1	2	3	4
Print moves in and out of focus when reading	0	1	2	3	4
Light Sensitivity					
Normal indoor light is uncomfortable – too much glare	0	1	2	3	4
Outdoor light is too bright – have to use sunglasses	0	1	2	3	4
Indoor fluorescent lighting is bothersome or annoying	0	1	2	3	4
Dry Eyes					
Eyes feel "dry" and sting	0	1	2	3	4
"Stare" into space without blinking	0	1	2	3	4
Have to rub eyes a lot	0	1	2	3	4
Depth Perception					
Clumsiness/misjudge where objects really are	0	1	2	3	4
Lack of confidence walking/missing steps/stumbling	0	1	2	3	4
Poor handwriting (space, size, legibility)	0	1	2	3	4
Peripheral Vision					
Side vision distorted/objects move or change position	0	1	2	3	4
What looks straight ahead – isn't always straight ahead	0	1	2	3	4
Avoid crowds – can't tolerate "visually busy" places	0	1	2	3	4
Reading					
Short attention span/easily distracted when reading	0	1	2	3	4
Difficulty/slowness with reading and writing	0	1	2	3	4
Poor reading comprehension/can't remember what was read	0	1	2	3	4
Confusion of words/skip words during reading	0	1	2	3	4
Lose place/have to use finger not to lose place when reading	0	1	2	3	4

Statement of Authorship

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The authors declare no conflicts of interest.

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