CLINICAL RECOMMENDATION

SCREENING FOR OCULOMOTOR DYSFUNCTIONS FOLLOWING TRAUMATIC BRAIN INJURY (TBI)

Purpose: This clinical recommendation (CR) specifies a rapid screening method for use in the eye care environment. Its use helps identify individuals who are affected by certain oculomotor dysfunctions that are prevalent after TBI, and which may negatively affect visual quality of life, post-TBI rehabilitation, return to duty, and reintegration to employment and other life activities.

The use of this CR assumes that a patient has been diagnosed or is suspected of having a TBI, that a refraction has been performed, and that other acute and chronic medical eye conditions have been identified and are being managed (see VCE Clinical Recommendation for the Eye Care Provider: Eye and Vision Care Following Blast Exposure and/or Possible Traumatic Brain Injury).[1]

This CR further specifies the detailed clinical methods and expected norms for the oculomotor systems of interest. Patients who fall outside the normative values on testing should be referred for more specialized care (see VCE Clinical Recommendation for the Eye Care Provider: Assessment and Management of Oculomotor Dysfunctions Associated with Traumatic Brain Injury).[2]

I. Accommodation

Test: Measure the monocular accommodative amplitude via the push-up method.

Testing accommodation in patients over 44 years of age is not performed, because of expected age-related accommodative loss.

Equipment needed:

1. Measuring Device – An ophthalmic near-point ruler (rule/rod) calibrated in both distance (centimeters [cm]) and accommodation (Diopters [D]) is preferable to achieve precision. Eye care providers can use one of the following rulers with a visual target:

Figure 1. Patient view of visual target.

   A. Near-point rule calibrated in cm and D, available commercially
   B. Near-point phoropter rod calibrated in cm and D (note: phoropter rod does not start at 0 cm)
   C. A centimeter ruler. Diopters of accommodation can be calculated using the formula: D=100/distance in cm.

2. Visual Target – The standard, best target is a single vertical column of Arial 4-point font that is mounted (or held) to traverse along the lower edge of the near-point ruler measuring device (see Fig. 1) (click here for downloadable test font).

Referral Criteria: Anything outside of the normative values for accommodation (Table 1) is an indication for referral.

Procedure:

1. Provide good illumination (60W or better directed at the visual target or lower illumination if the patient demonstrates photophobia during the test).
2. Begin testing with the patient wearing his/her habitual prescription glasses for distance viewing (reading glasses or near add power should NOT be used).

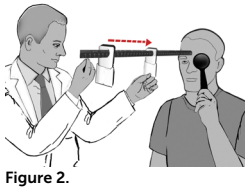

Figure 2.

3. Cover the patient's left eye.
4. Hold the near-point rule with the target below the ruler and with the lower edge of the ruler placed just above the patient's right eye at the level of his/her brow. Begin with the letter target placed toward the end of the ruler (typically 40 cm).
5. Instruct the patient to tell you when the letters first start to blur, but to try to keep the letters clear for as long as possible.

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6. Slowly move the target toward the patient at approximately 1-2 cm/sec until the patient reports first blurriness (see Fig. 2). Pause for 1-2 seconds and ask the patient if target stays blurry or becomes clear. If the target becomes clear, continue moving the target closer until it is blurred again. Stop moving the target when the blur does not clear ("sustained blur").
7. Measure the distance from the sustained blur point to the forehead just above the level of the patient's brow (zero measuring point) rounded to the nearest one-half centimeter.
8. Repeat the steps above with the ruler above the left eye and the right eye covered.
9. Record finding and refer if accommodative amplitude falls below age-related normative value.

Age (yrs)	Monocular Amplitude of Accommodation (Diopters)
6-8	11-15
9-12	10-14
13-16	9-13
17-20	8-12
21-24	7-11
25-28	6-10
29-32	5-9
33-36	4-8
37-40	3-7
41-44	2-6

Table 1. Normative values for Accommodation

*Diopters (D)=100/distance in cm

II. Near Point of Convergence (NPC)

Test: Measure the near point of convergence.

Equipment needed: The same near point rod and target used in the measurement of accommodation (see Section I).

Referral Criteria: Any NPC > 6 cm is considered a receded NPC, and is an indication for a referral.

Procedure:

1. Provide good illumination (60W or better directed at the visual target or lower illumination if the patient demonstrates photophobia during the test).
2. Begin testing with the patient wearing his/her habitual prescription. If the patient has multifocal lenses or reading glasses, testing should be performed through these lenses.
3. The patient should leave both eyes open.
4. Hold the lower edge of the measuring device on the center of the patient's forehead just above the level of his/her brow (so the patient is looking downward at a 15° angle from horizontal at the target). Begin with the target placed at the 40-cm mark on the rule.
5. Instruct the patient to look at the letters and to report when the patient experiences double vision (diplopia) but have the patient try to keep the target one/single as long as possible. Slowly (1-2 cm/sec) move target toward the patient (see Fig. 3). When diplopia is reported by the patient, stop moving the target, pause for 1-2 seconds, and ask the patient: "Do the letters remain double or do they become single again?"
6. If the letters become single within 1-2 seconds, continue slowly moving the target toward the patient until the patient is unable to regain fusion. Do not hold the target in place for longer than 2 seconds.

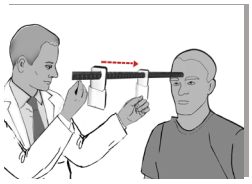


Figure 3.

7. If the letters remain double, this endpoint is the NPC break.
8. If the examiner observes a loss of fusion without a report of double vision, or if either eye turns outwardly, or fixation shifts between right and left eye, the point at which either of the above occurs is considered the NPC break.
9. Measure the distance from the point of NPC break to the center of the patient's forehead just above the eyebrow (zero measuring point) rounded to the nearest half-centimeter.
10. If the patient can maintain fused single vision until the target is against the nose/brow (i.e., NPC break does not occur), the measurement is recorded as "To The Nose or TTN".
11. Record the NPC break and refer if NPC is receded. After the NPC break is recorded, the NPC recovery must be recorded.
12. To start the NPC recovery, begin from the NPC break point and slowly (1-2 cm/sec) move the target away from the patient and instruct the patient to try to regain fusion as quickly as possible. When single vision is reported by the patient, this is the endpoint of the NPC recovery. A normal NPC recovery is less than 8cm.

III. Oculomotor Dysfunction (Saccades/Pursuits)*

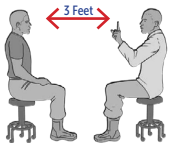
Test: Measure Ocular Pursuits and Saccades

Equipment Needed: None

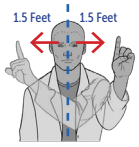
Referral Criteria: Any abnormal value of the following test and/or any increase in visual symptoms and/or headache, dizziness, nausea, fogginess from the baseline during this testing is an indication for referral for a complete eye TBI examination.

Smooth Pursuits:

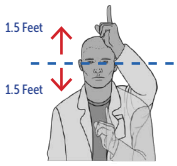
Procedure:



- Sit facing the patient.
- Instruct the patient to perform this test with their eye movements alone, while holding their head in the straight ahead position.
- Hold the tip of your index finger at the patient's midline 3 feet away from the patient.



- While the patient focuses on your fingertip, smoothly move your fingertip 1.5 feet from the patient's midline to your left.
- Then move your fingertip 1.5 feet from the patient's midline to the right (it should take 2 seconds to move this 3 foot distance).
- Perform twice.

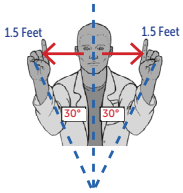


- With the patient focused on your fingertip, raise your finger 1.5 feet above the patient's eye level.
- Then lower your fingertip 1.5 feet below the patient's eye level (it should take 2 seconds to move this 3 foot distance). Perform twice.
- Abnormal value - inability to visually follow pursuit and or saccades are substituted for the smooth pursuit eye movements.
- Record the results and refer if appropriate.

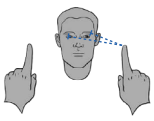
Horizontal Saccades:

Procedure:

- Sit facing the patient.
- Instruct the patient to perform this test with their eye movements alone, while holding their head in the straight ahead position.



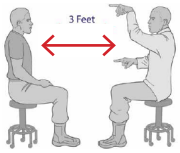
- Hold your left-index fingertip 1.5 feet from the patient's midline and your right-hand index fingertip 1.5 feet from the patient's midline, about 3 feet from the patient (so that the patient must gaze 30° left and 30° right).
- Ask the patient to move his/her eyes from one fingertip to another as quickly as possible.
- Repeat 10 times.



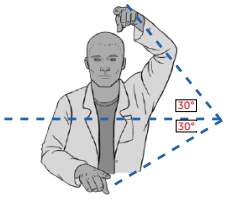
- Abnormal value - saccades are dysmetric (ie: inaccurate because of undershooting, overshooting, or making 2 or more saccades to visually fixate the intended target instead of one accurate saccade).
- Record the results and refer if appropriate.

Vertical Saccades:

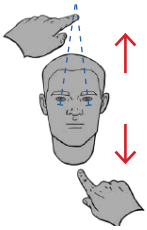
Procedure:



- Sit facing the patient.
- Instruct the patient to perform this test with their eye movements alone, while holding their head in the straight ahead position.



- Hold one index fingertip 1.5 feet above the patient's midline and the other index fingertip 1.5 feet below the patient's midline, with both finger tips held about 3 feet away from the patient (so that the patient gazes 30° up and 30° down).
- Ask the patient to move their eyes from one fingertip to another as quickly as possible.
- Perform 10 times.



- Abnormal value saccades are dysmetric (ie: inaccurate because of undershooting, overshooting, or making 2 or more saccades to visually fixate the intended target instead of one accurate saccade).
- Record the results and refer if appropriate.

*The instructional figures in this section are adopted from Vestibular/Oculomotor Motor Assessment (VOMS)

ICD-10 Coding Guidance for Visual Dysfunction following Traumatic Brain Injury[3]

Diagnostic position 1: TBI diagnostic code
TBI is coded using the S06 code groups (Intracranial Injury). The digits following the decimal (S06.XXXX) are used to code for Etiology, Location, Severity and Encounter (ELSE coding structure). This coding element can be referenced from either the initial TBI diagnosis encounter or from referring physician encounter. The first 3 digits of ELSE should remain as noted in previous notes. Code Encounter as D for subsequent visit, or S for sequela. Sequela, or late effect, is used for complications or conditions that arise as a direct result of a condition. A sequela is the residual effect on visual function after the Service Member (SM) has recovered from the acute phase of the TBI. If a SM presents for evaluation for visual dysfunction and is still symptomatic from the TBI (headache, XXXX), code as D. If the acute TBI symptoms have resolved, code the encounter as S.
Diagnostic position 2: Primary symptom code
Code the predominant symptom or finding from major groupings (click here to see pertinent partial listing of eye codes):
Accommodative dysfunction
Blindness and low vision
Convergence insufficiency
Disorders of binocular vision
Disorders of pupil function
Nystagmus and irregular eye movements
Photophobia (There is no specific code under ICD-10, it is recommended that it be coded as "Glare sensitivity-H53.71")
Strabismus disorders
Subjective visual disturbances
Visual field loss
Diagnostic position 3: Deployment code, if applicable
If applicable; may be referenced from initial provider.
Diagnostic position 4: TBI external cause of morbidity code
For example, Y36.290D [D: use for subsequent encounter] for war operations involving other explosions and fragments, military personnel, subsequent encounter; may be referenced from initial provider.
Diagnostic position 5: Other symptoms codes as applicable
Code any additional symptom or finding from major groupings as above.
Diagnostic position 6: Personal history of TBI
Z87.820 - Personal history of traumatic brain injury; may be referenced from referring provider.

References

1. Vision Center of Excellence. Clinical Recommendation for the Eye Care Provider: Eye and Vision Care Following Blast Exposure and/or Possible Traumatic Brain Injury. DoD/VA. Available at: https://vce.health.mil/Providers/ClinicalPracticeRecommendations/Eye-Care-and-TBI.
2. Vision Center of Excellence. Clinical Recommendation for the Eye Care Provider: Assessment and Management of Oculomotor Dysfunctions Associated with Traumatic Brain Injury. DoD/VA. Available at: https://vce.health.mil/Providers/ClinicalPracticeRecommendations/Oculomotor.
3. Reynolds ME. Barker FM. Merezhinskaya N. Oh GT. Stahlman S. Incidence and temporal presentation of visual dysfunction following diagnosis of traumatic brain injury, active component, U.S. Armed Forces, 2006-2018. MSMR. 2019; Vol 26(9) 13-24. MSMR Report available at: https://health.mil/Reference-Center/Reports/2019/09/01/Medical-Surveillance-Monthly-Report-Volume-26-Number-9.

Highlighting our Expert Workgroup Panel Members

The Vision Center of Excellence would like to thank the following expert workgroup panel members, review consultants and contributors to the development of content for this clinical recommendation:

Department of Defense (DoD)
Tina Aldana, MA, OD
Jill M Bakota Gutierrez, OD
LTC Marcus Colyer, MD
Carlos Esquivel, MD
MAJ Lyndsey Ferris, OD
Geeta Girdher, OD
CPT Michael Goering, OD
LTC Justin Holbrook, OD
CDR (r) Kevin Jackson, OD, MPH
MAJ Gbade-Alabi Oluwaseyi, MD
Marcy Pape, PT, DPT
CAPT Scott Pyne, MD
COL (r) Beverly Scott, MD
COL Nathan Tagg, MD
Abby Wicks, OD
Robin Winslow, OD

Academia/Civilian
Richard Hertle, MD
Tonia Rex, PhD
Mitchell Scheiman, OD PhD *Chair
Eric Singman, MD
Keith Smithson, OD
Kate Davis Tarver, OD
Dean VanNasdale, OD, PhD

Department of Veterans Affairs (VA)
Col. (r) Glenn Cockerham, MD
Kia Eldred McGee, OD
Cynthia Greenacre, PhD, COMS, CLVT, CVRT
Odette Harris, MD, MPH
Randy Kardon, MD, PhD
Eve Klein, MA, CLVT, CCC-SLP, ATP
Imelda Llanos, MS, OTR/L
Chrystyna Rakoczy, OD
Steven Scott, MD
John Townsend, OD
Deborah Voydetich, OTR/L
Suzanne Wickum, OD

VCE
COL Mark Reynolds, MD, MPH
Felix Barker, OD
David Eliason, MD
Natasha Merezhinskaya, PhD
Michael Pattison, OD
Rita Mallia, OD
Lymarie Millian-Morell, PhD
Andrew Morgenstern, OD

Revised as of 12 May 2022

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CLINICAL RECOMMENDATION FOR THE EYE CARE PROVIDER

ICD-10 CODING GUIDANCE FOR OCULOMOTOR DYSFUNCTIONS AND OTHER VISION INJURIES ASSOCIATED WITH TBI

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
Convergence Insufficiency	H51.11
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 eye	H53.461
Homonymous bilateral field defects, left eye	H53.462
Homonymous unspecified side field defects, bilateral	H53.463
Homonymous bilateral field defects, unspecified eye	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 Disturbances 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, unspeficied eye	H53.129
Sudden vision loss	H53.13
Sudden vision loss, right eye	H53.131

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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 *(Photophobia*)*	H53.71
Blindness and Low Vision	
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 eye	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 1-2	H54.511
Low vision right eye, category 1, Normal vision left eye	H54.511A
Low vision right eye, category 2, Normal vision left eye	H54.5A12
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, one eye, right eye, normal vision left eye	H54.61
Unqualified visual loss, one eye, left eye, normal vision right eye	H54.62
Unspecified visual loss	H54.7
Legal Blindness, USA Definition	H54.8

Nystagmus and Irregular Eye Movements	
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	
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
Disorders of Binocular Vision	
Other specified disorders of binocular movement	H51.8
Unspecified disorders of binocular movement	H51.9
Strabismus Disorders	
Paralytic strabismus	H49
Other strabismus	H50
Other	
*Photophobia** (See Glare sensitivity)	H53.71

**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 2021 International Classification of Disease, Tenth Revision, Clinical Modification (ICD-10-CM) diagnostic medical billing codes effective on October 1, 2020.
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