



Visual Dysfunction in Patients with Traumatic Brain Injury: A Systematic Review

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PREFACE

Quality Enhancement Research Initiative's (QUERI) Evidence-based Synthesis Program (ESP) was established to provide timely and accurate syntheses of targeted healthcare topics of particular importance to Veterans Affairs (VA) clinicians, managers and policymakers as they work to improve the health and healthcare of Veterans. The ESP disseminates these reports throughout the VA, and some evidence syntheses inform the clinical guidelines of large professional organizations.

QUERI provides funding for four ESP Centers and each Center has an active university affiliation. The ESP Centers generate evidence syntheses on important clinical practice topics, and these reports help:

- develop clinical policies informed by evidence;
- guide the implementation of effective services to improve patient outcomes and to support VA clinical practice guidelines and performance measures; and
- set the direction for future research to address gaps in clinical knowledge.

In 2009, the ESP Coordinating Center was created to expand the capacity of HSR&D Central Office and the four ESP sites by developing and maintaining program processes. In addition, the Center established a Steering Committee comprised of QUERI field-based investigators, VA Patient Care Services, Office of Quality and Performance, and Veterans Integrated Service Networks (VISN) Clinical Management Officers. The Steering Committee provides program oversight, guides strategic planning, coordinates dissemination activities, and develops collaborations with VA leadership to identify new ESP topics of importance to Veterans and the VA healthcare system.

Comments on this evidence report are welcome and can be sent to Nicole Floyd, ESP Coordinating Center Program Manager, at Nicole.Floyd@va.gov.

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EXECUTIVE SUMMARY

INTRODUCTION

In 2009, approximately 3.5 million people sought treatment related to a traumatic brain injury (TBI) in the United States (U.S.), just over 1% of the U.S. population. Researchers estimate that approximately 15% of Operation Enduring Freedom/Operation Iraqi Freedom/Operation New Dawn (OEF/OIF/OND) U.S. Service Members have incurred TBI during deployment. This equates to 390,000 of the 2.6 million Service Members who have deployed as of 2014. Given that intact visual functioning depends on portions of the brain interacting in complex ways, there are multiple potential mechanisms through which TBI can result in visual dysfunction. To provide relevant data for policymakers, optometrists, ophthalmologists, rehabilitation specialists, and others who provide services for Veterans with TBI history, we conducted a systematic review of the prevalence and types of visual dysfunction in individuals with a history of TBI.

Key Questions are:

Key Question 1: What is the prevalence or incidence of visual dysfunction in a general population of individuals who have been diagnosed with a TBI?

Key Question 2: What are the types of visual dysfunction reported by individuals who have been diagnosed with a TBI and are presenting to eye care clinics?

METHODS

We used a previous systematic review on visual problems in traumatic brain injury to identify studies published prior to 2009. We searched Medline (OVID), PsychINFO (OVID), the Cochrane Register of Controlled Trials (OVID), SPORTDiscus, Rehabilitation & Sports Medicine Source (EBSCO), and Rehabdata (National Rehabilitation Information Center) for studies published between January 1st, 2009 and March 27th, 2014. We included studies reporting visual dysfunctions likely to be treated in eye care clinics in patients over 5 years of age with a history of TBI diagnosis of any severity; studies included for Key Question 1 were based on unselected populations (*ie*, participants not selected for inclusion in the study based on visual dysfunction). Data abstraction and quality assessment were dual reviewed by investigators. Standard quality criteria were applied as relevant for each Key Question. We provide both qualitative synthesis of results and evidence tables for each type of visual dysfunction identified.

RESULTS

We examined 1299 titles and abstracts, selecting 118 articles for full-text review. We report the results of 12 primary studies meeting inclusion criteria for Key Question 1, and 4 primary studies that provide data for Key Question 2. Study results were grouped and synthesized according to common sample characteristics. Evidence from a large retrospective cohort study of U.S. Service Members who were diagnosed with visual dysfunction and treated in military healthcare settings suggests that visual dysfunction is infrequently diagnosed in unselected populations

of U.S. Service Members with TBI history, occurring in less than 1% of the population in most cases. Disorders of accommodation and refraction are slightly more common, with a frequency of 7.3% in this population. Other studies included in this review focused on Veterans seen at the Department of Veterans Affairs (VA) Polytrauma Rehabilitation Centers (PRCs) and Polytrauma Network Sites (PNSs). Visual dysfunction was much more frequent in these populations, with estimates of over 50% for many conditions such as accommodation and refraction disorders, convergence insufficiency or dysfunction, dry eye syndrome, photosensitivity, pursuit or saccadic dysfunction, and self-reported visual impairments. Table 1 summarizes results across studies.

CONCLUSIONS

Studies included in this review report a wide range in the frequency of visual dysfunction in people with TBI history. The range of estimates is likely due to differences in setting and patient population across studies. While some studies reported results from individuals regardless of current symptoms, many of the included studies were conducted in VA PRCs and PNSs, clinics that only serve Veterans who have current symptoms as well as other, often serious, comorbidities. Overall, visual dysfunction diagnosed in U.S. Service Members treated in military healthcare settings is uncommon, occurring in less than 1% of individuals for most disorders. However, studies of Veterans with TBI history and current symptoms who are treated in TBI rehabilitation clinics report much higher frequencies, often over 50% for many types of visual dysfunction.

Table 1. Summary of Findings: Ranges of Visual Dysfunction Frequencies Across Studies

Outcome	Studies including patients with TBI history <u>regardless</u> of current symptoms		Studies including patients with TBI history who <u>all</u> have current symptoms
	Unscreened	Screened	Screened
Accommodation Dysfunction and Refractive Errors	7.3% (1 study)	3.0% (1 study)	19.0 - 66.7% (6 studies)
Convergence Insufficiency or Dysfunction	No studies	No studies	11.0 - 62.5% (6 studies)
Diplopia	No studies	No studies	3.0 - 40.0% (4 studies)
Dry Eye	0.1% (1 study)	2.0% (1 study)	93.0% with one or more positive tests (1 study)
Nystagmus or Fixation Dysfunction	No studies	No studies	0.0 - 23.4% (5 studies)
Photosensitivity, Photophobia, or Light Sensitivity	No studies	5.0 – 54.0% (1 study, diagnosed vs self-report)	51.0 - 59.0% (3 studies, all self-report)
Pursuit or Saccadic Dysfunction	No studies	No studies	2.0 - 70.8% (5 studies)
Strabismus and Cranial Nerve Palsy	0.6% (1 study)		0.0 - 37.5% (4 studies)
Visual Field Defect	0.1% (1 study)	2.0% (1 study)	0.0% - 38.8% (3 studies)
Visual Impairment or Dysfunction, Diagnosed	0.4% (1 study)	22.0% (1 study)	8.5% (1 study)
Visual Impairment or Dysfunction, Self-Reported	No studies	8.8 - 47.0% (3 studies)	32.2 - 77.4% (6 studies)