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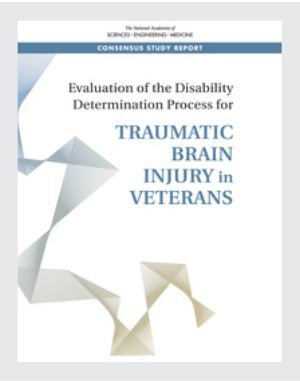

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Evaluation of the Disability Determination Process for TRAUMATIC BRAIN INJURY in VETERANS

Committee on the Review of the Department of Veterans Affairs Examinations for Traumatic Brain Injury

Board on Health Care Services

Health and Medicine Division

A Consensus Study Report of

The National Academies of
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Reviewers

This Consensus Study Report was reviewed in draft form by persons chosen for their diverse perspectives and technical expertise. The purpose of this independent review is to provide candid and critical comments that will assist the National Academies of Sciences, Engineering, and Medicine in making each published report as sound as possible and to ensure that it meets institutional standards of quality, objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain privileged to protect the integrity of the deliberative process.

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Although the reviewers listed above provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations of this report, nor did they see the final draft before its release. The review of the report was overseen by **KENNETH W. KIZER,** University of California, Davis, and **NANCY ADLER,** University of California, San Francisco. They were responsible for making certain that an independent examination of this report was carried out in accordance with the standards of the National Academies and that all review comments were carefully considered. Responsibility for the final content rests entirely with the authoring committee and the National Academies.

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Contents

ACRONYMS AND ABBREVIATIONS xi

SUMMARY 1

1 INTRODUCTION 9
Traumatic Brain Injury, 9
TBI in the U.S. Population, 9
TBI in the Military, 11
Overview of the Organization of the Department of Veterans Affairs, 12
Brief History of the Department of Veterans Affairs Compensation System, 12
Disability Compensation and the Disability Claims Process, 15
Compensation and Pension Examination, 17
VA's Schedule for Rating Disabilities: The VASRD, 17
Statement of Task, 17
Approach to the Task, 18
Organization of the Report, 19
References, 19

2 DIAGNOSIS AND ASSESSMENT OF TRAUMATIC BRAIN INJURY 23
Traumatic Brain Injury, 23
Assessment of TBI Severity, 26
Emerging Evidence on Natural History of Mild TBI, 33
Establishing a TBI Diagnosis, 34
Co-occurring TBI, PTSD, Depression, Pain, and Sleep Disturbance, 45
Summary and Recommendation, 46
References, 48

3 DISABILITY DETERMINATION PROCESS FOR VETERANS WITH TRAUMATIC BRAIN INJURY 57
Disability and Disability Compensation, 57
Department of Veterans Affairs Disability Determination Process for Residuals of Traumatic Brain Injury, 58
The Rating Process, 60
The Appeals Process, 61
The Disability Benefits Questionnaire and a Schedule for Rating Disabilities for Residuals of TBI, 62
Credentials and Training Required in Evaluating Residuals of TBI for VA Disability Compensation, 68
Quality Assurance in the Adjudication of Disability Compensation Claims for Residuals of TBI, 72
Summary and Recommendations, 77
References, 79

4 CHARACTERISTICS OF A HIGH-QUALITY PROCESS FOR DETERMINING DISABILITY RESULTING FROM TRAUMATIC BRAIN INJURY 83

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Definitions of Quality Domains, 83
Approaches for Ensuring Quality, 87
Summary and Recommendations, 93
References, 95

5 SUMMARY AND RECOMMENDATIONS 97
Diagnosing TBI, 98
The Adjudication Process, 99
Adequacy of the Adjudication Process, 101

A LEGISLATION DIRECTING THE STUDY 105

B DEFINITIONS OF TRAUMATIC BRAIN INJURY 107

C TIMELINE OF DISABILITY AND VETERANS COMPENSATION POLICY 115

D DISABILITY BENEFITS QUESTIONNAIRES INITIAL EVALUATION OF RESIDUALS OF TRAUMATIC BRAIN INJURY (I-TBI) DISABILITY 119

E § 4.124A SCHEDULE OF RATINGS—NEUROLOGICAL CONDITIONS AND CONVULSIVE DISORDERS. 127

F CASE DEFINITIONS OF TRAUMATIC BRAIN INJURY 133

G MACE 2: MILITARY ACUTE CONCUSSION EVALUATION 137

H FACT SHEET: CODING GUIDANCE FOR TRAUMATIC BRAIN INJURY 145

I M21-1 COMPENSATION AND PENSION MANUAL 151

J REVIEW POSTTRAUMATIC STRESS DISORDER (PTSD) DISABILITY BENEFITS QUESTIONNAIRE 155

K INFORMATION AND INSTRUCTIONS FOR COMPLETING NOTICE OF DISAGREEMENT (NOD) 163

L APPEAL TO BOARD OF VETERANS' APPEALS 169

M NECK (CERVICAL SPINE) CONDITIONS DISABILITY BENEFITS QUESTIONNAIRE 175

N SUMMARY TABLE OF U.S. GOVERNMENT ACCOUNTABILITY OFFICE REPORTS RELEVANT TO ADJUDICATION OF VETERANS' DISABILITY CLAIMS 187

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Acronyms and Abbreviations

A&A	aid and attendance
ACGME	Accreditation Council for Graduate Medical Education
ADD	attention deficit disorder
ADHD	attention deficit hyperactivity disorder
APA	American Psychiatric Association
ApoE	apolipoprotein E
BBB	blood–brain barrier
BBBD	blood–brain barrier dysfunction
bTBI	blast-induced traumatic brain injury
BTBIS	Brief Traumatic Brain Injury Screen
BVA	Board of Veterans Appeals
C&P	compensation and pension
CARE	Concussion Assessment, Research and Education (Consortium)
CDC	Centers for Disease Control and Prevention
CENC	Chronic Effects of Neurotrauma Consortium
CPG	Clinical Practice Guide
CT	computed tomography
DBQ	Disability Benefits Questionnaire
DEMO	Disability Examination Management Office
DMA	[Office of] Disability and Medical Assessment
DoD	Department of Defense
DRO	decision review officer
DSM	Diagnostic and Statistical Manual of Mental Disorders
DTI	diffusion tensor imaging
DVBIC	Defense and Veterans Brain Injury Center
ED	emergency department
FDA	Food and Drug Administration
FTE	full-time equivalent
FY	fiscal year
GAO	Government Accountability Office
GCS	Glasgow Coma Scale
GPS	global positioning system
ICD	*International Statistical Classification of Diseases and Related Health Problems*
IOM	Institute of Medicine

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IPR	in-process review
IT	information technology
MACE	Military Acute Concussion Evaluation
MRI	magnetic resonance imaging
mTBI	mild traumatic brain injury
NCCT	noncontrast computed tomography
NIRS	near-infrared spectroscopy
PET	positron emission tomography
PTSD	posttraumatic stress disorder
QR	quality review
QRT	quality review team
RVSR	rating veterans service representative
SNP	single nucleotide polymorphism
SSA	Social Security Administration
STAR	Systematic Technical Accuracy Review
TBI	traumatic brain injury
TRACK-TBI	Transforming Research and Clinical Knowledge in Traumatic Brain Injury
VA	Department of Veterans Affairs
VASRD	Veteran Affairs schedule for rating disabilities
VBA	Veterans Benefits Administration
VHA	Veterans Health Administration
VSO	veterans service organization
VSR	veterans service representative

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Summary

The Veterans Benefits Administration (VBA) provides disability compensation to veterans with a service-connected injury. Disability compensation is "a tax-free monetary benefit paid to veterans with disabilities that are the result of a disease or injury incurred or aggravated during active military service."

To receive disability compensation from the Department of Veterans Affairs (VA), a veteran must submit a claim or have a claim submitted on his or her behalf. A disability percentage is then assigned in a process summarized below:

1. The veteran or veterans service organization acting as the veteran's proxy submits a claim to VBA.
2. VBA receives the claim. If all necessary information is provided, the claim will be processed. In most cases, the medical information submitted is not "adequate for rating purposes," and VBA orders a compensation and pension (C&P) exam from a C&P examiner, who can be a Veterans Health Administration (VHA) clinician or a VBA-contracted clinician.
3. The C&P examiner notes the diagnosis and evaluates the degree of impairment, functional limitation, and disability. The examiner records information using a Disability Benefits Questionnaire (DBQ).
4. DBQ results are submitted to VBA via the compensation and pension record interchange. At VBA, a veterans service representative may determine that there is enough evidence to make a rating or request more information. If there is enough evidence, a ratings veterans' service representative makes a disability rating decision by comparing DBQ results and other evidence to criteria in the Veterans Affairs Schedule for Rating Disabilities (VASRD).
5. The veteran begins receiving disability benefits.
6. The veteran may appeal to have his case reviewed by the Board on Veterans Appeals if he does not agree with the rating decision. The appeals process re-reviews the case.

A committee was formed in response to Public Law 114-315 passed on December 16, 2016, which required that the VA contract with the National Academies to provide an independent review of the process by which the VA assesses impairments resulting from traumatic brain injury (TBI) for purposes of awarding disability compensation. The committee's statement of task is described in the next section.

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STATEMENT OF TASK

The committee will review the process by which impairments that result from TBI are assessed for purposes of awarding disability compensation. The specific tasks are noted in Box S-1.

BOX S-1
Statement of Task

The National Academies of Sciences, Engineering, and Medicine will convene a committee to make:

(A) A determination of the adequacy of the tools and protocols used by the Department of Veterans Affairs to provide examinations; and

(B) A determination of which credentials are necessary for health care specialists and providers to perform such portions of such examinations that relate to an assessment of all disabling effects.

Additionally, the committee shall include in its final report:

(1) Findings with respect to the comprehensive review noted in (A) and (B) above; and

(2) Recommendations for legislative or administrative action for improving the adjudication of veterans' claims seeking entitlement to compensation for all impairments arising from a traumatic brain injury

APPROACH TO THE TASK

A committee of experts in emergency medicine, neurology, neurosurgery, psychiatry, psychology, physical medicine and rehabilitation, and epidemiology and biostatistics was convened to address the statement of task. Given the task, the committee found it necessary to review the scientific literature on TBI, gain an understanding of each step of the adjudication process for residuals of TBI[1] (from submission of claims through appeals), and learn what measures the VA has already taken to ensure the quality of its process. In this publication the committee provides recommendations to the VA related to the health care specialists who diagnose TBI, the adequacy of the tools used by the VA to provide clinical examinations and disability ratings for TBI residuals (the DBQ and the VASRD), and the overall adjudication process.

[1] Residuals of TBI include three main areas of dysfunction that might result from sustaining a TBI. These might have profound effects on functioning, including cognitive, emotional/behavioral, and physical. "Residual" is a term used by the VA in its VASRD (Veterans Affairs Schedule for Rating Disabilities) and DBQ (Disability Benefits Questionnaire), but the scientific community uses the term "sequela" to indicate outcomes resulting from a TBI.

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HEALTH CARE PROFESSIONALS TRAINED TO DIAGNOSE TRAUMATIC BRAIN INJURY

The committee reviewed the scientific literature on the natural history of TBI and how it is diagnosed in military personnel, veterans, and civilians in order to comment on the credentials and training necessary for health care specialists to diagnose TBI. Given the complexities in diagnosing TBI and the time that might have elapsed since the original injury, the diagnostician needs to have experience with TBI and be trained in and familiar with the state of the science for making a determination of brain injury and its severity. In addition, there is enough ongoing research and new theoretical views on the trajectory of recovery after TBI that new developments are likely forthcoming that would assist providers who have training and experience with TBI to accurately diagnose TBI.

Currently the VA requires one of four specialists to diagnose TBI: a neurologist, neurosurgeon, physiatrist, or psychiatrist. The committee found that in addition to those four specialties, there are many specialties and subspecialties involved in making the diagnosis of a brain injury, particularly if the diagnosis occurs months to years following the injury. Clinical psychology and clinical neuropsychology, for example, are disciplines where specialized training in assessment of TBI consequences is common and documentable. Even if the sole determination is not made by one of those professionals, it is difficult to see how adequate information about cognitive consequences of TBI could be collected without a formal assessment.

Given today's increased awareness of TBI, more medical specialties now include training in TBI within their curriculum and have continued updates concerning the current state of the science. Additionally, there are at least 18 Accreditation Council for Graduate Medical Education (ACGME) accredited brain injury programs to train physicians of many specialties to assist in the diagnosis, treatment, and rehabilitation of individuals diagnosed with brain injury. Thus, the VA should allow health care professionals, including non-physicians, with additional training and experience in brain injury, to make the TBI diagnoses. The committee believes that it is the training and experience, not necessarily the medical specialty that renders a health care specialist capable of an accurate diagnosis.

The committee recommends that the Department of Veterans Affairs allow health care professionals who have specific traumatic brain injury (TBI) training and experience, in addition to the current required specialists, to make a TBI diagnosis. Furthermore, the committee recommends pertinent and ongoing clinical training that is up to date with the state of current knowledge regarding TBI.

THE DISABILITY BENEFITS QUESTIONNAIRE AND THE VA SCHEDULE FOR RATING DISABILITIES FOR RESIDUALS OF TRAUMATIC BRAIN INJURY

As previously noted, after the claim is filed with VBA, if the VBA employee determines additional medical evidence is needed, a C&P examination is completed by a VHA clinician or a VBA-contracted clinician to provide medical information to VBA to help determine the presence and degree of medical impairment incurred by the veteran. The C&P exam should note the diagnosis and the medical nature of the condition and record all requested measurements and test results in a DBQ. As its name suggests, a DBQ is a questionnaire and therefore provides limited information that is relevant only to making the rating. The DBQs do not document all C&P

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examination findings. They provide medical information that is directly relevant to the VASRD, a federal regulation that lists criteria that provide the majority of the medical evidence that VBA rating specialists need as they process the claim. There are more than 70 DBQs for various medical conditions, including one for the residuals of TBI. The criteria in the DBQ for the residuals of TBI mirror those in the section of the VASRD used for rating the residuals of TBI, as the DBQ was developed to aid the non-clinician VBA rating specialist in determining the disability rating.

The committee reviewed the criteria in the DBQ and VASRD in response to the VA's request for them to determine the adequacy of the tools used in providing examinations.

The DBQ and the VASRD provide a list of common residuals of TBI that are used to rate the level of disability associated with TBI. For the most part, the identified residuals accurately reflect problems that are most likely to disrupt quality of life following TBI. However, some of the characteristics of the criteria used to rate severity of disability (e.g., the frequency at which the problem is observed) do not fully capture the residual's potential impact. Furthermore, they fail to take into account some basic medical knowledge concerning how residuals of TBI might manifest and affect disability.

The committee recommends that the Department of Veterans Affairs convene experts from both Veterans Health Administration and Veterans Benefits Administration, including clinicians who diagnose and assess residuals of traumatic brain injury, to regularly update the Veterans Affairs Schedule for Rating Disabilities and the Disability Benefits Questionnaires for residuals of TBI to better reflect the current state of medical knowledge.

In the committee's review of the residuals of TBI DBQ, it found that there are important residuals that were not included. In particular, three important residuals of TBI are not adequately covered by any of the existing DBQs: insomnia, vestibular dysfunction, and near-vision dysfunction (near point accommodative and convergence insufficiency).

Isolated questions related to insomnia and sleep disruption can be found on four DBQs (mental disorders, chronic fatigue syndrome, PTSD, and sleep apnea), but no single DBQ combines them all in a way that captures the full extent of disability associated with post-TBI sleep disruption. Sleep disruption occurs commonly after TBI, contributing to fatigue, cognitive dysfunction, and disrupted mood.

Isolated questions and physical exam elements related to vestibular dysfunction can be found on two DBQs (cranial nerves diseases and ear conditions), but no single DBQ combines them in a way that captures the full extent of disability associated with post-TBI vestibular dysfunction. This dysfunction is typically a mix of both peripheral (ear and vestibulocochlear nerves) and central (vestibulo-spinal and vestibulo-ocular) vestibular structure disruption. Vestibular dysfunction occurs commonly after TBI, producing symptoms related to (1) altered postural stability (imbalance and abnormal gait); (2) altered oculomotor function (reduced dynamic visual acuity, dizziness with head movement, dizziness with movement of objects in visual field); and (3) reduced concentration or "fogginess" when in motion. Vestibular dysfunction may also contribute to altered mood, particularly anxiety.

Although the eye conditions DBQ provides questions related to diplopia, no existing DBQ includes questions or physical exam elements intended to capture the full extent of disability associated with near-point accommodative and convergence insufficiency. These near vision problems occur commonly after TBI, and can result in not only diplopia but also blurred

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vision, headache, nausea, and an inability to maintain focus while reading and doing other close-range visual activities.

The committee recommends that the Department of Veterans Affairs add insomnia, vestibular dysfunction, and near-vision dysfunction to the Disability Benefits Questionnaires for residuals of traumatic brain injury.

QUALITY OF THE ADJUDICATION PROCESS

In the committee's discussions with VBA officials, VBA placed great emphasis on the consistency of the rating process, rather than on the outcome of the disability determinations. Consistency of process was presented as an end in and of itself, rather than as a way of ensuring the reliability and validity of the assessments, i.e., the characteristics of the process needed to ensure that the veteran had been given an accurate disability rating. VBA has taken great pains to train its raters so that they might accurately and reliably rate a disability; however, the emphasis on consistency of process does not actually ensure the reliability or the validity of the rating. Furthermore, and just as important, a lack of consistency in process does not necessarily mean there is a lack of reliability or validity. It is plausible that those factors are related to assessment performance, but it is not guaranteed to be true.

The committee discussed several major domains of quality and how they are related to the adjudication process for veteran disability claims, including reliability and validity. A process with high reliability is one in which repeated evaluations of the same service member would result in the same disability rating. An adjudication process with high validity would be one in which the disability rating reflects the true degree of service-connected disability. A high-quality adjudication process would ideally excel in both of these quality domains, while also being transparent, timely, and credible and minimizing burden to the veteran. To ensure and maintain high quality, systems need to measure both process and outcome quality, incorporate feedback, correct themselves, and measure outcomes after such a correction.

The committee's review of the VA's quality assurance measures found that the VA's quality measures focus on consistency in the disability rating step of the process. One example of a VA quality measure that focuses on consistency of process but with unclear effect on reliability or validity is the measurement of the fraction of diagnoses of TBI that are made by a physician board-certified in one of four specialties: neurology, neurosurgery, physical medicine and rehabilitation, or psychiatry. While the committee appreciates that an understanding of the pathophysiology of TBI and of the proximal and distal signs and symptoms associated with this diagnosis is necessary for an accurate diagnosis, there need not be an inordinate amount of emphasis placed on the specialty of the examiner or on adherence to this policy if there is no evidence that this will lead to more accurate evaluations of disability.

The transparency of the adjudication process is another key quality characteristic. Transparency should be considered from the points of view of both the individual veteran and the system. Transparency from the point of view of the individual veteran would include, for example, access to the details of his or her individual application (e.g., the results of the examination as documented on the DBQ, details regarding additional materials that have been requested by VBA). Transparency from a system-wide point of view would include easy access to and widespread distribution of data on the system performance, including performance with respect to both process quality measures (e.g., timeliness of and access to VHA examinations,

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percent of examinations conducted by contracted examiners) and outcome quality measures (e.g., the consistency of outcomes across geographic regions, the accuracy of disability determinations evaluated using standardized patients, the inter-rater reliability of determinations as assessed through independent examinations and ratings of random cases). The committee found that transparency was inadequately appreciated as a goal by both VHA and VBA personnel.

The committee recommends that Veterans Health Administration (VHA) and Veterans Benefits Administration take specific actions to increase transparency at both individual and system-wide levels, including but not limited to providing full access to veterans of the details of their examinations and ratings and providing public access to detailed system-wide data, with separation by geographic location and examination type (e.g., VHA versus contracting examiner), on the outcomes of evaluations and outcome quality.

Careful consideration should be given to the methods that the VA uses to evaluate the processes of diagnosis and disability assessment, including not only the disability rating step, but also the diagnosis of TBI, the determination of service connection, and the detection and characterization of the sequelae of TBI (e.g., as documented in the DBQ). The overall goal of the evaluation is to ensure that the approaches taken by the examiner result in an evaluation that accurately capture the effects of TBI on disability in veterans.

The committee recommends that the Department of Veterans Affairs institute processes and programs to measure the reliability and validity of the adjudication process, identify opportunities for improvement in the quality of outcomes, and implement modifications of the adjudication process as needed to optimize the quality of both the adjudication process and the reliability and validity of the outcomes.

Four specific recommendations for the initial steps to be taken are (1) instituting a program of standard patients to directly measure the reliability and validity of the examination and rating processes for such patients; (2) the use of experienced, second-level reviewers to conduct fully independent evaluations to evaluate the criterion validity of actual veterans' evaluations; (3) creating a system by which veterans may rate the quality of their own evaluations; and (4) the systematic and transparent collection and comparison of disability outcome data across geographic regions.

The implementation of these final two recommendations will represent a fundamental enhancement in the methods used by the VA to ensure the quality of disability evaluations for TBI. Shifting from a focus on the consistency of the process (e.g., for the rating step in disability determination) and on practitioner qualifications to a focus on the accuracy of the outcome of the evaluation is intended and expected to identify steps or components in the disability evaluation process that warrant improvement. In fact, the identification of such opportunities for improvement will be a key indicator of the success and positive impact of these recommendations in improving the system, rather than a criticism of the current system or the personnel who work within it. Furthermore, by adopting an explicit learning structure in which the reliability and validity of disability determinations are directly assessed, the VA will be able

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to devote its resources to those modifications and enhancements of the disability evaluation system that will have the greatest impact in improving the service provided to injured veterans.

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1

Introduction

This introductory chapter provides an overview of traumatic brain injury (TBI), including how it is defined and its incidence and prevalence. The chapter then reviews the organization of the Department of Veterans Affairs (VA) and offers a brief history of the VA's compensation and pension (C&P) program. The chapter introduces the reader to the VA's disability compensation and disability claims process, including the C&P exam. The chapter provides the study's Statement of Task, as described in Congressional legislation (see Appendix A), which led to the VA's request for the study. Finally, the chapter presents the committee's approach to the task and the organization of the overall report. The committee relied on the VA's Office of Inspector General's Report No. 15-01580-108, published February 27, 2018, for background information.[1]

TRAUMATIC BRAIN INJURY

Traumatic brain injury is defined as an insult to the brain from an external force that leads to temporary or permanent impairment of cognitive, physical, or psychosocial function. TBI is a form of acquired brain injury, and it may be open (penetrating) or closed (non-penetrating) and can be categorized as mild, moderate, or severe, depending on the clinical presentation (Gennarelli and Graham, 2005). Numerous organizations have defined TBI, and a compilation of those definitions can be found in Appendix B; additionally, Chapter 2 provides detailed information about TBI.

TBI IN THE U.S. POPULATION

TBI is a serious public health problem in the United States, in both civilian and military populations. Each year traumatic brain injuries contribute to a substantial number of deaths and cases of permanent disability (CDC, 2017). While not all blows or jolts to the head result in a TBI, many do. The Centers for Disease Control and Prevention (CDC) estimates that in 2013, 2.8 million Americans were diagnosed with TBI. Among civilians, TBIs accounted for approximately 2.5 million emergency department (ED) visits, 282,000 hospitalizations, and

[1] Healthcare Inspection Review of Montana Board of Psychologists Complaint and Assessment of VA Protocols for Traumatic Brain Injury Compensation and Pension Examinations (2018).

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56,000 deaths in 2013. The majority of these civilian incidents were due to falls (47 percent) or being struck by or against an object (15 percent). From 2007 to 2013, motor vehicle–related TBIs have decreased, but TBIs due to falls in older adults have increased. In 2013, 2.2 percent of all civilian deaths in the United States were attributed to TBI (CDC, 2017).

CDC has been the source of the frequently cited estimates in the United States for the prevalence of disability in civilians due to TBI (Selassie et al., 2008; Thurman et al., 1999; Zaloshnja et al., 2008). The estimates are based on 1-year outcomes following acute hospitalization in single states, to which assumptions about mortality were applied. Using data from Colorado, Thurman and colleagues (1999) estimated that in 1996, 2.0 percent of the U.S. population experienced disability due to TBI. Extrapolating from data from South Carolina, Zaloshnja and colleagues (2008) estimated that 1.1 percent of the U.S. population, or 3.2 million people, had long-term disability associated with TBI. The primary difference in the two estimates is the application of more pessimistic mortality assumptions to the 2008 data. The authors identified multiple limitations, including that their estimates relied solely on hospitalized patients, thus excluding disability that might arise from injuries that did not result in hospitalization.

The prevalence of disability estimated from general population surveys would circumvent the limitation of using hospitalization data, but only one such survey has been conducted to date. Using the French National Disability and Health Survey, Jourdan and colleagues (2018) estimated the prevalence of disability due to TBI to be 0.7 percent, which is lower than follow-up data in single American states. The authors noted that their estimate is likely to be conservative, and suggested that the fact that their estimate is lower than CDC estimates (2003) might, in part, be due to the lower incidence of medically treated TBI in Europe. The French National Disability and Health Survey relied on respondents to identify their current disability arising from TBI. For impairments that are immediate and persistent following injury, such self-identification could be reliable. However, the disabling effects of an injury that emerged some time after the injury occurred could be attributed to other causes.

There is growing recognition that even mild TBIs in childhood might introduce a risk for disability in later life (CDC, 2003; Corrigan and Hammond, 2013; Masel and DeWitt, 2010). TBI is a well-established risk factor for dementia generally (Barnes et al., 2018; Fann et al., 2018) as well as for Parkinson's disease (Gardner et al., 2018; IOM, 2009), and there is emerging evidence that a lifetime history of TBI might affect cognition and mobility in independently living older adults without dementia (Gardner et al., 2017; Peltz et al., 2017). Repeated blows to the head have been implicated in later, degenerative disease processes, specifically chronic traumatic encephalopathy (Aldag et al., 2017; Asken et al., 2017; Iacono et al., 2017; Johnson et al., 2017; Vile and Atkinson, 2017; Wilson et al., 2017). Whiteneck and colleagues (2016) analyzed survey data on the co-occurrence of disability and TBI regardless of the need for hospitalization and concluded that the prevalence of disability due to TBI could easily be triple that based on hospitalizations only. Yi and colleagues (2017) found that adults with a history of TBI and loss of consciousness had an increased risk of current, self-reported disability.

A complete assessment of disability due to TBI would account for non-hospital-treated injuries as well as the later development of future consequences. CDC (2015) noted that national TBI-related disability is based on extrapolations of one-time state-level estimates of lifetime TBI-related disability (Selassie et al., 2008; Zaloshnja et al., 2008). CDC concluded there is a need to improve TBI surveillance of both incidence and prevalence by capturing TBIs treated in non-hospital settings or not receiving medical care, among other types of monitoring (CDC,

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2015). Despite difficulties in obtaining the information, quantifying lifetime histories of TBI, including timing and severity, may be crucial to understanding the full public health burden.

TBI IN THE MILITARY

TBIs have been an increasing cause of casualty and disability in the military since the conflicts in Iraq and Afghanistan began, and TBI has become known as the signature injury for those veterans. A 2017 Department of Defense and Veterans Brain Injury Center (DVBIC) report estimates that 22 percent of all combat casualties from Iraq and Afghanistan are due to TBIs (VA, 2017). A 2019 DVBIC report estimates that more than 375,000 incidents of TBI were incurred in the military between the years of 2000 and 2018 (see Figure 1-1), primarily outside of combat, such as training accidents, motor vehicle collisions, and sport-related incidents (DVBIC, 2010). A minority of injuries are incurred in combat, with mechanisms including penetrating and blast-induced TBIs. The principal source of blast injuries is one or more encounters with a blast wave produced by a detonated improvised explosive device as well as large ammunitions and some firearms, while penetrating TBIs may be due to gunshot wounds as well as shrapnel associated with blasts. Consistent with rates observed in civilian populations, approximately 80 percent of TBIs in the military are mild in severity (see Figure 1-1).

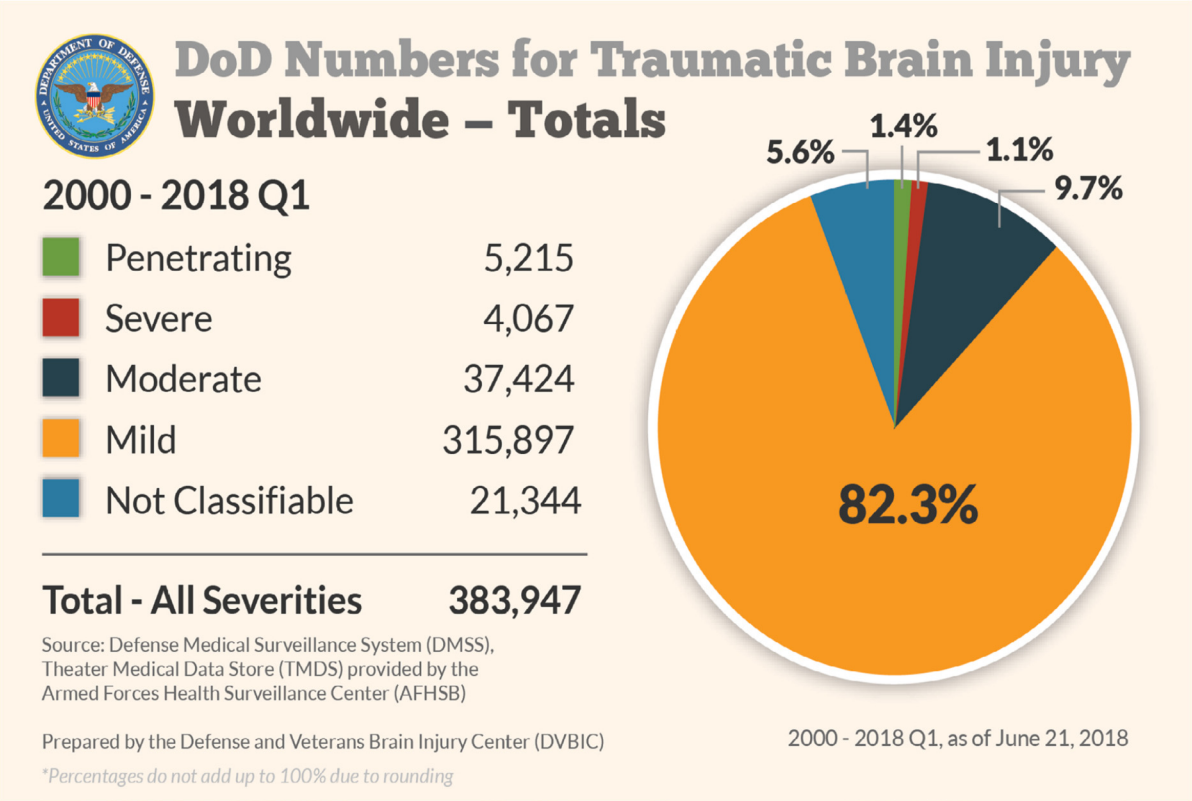

FIGURE 1-1 TBIs in the military by severity.
SOURCE: DVBIC, 2019.

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OVERVIEW OF THE ORGANIZATION OF THE DEPARTMENT OF VETERANS AFFAIRS

The VA is divided into the Veterans Health Administration (VHA), the Veterans Benefits Administration (VBA), and the National Cemetery Administration. VHA provides health services to qualified veterans and, related to the committee's task, arranges medical exams for veterans who are filing for disability compensation. VBA focuses on disability and is distinct from VHA. It provides numerous types of services and benefits to service members, veterans, and their families. In particular, VBA oversees the delivery of disability compensation, which is a tax-free monetary benefit paid to veterans with disabilities that are the result of disease or injury incurred or aggravated during active military service (VA, 2018a).

Disability compensation is based on the severity of the service-connected medical condition and can range from 0 to 100 percent disability depending on the severity of the disabling condition (see Table 1-1). The VA regards disability as an intersection of service connection, diagnosis, and function. The VA awards disability compensation to people who sustain injuries from military service, regardless of their ability to work (VA Law, 2018).

The VA is the second largest federal department after the Department of Defense. The proposed fiscal year (FY) 2019 budget for the VA is $198.6 billion. The proposed budget represents an increase of $12.1 billion over 2018. The budget included $88.9 billion in discretionary funding for VA medical care, including medical collections,[2] which is $6.8 billion (8.3 percent) above the FY 2018 budget. The budget also includes $109.7 billion in mandatory funding for benefit programs, $5.3 billion (5.1 percent) above FY 2018 (VA, 2018b). The 2019 request also will support 366,358 full-time equivalent (FTE) employees[3] (see Table 1-2). The 2020 advance appropriations request includes $79.1 billion in discretionary funding for medical care, including collections (see footnote 2), and $121.3 billion in mandatory funding for veterans benefits programs (compensation and pensions, readjustment benefits, and veterans insurance and indemnities accounts).

BRIEF HISTORY OF THE DEPARTMENT OF VETERANS AFFAIRS COMPENSATION SYSTEM[4]

The beginnings of the U.S. disability compensation system can be traced back to 1636, when the Pilgrims of Plymouth Colony were at war with the Pequot Indians. The Pilgrims passed a law stating that disabled soldiers would be supported by the colony. Later, the Continental Congress of 1776 encouraged enlistments during the Revolutionary War by providing pensions to disabled soldiers. In 1811 the federal government authorized the first domiciliary and medical facility for veterans. Also in the 19th century, assistance programs for veterans were expanded to include benefits and pensions not only for veterans, but also for their widows and dependents.

[2] Medical collections include the assessment of fees, referred to as co-payments, from certain veterans who receive inpatient or outpatient health care, medications, or extended care services. Such debts are subject to interest, late payment charges, and referral for collection purposes.
[3] The 2019 VA budget request includes 324,701 FTEs for VHA and 23,692 FTEs for VBA.
[4] The text in this section has been excerpted from *VA History in Brief* (VA, 2018e).

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TABLE 1-1 Disability Compensation Rate Table for 2018 (in Dollars) per Month

Disability Percent	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Veteran Alone	136.24	269.30	417.15	600.90	855.41	1,083.52	1,365.48	1,587.25	1,783.68	2,973.86
Veteran & Spouse			466.15	666.90	937.41	1,182.52	1,481.48	1,719.25	1,932.68	3,139.67
Veteran, Spouse, & 1 Child			503.15	714.90	998.41	1,255.52	1,566.48	1,816.25	2,041.68	3,261.10
Veteran & 1 Child			450.15	644.90	910.41	1,149.52	1,442.48	1,675.25	1,882.68	3,084.75
Additional Children			24.00	32.00	41.00	49.00	57.00	65.00	74.00	82.38
Additional Schoolchild			79.00	106.00	133.00	159.00	186.00	212.00	239.00	266.13
A&A for Spouse			46.00	61.00	76.00	91.00	106.00	122.00	137.00	152.06

NOTES: A&A = aid and attendance, which provides increased monthly pension if a veteran requires the aid of another person to perform personal functions. If veteran has a spouse who requires A&A, add "A&A for spouse" to the amount of dependency and rate code above.
SOURCE: Veterans Aid Benefit, 2018.

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TABLE 1-2 VA FTE Employees by Administration and Office

	2017 Actual	2018 Request	2019 Request
VHA	313,512	318,944	324,701
VBA	22,408	22,812	23,692
National Cemetery Administration	1,847	1,923	1,941
Office of Information Technology	7,241	7,889	8,138
General Administration	2,524	2,937	3,035
Board of Veterans' Appeals	840	1,105	1,025
Office of the Inspector General	745	855	827
Supply Funds	1,145	1,150	1,150
Franchise Funds	1,314	1,750	1,849
Total VA	351,576	359,365	366,358

SOURCE: VA, 2018c.

Following the Civil War, many state veterans' homes were established, and indigent and disabled veterans of the Civil War, Indian Wars, Spanish-American War, and Mexican Border period, as well as discharged members of the Armed Forces, received care at those homes. In 1917 Congress established a new system of veterans' benefits, including programs for disability compensation, insurance for service personnel and veterans, and vocational rehabilitation for the disabled.

In 1924 veterans' benefits were liberalized to cover disabilities that were not service-related. In 1928 admission to the national homes was extended to women and National Guard and militia veterans. On July 21, 1930, President Herbert Hoover signed Executive Order 5398 and elevated the Veterans Bureau to a federal administration—creating the Veterans Administration. At that time the National Homes and Pension Bureau also joined the VA. The three component agencies became bureaus within the Veterans Administration. Brig. Gen. Frank T. Hines, who had directed the Veterans Bureau for 7 years, was named the first Administrator of Veterans Affairs. Following World War II there was a vast increase in the veteran population, and Congress endorsed large numbers of new benefits for war veterans, the most significant of which was the World War II GI Bill, signed into law on June 22, 1944.

In 1945 the VA Schedule for Rating Disabilities (VASRD) underwent its last major revision in an effort to address World War II veterans' organ system injuries and illnesses. In a significant change, the revised VASRD allowed the VA to reevaluate a veteran and change the veterans' disability rating. The revised 1945 version of the VASRD forms the foundation of the VA Schedule for Rating Disabilities that is in effect today. The VASRD will be discussed later in the chapter (and in more detail in Chapter 3).

The current VASRD assigns a percentage of disability, called a *rating*, based primarily on the severity of the veteran's medical impairment or diagnosis. As noted above, the assigned percentages are in increments of 10 on a scale of 0 to 100. When the disability is judged service-connected and a compensable evaluation (at least 10 percent) is assigned, the veteran is entitled to receive monthly monetary benefits (see Table 1-1 for the range in monthly benefits).

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More recently the VA amended its adjudication regulations to provide additional compensation benefits for veterans with residuals of traumatic brain injury.[5] The final rule incorporates a benefit authorized by the Veterans' Benefits Act of 2010. That act authorizes special monthly compensation for veterans with TBI who are in need of aid and attendance and, in the absence of such aid and attendance, require hospitalization, nursing home care, or other residential institutional care. (Note: This final rule related to special compensation for TBI was effective on June 7, 2018. The provisions of this final rule apply to all applications for benefits received by the VA on or after October 1, 2011, or that were pending before VA, the U.S. Court of Appeals for Veterans Claims, or the U.S. Court of Appeals for the Federal Circuit on October 1, 2011[6]). See Appendix C for a timeline of the VA's disability and veterans' compensation policy.

Disability compensation often reflects the social, political, and economic values of the time. The legislators who create the policies on which disability compensation are based are often influenced by stakeholders, their constituents, and by the state of the relevant science and law at the time of their enactment.

DISABILITY COMPENSATION AND THE DISABILITY CLAIMS PROCESS

VBA provides different types of compensation to veterans, including disability compensation, health care, housing, and insurance benefits (VA, 2018d). Disability compensation is provided to service members or veterans with a service-connected injury. Disability compensation is

> a tax free monetary benefit paid to veterans with disabilities that are the result of a disease or injury incurred or aggravated during active military service. Compensation might also be paid for post-service disabilities that are considered related or secondary to disabilities occurring in service and for disabilities presumed to be related to circumstances of military service, even though they might arise after service. (VA, 2018d)

To receive the VA disability, a veteran must submit a claim or have a claim submitted on his or her behalf. If a service member is separating from the military because of a medical condition, then the VA disability process begins automatically as part of the Integrated Disability Evaluation System. A disability percentage is assigned in a process that is detailed in Chapter 3 of this report and summarized in Box 1-1.

According to the VA, the factors affecting the length of time it takes to process a claim include the type of claim filed, the number and complexity of the claimed conditions (for example, comorbidities), and the availability of evidence to support the claim. If the veteran does not agree with the decision, there is an appeals process. The benefits and appeals procedures will be discussed in detail in Chapter 3.

The process for determining eligibility for disability benefits resulting from a TBI involves several steps, the first of which is a TBI diagnosis. If the TBI diagnosis had occurred

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[5] Residuals of TBI include three main areas of dysfunction that might result from sustaining a TBI. These might have profound effects on functioning, including cognitive, emotional/behavioral, and physical. "Residual" is a term used by the VA in its VASRD and DBQ (Disability Benefits Questionnaire), but the scientific community uses the term "sequela" to indicate outcomes resulting from a TBI.

[6] *Federal Register*, Vol. 83, No. 89 (Tuesday, May 8, 2018), Rules and Regulations 20735 FR.

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during military service by Department of Defense personnel, then VBA's policy is to accept that diagnosis. If, however, a veteran does not have a TBI diagnosis, then the VA requires that the diagnosis be made by a neurologist, neurosurgeon, physiatrist, or psychiatrist prior to the completion of the disability evaluation (see Chapter 2 for a further discussion about the expertise necessary for diagnosing TBI).

For veterans with a previous TBI diagnosis, the C&P examination is performed to evaluate the current state of any residuals resulting from the TBI. The exam can be made by any compensation-and-pension clinician certified through a program established by the Office of Disability and Medical Assessment, regardless of specialty.[7] The examination might also be completed by one of the required specialists who performed the first part of the examination (i.e., provided the TBI diagnosis). VBA might send the veteran for a TBI disability examination to an outside contractor (generally to one of the four specialists required for a diagnosis), or VBA staff might send an examination request to VHA or have its contractors perform the exam; the VBA employee processes the application generally based on which path might be fastest.

BOX 1-1
Disability Determination Process Summary

Step 1 The veteran or veterans service organization acting as the veteran's proxy submits a claim to VBA.

Step 2 VBA receives the claim. If all necessary information is provided, the claim will be processed. In most cases, medical information submitted is not "adequate for rating purposes," and VBA orders a compensation and pension (C&P) exam from a VHA clinician or a VBA-contracted clinician.

Step 3 The C&P examiner notes a diagnosis and evaluates degree of impairment, functional limitation, and disability. The examiner records information using a Disability Benefits Questionnaire (DBQ). The diagnosis of TBI must be made by a psychiatrist, physiatrist, neurologist, or neurosurgeon, but residuals of TBI may be evaluated by any clinician certified by the Office of Disability and Medical Assessment to complete C&P exams.

Step 4 The C&P examiner submits the DBQ results to VBA via the compensation and pension record interchange. At VBA, a veterans service representative may determine there is enough evidence to make a rating, or request more information. If there is enough evidence, a ratings veterans' service representative makes a percentage disability rating decision by comparing DBQ results and other evidence to criteria in the Veterans Affairs Schedule for Rating Disabilities.

Step 5 The veteran begins receiving disability benefits.

Step 6 The veteran may appeal to have his case reviewed by the Board on Veterans Appeals if he or she does not agree with the rating decision. The appeals process re-reviews the case.

[7] The certification process includes completion of a TBI training module, which is a 1-hour course.

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COMPENSATION AND PENSION EXAMINATION

After a claim is filed with VBA, if the VBA employee determines there needs to be additional medical evidence,[8] a C&P exam is completed by a VHA clinician or VBA-contracted clinician to provide medical information to VBA to help determine the presence and degree of medical impairment incurred by the veteran. The C&P exam should note the diagnosis and the medical nature of the condition, and record all requested measurements and test results in a Disability Benefits Questionnaire (DBQ). It should be noted that, as the title suggests, the DBQs are questionnaires and therefore provide limited information that is relevant only to making the rating. The DBQs do not document all C&P examination findings. The DBQ provides medical information that is directly relevant to the VA schedule of rating disease, providing the majority of the medical evidence that VA rating specialists need as they start to process the claim. There are more than 70 DBQs for various medical conditions, including one that is specific to residuals of TBI (see Appendix D).

THE VA'S SCHEDULE FOR RATING DISABILITIES: THE VASRD

After VBA receives all information necessary to process the claim, a VBA rater assesses all the information necessary to rate the claim based on the criteria in the VASRD. The VASRD is the collection of federal regulations used by VBA raters to assign disability ratings. The VASRD is encoded in Title 38 Code of Federal Regulations Part 4 (see Appendix E). TBI residuals are evaluated in the VASRD under diagnostic code 8045. Disability ratings are based on an individual's functioning in three areas: cognitive, emotional/behavioral, and physical.

The intent of the VASRD is to consistently rate every service-connected condition that has been diagnosed in a service member. Each disabling condition is evaluated based on the veteran's symptoms and functional abilities. The criteria for symptoms and functional abilities in the TBI DBQ are aligned with those noted in the VASRD (further discussed in Chapter 3). Once all of the evidence is submitted and reviewed for a service-connected disability, VBA assigns a disability rating based on the VASRD criteria.

VA disability ratings can be adjusted over time because the VA retains the right to reexamine a disability rating as the veteran's condition might improve. Additionally, if a veteran does not agree with the rating decision, he or she can submit an appeal to have the case reviewed (the appeals process is discussed further in Chapter 3).

STATEMENT OF TASK

Public Law 114-315 (see Appendix A), passed December 16, 2016, required the VA to contract with the National Academies to provide an independent review of the process by which the VA assesses impairment resulting from TBI for purposes of awarding disability compensation.[9] In response to that mandate, the VA requested a comprehensive review of examinations conducted by the VA of individuals who submit claims to the Secretary of

[8] VBA can use information in the veteran's health record to adjudicate the claim, if the information is sufficiently complete for rating purposes.

[9] Public Law 114-315, the Jeff Miller and Richard Blumenthal Veterans Health Care and Benefits Improvement Act of 2016. Section 110. December 16, 2016.

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Veterans Affairs for compensation for traumatic brain injury. The committee will review the process by which impairments that result from TBI, for purposes of awarding disability compensation, are assessed. The specific Statement of Task is in Box 1-2.

BOX 1-2
Statement of Task

The National Academies of Sciences, Engineering, and Medicine will convene a committee to make:

(A) A determination of the adequacy of the tools and protocols used by the Department of Veterans Affairs to provide examinations; and

(B) A determination of which credentials are necessary for health care specialists and providers to perform such portions of such examinations that relate to an assessment of all disabling effects.

Additionally, the committee shall include in its final report:

(1) Findings with respect to the comprehensive review noted in (A) and (B) above; and

(2) Recommendations for legislative or administrative action for improving the adjudication of veterans' claims seeking entitlement to compensation for all impairments arising from a traumatic brain injury

APPROACH TO THE TASK

A committee of 15 experts who have expertise in emergency medicine, neurology, neurosurgery, psychiatry, psychology, physical medicine and rehabilitation, epidemiology, and statistics was assembled. The committee members held five meetings over the course of 1 year. The committee members met with representatives from VHA and VBA at its first three meetings, during open sessions, so that they could understand the issues and various department processes. The committee also met with VBA quality assurance staff, VHA clinicians, and raters to discuss the evaluation of TBI and to better understand the role of those filling out the § 4.124a—Schedule of ratings, 8045, that is, the residuals of traumatic brain injury (see Appendix E).

Inasmuch as the legislation, directing the committee's study, called for an assessment of adequacy of the tools and protocols used by the VA to provide examinations, a determination of which credentials are necessary for health care specialists and providers to perform such examinations, and to make recommendations for legislative or administrative action for improving the adjudication of veterans' claims, the committee found it necessary to review and comment on all aspects of the adjudication process (i.e., from diagnosis to final decision making regarding veterans' claims).

Finally, although the VA provided a great deal of information to the committee regarding the details of the process that the committee was reviewing, the committee directed the staff to conduct broad literature searches for additional relevant information. Numerous published papers, government reports, and other documents were gathered and reviewed by the staff and the committee.

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ORGANIZATION OF THE REPORT

The report is organized into five chapters. Chapter 1 provides introductory material intended to acquaint the reader with background information about the VA and processes related to the committee's task. Chapter 2 discusses the diagnosis and assessment of TBI, the difficulties in diagnosing mild TBI, and distinguishing TBI from posttraumatic stress disorder or other comorbidities. The chapter also discusses the neuropathology of TBI and the possible recovery trajectories of TBI. Chapter 3 provides a detailed description of the disability determination process for residuals of TBI and assesses the adequacy of the tools and training provided in the process. Chapter 4 explores the characteristics of a high-quality process for determining disability resulting from TBI (such as validity, reliability, and consistency of process). Finally, conclusions and recommendations are discussed in Chapter 5.

REFERENCES

Aldag, M., R. C. Armstrong, F. Bandak, P. S. F. Bellgowan, T. Bentley, S. Biggerstaff, K. Caravelli, J. Cmarik, A. Crowder, T. J. DeGraba, T. A. Dittmer, R. G. Ellenbogen, C. Greene, R. K. Gupta, R. Hicks, S. Hoffman, R. C. Latta, 3rd, M. J. Leggieri, Jr., D. Marion, R. Mazzoli, M. McCrea, J. O'Donnell, M. Packer, J. B. Petro, T. E. Rasmussen, W. Sammons-Jackson, R. Shoge, V. Tepe, L. A. Tremaine, and J. Zheng. 2017. The biological basis of chronic traumatic encephalopathy following blast injury: A literature review. *Journal of Neurotrauma* 34(S1):S26–S43.

Asken, B. M., M. J. Sullan, S. T. DeKosky, M. S. Jaffee, and R. M. Bauer. 2017. Research gaps and controversies in chronic traumatic encephalopathy: A review. *JAMA Neurology* 74(10):1255–1262.

Barnes, D. E., A. L. Byers, R. C. Gardner, K. H. Seal, W. J. Boscardin, and K. Yaffe. 2018. Association of mild traumatic brain injury with and without loss of consciousness with dementia in US military veterans. *JAMA Neurology* 75(9):1055–1061.

CDC (Centers for Disease Control and Prevention). 2003. *Report to Congress on mild traumatic brain injury in the United States: Steps to prevent a serious public health problem*. https://www.cdc.gov/traumaticbraininjury/pdf/mtbireport-a.pdf (accessed August 24, 2018).

CDC. 2015. *Report to Congress on traumatic brain injury in the United States: Epidemiology and rehabilitation*. https://www.cdc.gov/traumaticbraininjury/pdf/tbi_report_to_congress_epi_and_rehab-a.pdf (accessed May 11, 2018).

CDC. 2017. *Traumatic brain injury & concussion*. https://www.cdc.gov/traumaticbraininjury/index.html (accessed August 24, 2018).

Corrigan, J. D., and F. M. Hammond. 2013. Traumatic brain injury as a chronic health condition. *Archives of Physical Medicine and Rehabilitation* 94(6):1199–1201.

DVBIC (Defense and Veterans Brain Injury Center). 2010. *Military traumatic brain injury and blast*. http://dvbic.dcoe.mil/research/military-traumatic-brain-injury-and-blast (accessed August 24, 2018).

DVBIC. 2019. *DOD worldwide numbers for TBI.* https://dvbic.dcoe.mil/dod-worldwide-numbers-tbi (accessed March 21, 2019).

Fann, J. R., A. R. Ribe, H. S. Pedersen, M. Fenger-Gron, J. Christensen, M. E. Benros, and M. Vestergaard. 2018. Long-term risk of dementia among people with traumatic brain injury in Denmark: A population-based observational cohort study. *Lancet Psychiatry* 5(5):424–431.

Gardner, R. C., C. B. Peltz, K. Kenney, K. E. Covinsky, R. Diaz-Arrastia, and K. Yaffe. 2017. Remote traumatic brain injury is associated with motor dysfunction in older military veterans. *Journals of Gerontology, A: Biological Sciences and Medical Sciences* 72(9):1233–1238.

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Gardner, R. C., A. L. Byers, D. E. Barnes, Y. Li, J. Boscardin, and K. Yaffe. 2018. Mild TBI and risk of Parkinson disease: A chronic effects of neurotrauma consortium study. *Neurology* 90(20):e1771–e1779.

Gennarelli, T. A., and D. I. Graham. 2005. Neuropathology. In *Textbook of traumatic brain injury*, edited by J. M. Silver, T. W. McAllister and S. C. Yudofsky. Washington, DC: American Psychiatric Publishing, Inc. Pp. 27–50.

Iacono, D., S. B. Shively, B. L. Edlow, and D. P. Perl. 2017. Chronic traumatic encephalopathy: Known causes, unknown effects. *Physical Medicine and Rehabilitation Clinics of North America* 28(2):301–321.

IOM (Institute of Medicine). 2009. *Gulf War and health: Volume 7: Long-term consequences of traumatic brain injury*. Washington, DC: The National Academies Press.

Johnson, V. E., W. Stewart, J. D. Arena, and D. H. Smith. 2017. Traumatic brain injury as a trigger of neurodegeneration. *Advances in Neurobiology* 15:383–400.

Jourdan, C., P. Azouvi, F. Genet, N. Selly, L. Josseran, and A. Schnitzler. 2018. Disability and health consequences of traumatic brain injury: National prevalence. *American Journal of Physical Medicine and Rehabilitation* 97(5):323–331.

Masel, B. E., and D. S. DeWitt. 2010. Traumatic brain injury: A disease process, not an event. *Journal of Neurotrauma* 27(8):1529–1540.

Peltz, C. B., R. C. Gardner, K. Kenney, R. Diaz-Arrastia, J. H. Kramer, and K. Yaffe. 2017. Neurobehavioral characteristics of older veterans with remote traumatic brain injury. *Journal of Head Trauma Rehabilitation* 32(1):E8–E15.

Selassie, A. W., E. Zaloshnja, J. A. Langlois, T. Miller, P. Jones, and C. Steiner. 2008. Incidence of long-term disability following traumatic brain injury hospitalization, United States, 2003. *Journal of Head Trauma Rehabilitation* 23(2):123–131.

Thurman, D. J., C. Alverson, K. A. Dunn, J. Guerrero, and J. E. Sniezek. 1999. Traumatic brain injury in the United States: A public health perspective. *Journal of Head Trauma Rehabilitation* 14(6):602–615.

VA (Department of Veterans Affairs). 2017. *Traumatic brain injury and PTSD: Focus on veterans*. https://www.ptsd.va.gov/professional/co-occurring/traumatic-brain-injury-ptsd.asp (accessed August 24, 2018).

VA. 2018a. *About VBA*. https://www.benefits.va.gov/benefits/about.asp (accessed August 24, 2018).

VA. 2018b. *FY 2019 budget submission*. https://www.va.gov/budget/products.asp (accessed June 15, 2018).

VA. 2018c. *Department of Veterans Affairs—Budget in brief 2019*. https://www.va.gov/budget/docs/summary/fy2019VAbudgetInBrief.pdf (accessed June 15, 2018).

VA. 2018d. *Compensation*. https://www.benefits.va.gov/compensation (accessed August 24, 2018).

VA. 2018e. *History—Department of Veterans Affairs (VA)*. https://www.va.gov/about_va/vahistory.asp (accessed August 24, 2018).

VA Law (Veterans Law Group). 2018. *Frequently asked questions*. https://www.veteranslaw.com/faq (accessed August 28, 2018).

Veterans Aid Benefit. 2018. *VA 2018 Compensation, SMC, and DIC Rates*. https://www.veteransaidbenefit.org/claim_support_disc/5%20Reference%20Material/1%20Rate%20Tables%20for%202018/VA%202018%20Compensation,%20SMC%20and%20DIC%20Rates.pdf (accessed August 28, 2018).

Vile, A. R., and L. Atkinson. 2017. Chronic traumatic encephalopathy: The cellular sequela to repetitive brain injury. *Journal of Clinical Neuroscience* 41:24–29.

Whiteneck, G. G., J. P. Cuthbert, J. D. Corrigan, and J. A. Bogner. 2016. Prevalence of self-reported lifetime history of traumatic brain injury and associated disability: A statewide population-based survey. *Journal of Head Trauma Rehabilitation* 31(1):E55–E62.

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Wilson, L., W. Stewart, K. Dams-O'Connor, R. Diaz-Arrastia, L. Horton, D. K. Menon, and S. Polinder. 2017. The chronic and evolving neurological consequences of traumatic brain injury. *The Lancet Neurology* 16(10):813–825.

Yi, H., J. D. Corrigan, B. Singichetti, J. A. Bogner, K. Manchester, J. Guo, and J. Yang. 2017. Lifetime history of traumatic brain injury and current disability among Ohio adults. *Journal of Head Trauma Rehabilitation* 33(4):E24–E32.

Zaloshnja, E., T. Miller, J. A. Langlois, and A. W. Selassie. 2008. Prevalence of long-term disability from traumatic brain injury in the civilian population of the United States, 2005. *Journal of Head Trauma Rehabilitation* 23(6):394–400.

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2

Diagnosis and Assessment of Traumatic Brain Injury

This chapter provides an overview of traumatic brain injury (TBI), including how it is defined, its mechanisms of injury, and its neuropathology. The chapter also provides a conceptual model on the recovery trajectories after TBI and intrinsic factors related to the variability in its presentation and diagnosis and in recovery from TBI. There is a discussion of the complexity of establishing a diagnosis of TBI, especially mild TBI (mTBI), the role of neuroimaging after injury, and the limitations of the current approaches. Finally, there is a discussion of which health care providers are qualified to make the diagnosis as well as the additional complexity of common co-occurring conditions in diagnosing TBI.

TRAUMATIC BRAIN INJURY

As noted in Chapter 1, traumatic brain injury is defined as an insult to the brain from an external force that leads to temporary or permanent impairment of cognitive, physical, or psychosocial function. TBI is a form of acquired brain injury, and it may be open (penetrating) or closed (non-penetrating) and can be categorized as mild, moderate, or severe, depending on the clinical presentation (Gennarelli and Graham, 2005). A TBI diagnosis is best documented at the time of injury or within the first 24 hours.

Mechanism of Injury

There are various mechanisms that can bring about a traumatic brain injury, which can result in physiologic or structural brain damage. The committee discusses those different mechanisms, which include blunt, non-penetrating TBI injury; penetrating injury; and blast injury.

Blunt, Non-Penetrating TBI

Blunt, non-penetrating TBI can result from a direct impact to the head or from rapid head acceleration or deceleration without impact. Brain injury from this mechanism has two phases. The first phase occurs as a direct result of the initiating traumatic event; the second involves a cascade of several neuropathologic processes continuing for weeks to months after the initial injury.

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The primary injury phase is immediate, and its damage, which can cause death almost instantaneously, is often complete by the time emergency care is initiated. Direct impact of the brain against the bony cranial vault and shearing of neurovascular structures result in neuronal damage. Because the brain resides within a fluid-filled compartment, the movement of its cellular elements lags behind the skull during rapid deceleration. Thus, the brain will strike both anteriorly and posteriorly against the inner aspect of the skull, and a *coup-countercoup* lesion will result (Graham et al., 2002). If a rotational component is present—which is nearly universal in the case of blunt TBI—intracranial structures will torque and twist, resulting in excessive shear strain (i.e., stretch) (Morales et al., 2005; Smith, 2013). Neuronal axons and blood vessels are most susceptible to sheer strain due to their elongated microstructure. Thus, the primary injury phase of TBI results in damage to axons (axonal injury) and blood vessels (hemorrhage). Motor vehicle accidents are particularly injurious because of the sudden deceleration (Johnson et al., 2017).

The secondary injury phase begins immediately after the primary phase and involves a progression of axonal injury, with shifts in ionic flux leading to axonal swelling, a loss of axonal transport, and altered neurotransmission (Giza and Hovda, 2014). Mitochondrial failure results in an energy crisis for the neuron, leading to a loss of neuronal function and apoptosis (programmed cell death). This secondary phase might also involve necrosis and neuronal demyelination. A neuroinflammatory response involving microgliosis starts within hours of the injury and might continue for months or even years. TBI-induced blood–brain barrier dysfunction (BBBD) allows elements of the peripheral immune system to participate in this process. Diffuse microvascular damage combined with BBBD and a loss of autonomic regulation results in both hyper- and hypo-perfusion, contributing to ischemia and cerebral edema. The destruction of intra-axonal structures can result in abnormal accumulations of neurotoxic proteins such as beta-amyloid and phosphorylated tau. It is thought that post-TBI accumulations of those proteins in combination with persistent abnormal neuroinflammation might contribute to early-onset neurodegeneration or dementia (Giza and Kutcher, 2014; Smith, 2013).

Penetrating TBI

A TBI may be open (penetrating) or closed (non-penetrating). A penetrating TBI occurs when physical, external forces affect the brain and an object enters the brain tissue. A non-penetrating (closed) head injury is caused by an external force that produces movement of the brain within the skull.

Missile injuries, such as gunshot wounds, are a common cause of TBI, and are classified as either penetrating or perforating depending on how the missile traverses the head (Graham et al., 2000). In penetrating injuries, the object enters and lodges within the cranial cavity. Perforating injuries occur when the object traverses the cranial cavity and leaves through an exit wound. The extent of damage is governed by the shape and mass of the missile and by its direction and velocity (Morales et al., 2005). Damage is also related to the amount of energy released when the missile passes through the brain (Graham et al., 2000).

Blast-Induced TBI

Blast-induced traumatic brain injury (bTBI) has become a common type of military head injury, although non-blast mechanisms are still common in the military and civilian population (e.g., injuries from car and motorcycle accidents, athletic activities, and military physical training).

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The neurologic injury from bTBI can result both from a direct shock wave effect and an indirect transfer of the shock wave through blood vessels and cerebrospinal fluid to the brain. Exposure to blast overpressure initiates a cascade of cellular pathologic processes in the brain, including damage to the microvasculature and blood–brain barrier (BBB) integrity, followed by increased BBB permeability. The breakdown of the BBB can result in brain edema and an increase in intracranial pressure, accompanied by the activation of secondary brain injury by impairing cerebral perfusion and oxygenation. In particular, the activation of oxidative mechanisms and neuroinflammation has been shown to contribute to the neurodegeneration and cell death in secondary brain injury following bTBI.

As with TBIs from other causes, bTBI may range from a severe form, which is often comorbid with polytrauma (i.e., multiple traumatic injuries, such as a TBI in addition to a serious burn or TBI and posttraumatic stress disorder [PTSD]), to the mild form, which shares symptoms or is comorbid with PTSD (discussed later in the chapter). The epidemiologic scale and complexity of bTBI and closely related neuropsychiatric conditions present significant short- and long-term challenges for the military health care system and for the Department of Veterans Affairs (VA) (Papa et al., 2015). Comorbidities often associated with TBI, including bTBI, will be discussed later in the chapter.

Neuropathology

TBI neuropathology consists of a primary injury that is a direct consequence of the traumatic insult and a secondary injury that results from a cascade of molecular and cellular events triggered by the primary injury and which leads to cell death, axonal injury, and inflammation (McKee and Daneshvar, 2015; Taylor and Gercel-Taylor, 2014). In response to tissue damage, cells release proteins into extracellular space which offers transit to body fluids, including the blood (Taylor and Gercel-Taylor, 2014). Acute responses occur as a result of the primary injury and orchestrate neuronal recovery; however, in a subset of individuals these biologic changes are related to symptoms and deficits which last beyond this period into the sub-acute, and for some even into the chronic, period of recovery (Taylor and Gercel-Taylor, 2014). The mechanisms that influence individual variability into recovery are not well understood and are a current research focus.

Chronic neurologic symptoms following traumatic brain injuries in military personnel are common and can include global disability, neurobehavioral impairment, and psychological comorbidities (Laskowitz and Grant, 2016). It is hypothesized that TBI and the subsequent pathogenic processes induce neurons and glial and endothelial cells to release molecules extracellularly that transit into blood (DeKosky et al., 1998). Extracellular release of molecules may occur through a breakdown of cell membranes (e.g., neurodegeneration) or via secretion as part of intercellular communication (e.g., cytokines or angiogenic factors), which likely contribute to the development and maintenance of chronic symptoms and deficits following TBIs. There is also evidence linking TBI to neurodegenerative diseases, including Parkinson's disease, multiple sclerosis, amyotrophic lateral sclerosis, and other types of dementia (e.g., Alzheimer's disease and chronic traumatic encephalopathy) (Freeman and Ting, 2016; Gardner et al., 2014; Witcher et al., 2015).

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ASSESSMENT OF TBI SEVERITY

During the diagnostic process, a clinician typically assesses the severity of TBI. However, the initial assessment of TBI severity does not necessarily predict the extent of disability arising from TBI. Typical approaches to determining severity early after injury include neuroimaging, assessing the presence of an altered consciousness or loss of consciousness, assessing the presence of posttraumatic amnesia, and applying the Glasgow Coma Scale score.

That score has been the gold standard of neurologic assessment of trauma patients since its development by Teasdale and Jennett in 1974 (Teasdale and Jennett, 1974). The Glasgow Coma Scale is a clinical tool designed to assess coma and impaired consciousness and is one of the most commonly used TBI severity scoring systems. Other TBI severity-classification systems grade single indicators, such as loss of consciousness and the duration of posttraumatic amnesia. The predictive value of those measures has been demonstrated (Dikmen et al., 1990; Levin, 1990, 1995; Levin et al., 1990; Sherer et al., 2008), but each may be influenced by factors unrelated to or only indirectly related to the severity of TBI (e.g., intoxication).

The severity of a TBI might range from mild to severe. There are multiple schema that have been developed by several organizations to assist in defining TBI severity (see Table of Case Definitions of Traumatic Brain Injury in Appendix F) which differ slightly from one another according to which criteria are weighed most heavily. All are similar in that those individuals with mTBI experience just a brief loss of consciousness or even an alteration of consciousness without complete loss. The Department of Defense (DoD) classifies severity using a combination of the four factors mentioned above: neuroimaging results (normal or abnormal), extent of altered or loss of consciousness (0–30 minutes, >30 minutes to <24 hours, and >24 hours), length of posttraumatic amnesia (up to 24 hours versus >24 hours), and Glasgow Coma Scale scores (using best score in first 24 hours; 13–15, 9–12, <9).

Recovery Trajectories of TBI

In this section, the committee presents a conceptual model for understanding recovery trajectories of TBI and then describes subject-level factors that might influence TBI recovery.

Within the first week of any TBI, most patients will experience a decline in function associated with a variety of symptoms. However, the degree of functional decline varies; some will be able to carry out normal daily activities such as school and work, while others will require formal rehabilitation (Eisenberg et al., 2013) (see Figure 2-1, Acute Phase). The initial severity of the brain injury is thought to have a major influence on the degree of functional decline during this phase. Indicators of injury severity include the Glasgow Coma Scale score (15 is the least severe, 3 is the most severe) and mechanism of injury (TBIs from motor vehicle collisions are typically more severe than other mechanisms). Vulnerability to neuronal injury may also influence the degree of functional decline; a prior TBI and pre-existing central nervous system diseases (e.g., dementia, multiple sclerosis, stroke) increase the risk of dysfunction during this stage (Iverson et al., 2017). Females may be more vulnerable than males due to weaker neck muscles (allowing for more head rotation and shear strain on neurons) (Collins et al., 2014)[1] and reduced tensile strength of neuronal axons (Dollé et al., 2018). When symptoms are used to define function, declines from baseline also might be related to symptom reporting style.

[1] The authors note that it is unclear the relative roles biophysiology, anthropomology, and sociocultural constructs play in these differences.

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Although the initial severity of TBI often predicts the speed of recovery, recent research suggests that not everyone follows the same trajectory. Some recover fully, but slowly, while others never fully recover and might experience prolonged functional disability (Yeates et al., 2009) (see Figure 2-1, Subacute Phase). Factors influencing the degree of recovery during this phase include other comorbidities, resilience, cognitive reserve, and cognitive stressors such as work and school (Iverson et al., 2017; Sullivan et al., 2016). The treatments received might also influence the degree of recovery (Collins et al., 2016). It is not clear if the functional trajectory experienced in the acute phase influences the trajectory in subacute phase. Moreover, it should be emphasized that these subject-level factors account for less than one-quarter of the variance in TBI outcomes. That fact underscores their weakness as predictors of outcome and suggests that other, unmeasured factors are at play.

A single TBI of any severity can increase the risk of accelerated cognitive decline 10 or more years after the injury (Vincent et al., 2014) (see Figure 2-1, Chronic Phase). The individual's age at the time of initial injury has a significant influence on the risk of accelerated decline (Gardner et al., 2014). Subsequent brain insults, such as those experienced during contact sports, also might influence the risk of accelerated decline (e.g., chronic traumatic encephalopathy) (Asken et al., 2017). It is not clear if the functional trajectory of either the acute or subacute post-injury phase influences that risk.

Factors Related to Variability in Presentation, Diagnosis, and Recovery of TBI

A number of factor might affect the trajectory of disability and recovery after TBI. They might affect the presentation, diagnosis, and course of TBI, which is viewed here as a progressive and chronic disease with lifetime consequences (Maas, 2016). While there is a vast literature on factors related to TBI in the general population, there are fewer studies describing associations within the military setting. Regardless, there is evidence that demographic factors, including age and sex, might influence the course, progression, and outcomes of TBI, as will the type of injury, comorbidities, and genetic predisposition. There is also evidence that differences in TBI outcomes might be related to factors involving access to care. These are briefly discussed below.

Age

While the median age of incident TBI is relatively young, especially in cases due to trauma occurring during active duty, it is highly variable. In the general population, TBI is more prevalent among those under 25 years of age and those older than 75 years (Peeters et al., 2015), with the mean age for women higher than for men. The absolute incidence of TBI among the elderly is increasing, most likely due to the greater life expectancy and mobility of older adults, with the resulting increased risk of falls (Faul and Coronado, 2015). Studies following the outcome of TBI have reported older age to be associated with greater disability in terms of both physical and cognitive function (Graham et al., 2010), with older individuals experiencing more hospitalizations and higher mortality than any other age group (Roozenbeek et al., 2013). However, not all studies have found an association between age and TBI outcomes. Age did not affect the Glasgow Outcome Scale or Disability Rating Scale in one study examining outcomes (Oppelt et al., 2018), and mixed results were seen in a second study, with no age differences found in 1-year functional outcomes, but an association of being age 80 or older observed with 1-year outcome scores on the total Quality of Life after Brain Injury (Gross and Amsler, 2018).

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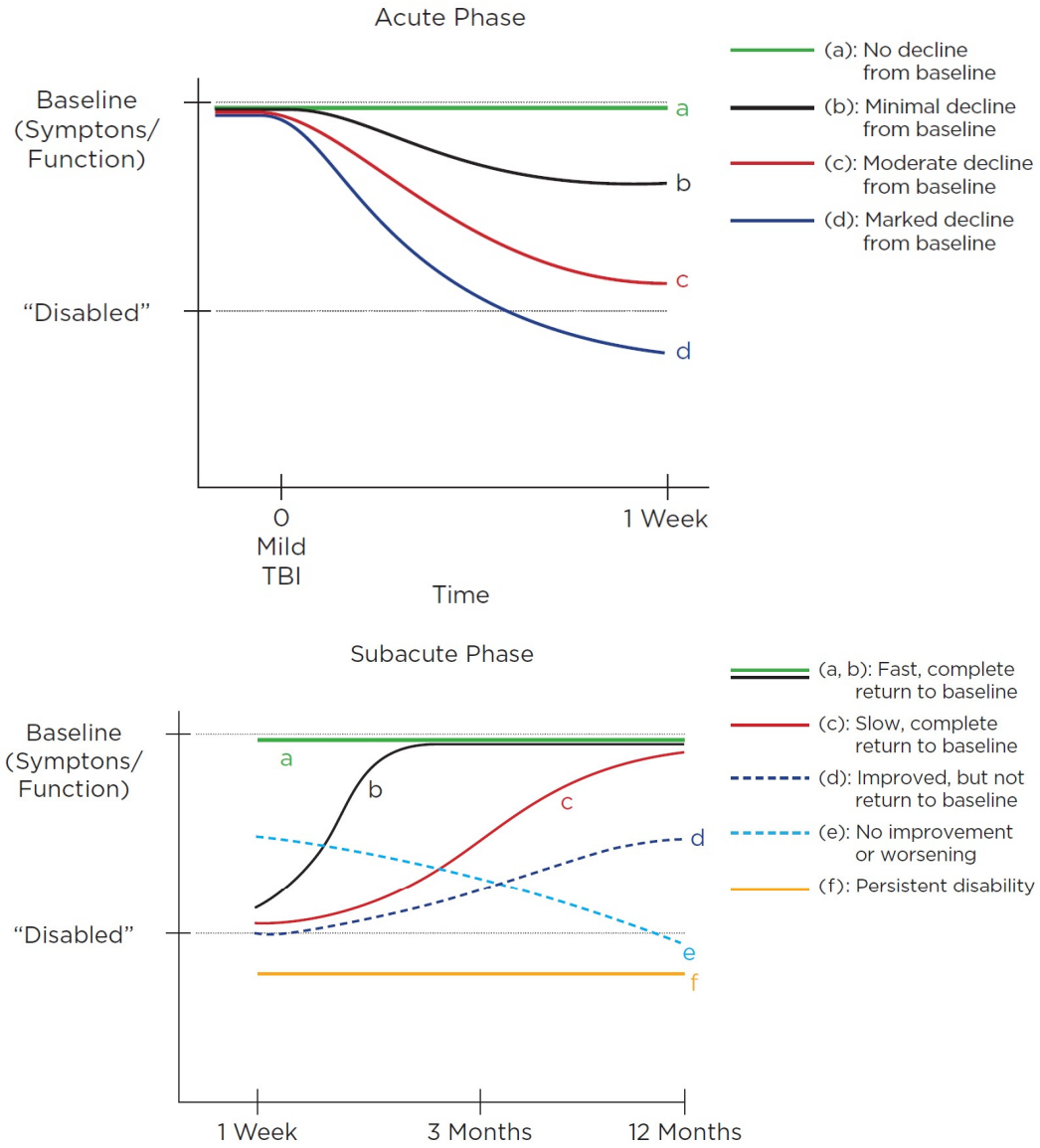
Potential Trajectory Pattern by Post-Injury Phase



Factors Influencing Trajectory

Severity of injury
Glasgow Coma Scale score
Mechanism of injury

Vulnerability to injury
Sex (F more vulnerable than M)
Prior TBI
Pre-existing CNS conditions

Symptom reporting
Sex (F report more symptoms than M)
High pre-injury symptom report

Pre-injury conditions
Migraine headache
ADD/ADHD

Resilience and cog reserve
Prior TBI
Learning disorder
Anxiety/depression
Education

Hormonal/genetic influences

Symptom reporting
Sex (F report more symptoms than M)
High pre-injury symptom report

Treatments

Life stress (e.g., school, work)

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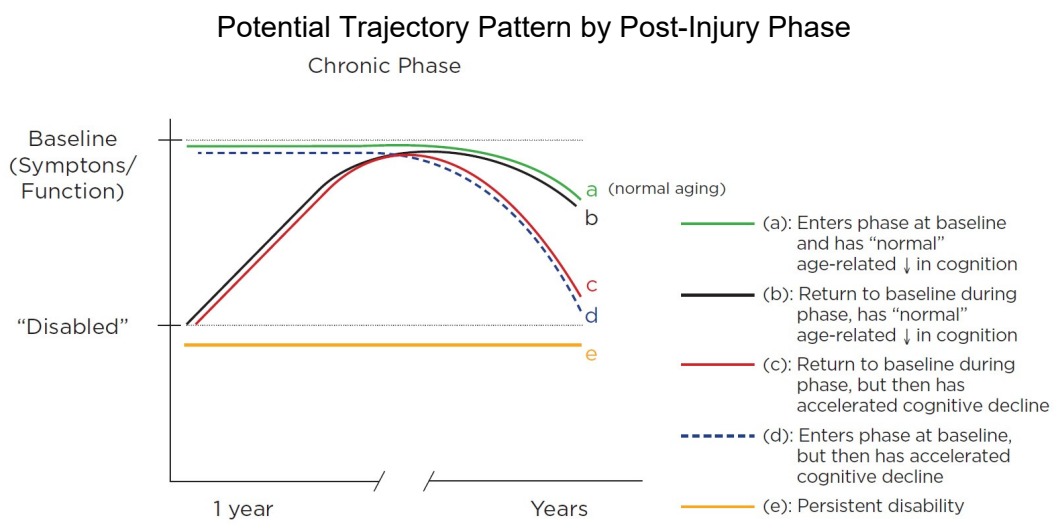

Factors Influencing Trajectory

Age
Young more likely to return to baseline than old

Repetitive head hits

Co-morbid health conditions

Genetic influences

FIGURE 2-1 Conceptual model of trajectories of disability and recovery after a single TBI during the acute, subacute, and chronic post-injury phases.
NOTES: The trajectories of disability and recovery after a single TBI are represented during the acute phase (0–1 week), the subacute phase (1 week to 3 months), and the chronic phase (3 months to >10 years). A solid line represents "typical" recovery trajectory; dashed lines represent trajectory variations. Breaks in the trajectory lines, between phases, indicate a lack of knowledge of how a trajectory in one phase influences the trajectory of the following phase. ADD/ADHD = attention deficit disorder/attention deficit hyperactivity disorder; CNS = central nervous system; F = female; M = male.

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Sex

There is strong evidence that sex plays an important role in various aspects of TBI, from pathophysiology to clinical care. TBI disproportionately affects young males due to their high-risk behaviors, and with a mortality rate after TBI being four times higher in males age 20 to 24 than in females of the same age (Coronado et al., 2011). However, incidence is increasing in women as their involvement in military combat, sports, and other high-risk activities associated with TBI is increasing (Amara et al., 2014). Research on the impact of sex differences has produced variable findings.

In 2001 the Institute of Medicine acknowledged the important influence of sex on brain function (IOM, 2001). In one study, women with mTBI were found to have significantly higher odds of poor outcome than males (Bazarian et al., 2010). However, males and older adults are at increased risk of depression following TBI (Albrecht et al., 2018).

TBI may affect women of reproductive age; the stress of TBI may result in anovulation and central hypothalamic-pituitary-ovarian axis suppression (Ranganathan et al., 2016). A growing body of evidence indicates that hormones may play a role in injury susceptibility as well as recovery (Wright et al., 2014). There is evidence that high estradiol production is associated with adverse outcomes related to the extracerebral consequences of severe TBI (Rakholia et al., 2018).

Another recent study found that males, but not females, with TBI performed significantly worse than comparison participants without TBI on a dynamic task of emotional recognition abilities and that the sex difference could not be explained by lesion location, TBI severity, or other neuropsychologic variables (Rigon et al., 2016). In another study, by contrast, sex was not found to be an independent predictor for poorer outcome after severe TBI (Herrera-Melero et al., 2015).

Type of Injury

The types of TBI have been investigated, and significant differences in medical complications have been reported. For example, although penetrating injuries are less common than closed injuries in the civilian population, they are far more lethal (Santiago et al., 2012). Compared with blunt injuries, penetrating injuries are associated with higher rates of comorbidities involving the pulmonary and central nervous systems including respiratory failure, pneumonitis/pneumonia, skull fracture, cerebrospinal fluid leak, and hypotonia (Black et al., 2002). Recently, a number of studies have examined the consequences of blast as a new mechanism of brain injury. Trotter et al. (2015) reported a dose–response relationship between military blast exposure and white matter integrity and added that the number of years since the most severe blast was negatively associated with fractional anisotropy. High rates of sensory impairment, pain issues, and polytrauma were also found to be present in those injured by blasts (French, 2010). Although differences in the frequency of long-term complications between blast and non-blast TBIs have been reported, clinical presentation of blast-related injuries are difficult to track as they are classified by severity score rather than mechanism; severity scoring is associated with prognosis in clinical practice (Yamamoto et al., 2018). Unfortunately, injuries that appear to have different pathophysiologies and outcomes are managed in the same way, with perhaps not all of them being managed optimally (Santiago et al., 2012).

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Comorbidities

Medical conditions associated with TBI are often diagnosed concurrent with or following the brain injury (Farmer et al., 2017; Hoge et al., 2006; Lew et al., 2007). A very comprehensive study was conducted by the RAND Corporation concerning the characteristics of non-deployed active duty service members diagnosed with mTBI, including their co-occurring symptoms and conditions (Farmer et al., 2017). In general, the rates of behavioral health diagnoses were found to be twice as high in those with a history of TBI, regardless of severity, than in those without such a history. Treatments for adjustment disorders (16 percent) and anxiety disorders (14 percent) were the most common, followed by treatment for depression; no differences were found in the rates of alcohol abuse or attention deficit disorder/attention deficit hyperactivity disorder (Farmer et al., 2017). Hoge at al. (2006), Kontos et al. (2013), and Manners et al. (2016) found that service members deployed in the Iraq war exhibited high rates of posttraumatic stress disorder associated with mTBI. However, self-reports of poorer general health, missed work days, medical visits, and a higher number of somatic and post-concussive symptoms were no longer associated with the TBI when adjusted for PTSD and depression. It is important to recognize that mental health symptoms might have causes other than TBI—specifically, causes involving pain, medication, alcohol or drug use or intoxication, or PTSD, any of which can be present either in isolation or in addition to a brain injury and can confound or complicate the diagnosis (Roozenbeek et al., 2013).

Genetic Predisposition

In the era of promoting precision medicine for the treatment of specific disease and disorders in individuals, genetic predisposition plays an important role in TBI outcomes. Understanding the impact of genetic influences on neurorecovery from TBI has the potential to provide guidance for the better individualization of prognosis and to inform the development of novel treatments, which are currently lacking (Kurowski et al., 2017). Several recent reviews and meta-analyses have been published that hint at the influence that genes may have in post-injury recovery and disability. The gene that has been most investigated to date is apolipoprotein E (ApoE), a lipid transport protein, which is recognized as an important genetic risk factor for dementia and other neurodegenerative diseases (Van Giau et al., 2015). While the ε4 allele of ApoE plays a significant role in the pathogenesis of neurodegeneration, particularly in Alzheimer's disease, its role in other neurologic diseases has not been conclusively elucidated, as confounding factors have affected interpretation of the allele's role (Maiti et al., 2015). A meta-analysis evaluating cognitive function and neuropsychologic domains published in 2016 concluded that that ApoE ε4 does not have a detrimental effect on cognitive performance following TBI (Padgett et al., 2016).

Several other systematic reviews have investigated the relationship between non-ApoE genes and TBI recovery. Kurowski and colleagues (2017) used a system biology–based approach to identify biologic processes over-represented with genetic variants previously implicated in clinical outcomes after TBI and attempted to identify unique genes potentially related to recovery after TBI. Their study identified genetic variants primarily involved in two biologic processes: response to injury (cell proliferation, cell death, inflammatory response, and cellular metabolism) and neurocognitive and behavioral reserve (brain development, cognition, and behavior). They concluded that novel sets of genes are implicated in the healing process following TBI, which may be important in understanding the underlying complex biologic processes important to TBI recovery (Kurowski et al., 2017). Another review of the relationship

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between genetic variations and outcomes after TBI found that the tissue, cellular, and subcellular location of non-ApoE single nucleotide polymorphisms (SNPs) reported to be associated with variation in global, neuropsychiatric, and behavioral outcomes could be clustered into three types: those associated with the blood–brain barrier, neuroprotective/regulatory functions, and neuropsychiatric/degenerative groups (Zeiler et al., 2018). A review of polymorphisms associated with TBI reported two studies that found SNPs related to brain-derived neurotrophic factor to be significantly associated with concussion incidence (Panenka et al., 2017). The investigators noted that U.S. soldiers with that genotype were more likely to report a history of concussion prior to deployment and to sustain a concussion during deployment. While work in this field is just beginning, it is clear that future studies using genomic, proteomic, and epigenetic approaches to research will have a significant impact on the understanding of risk and outcomes related to TBI.

Access to Care and Disparities in Outcomes, Treatment, and Follow-Up

While it is apparent that age, sex, race, and other factors are associated with differences in TBI incidence, presentation, and severity, studies investigating the follow-up of TBI are critical to determining if and what factors might affect long-term outcomes.

Two important factors, race and insurance status, have been found in multiple studies to be associated with lower referral rates for rehabilitation or other follow-up treatment after TBI. A study of discharge destinations of almost 300,000 patients with moderate or severe TBI using National Trauma Data Bank data over the years 2007–2010 found that Hispanic and black patients were less likely to be discharged to higher level rehabilitation than were non-Hispanic whites (Meagher et al., 2015). In that study, the racial disparity remained even at older ages where uniform insurance coverage by Medicare existed. In a study using the same data source, racial/ethnic groups were found to be comparable in terms of injury severity score, TBI severity, and associated injuries. However, after adjusting for confounders including insurance status, non-white patients were 15 percent less likely to be placed in rehabilitation than white patients (Shafi et al., 2007). Asemota et al. (2013) directly compared insured and non-insured patients by race. They found that insured blacks, Hispanics, and Asians were less likely to be discharged to rehabilitation than insured whites. In terms of insurance coverage, all ethnicities without insurance were less likely to be discharged to rehabilitation than insured whites. Haider et al. (2008) found similar results concluding that African American, Hispanic, and uninsured patients have worse outcomes, but insurance status appears to be more strongly associated with mortality after trauma than race/ethnicity.

McQuistion et al. (2016) expanded the investigation of outcomes reporting that the uninsured were less likely to have a TBI procedure, had longer hospital stays, were more likely to die in the hospital, and were less likely to be discharged to rehabilitation than those with private insurance. In this study of more than 187,000 patients registered in the National Trauma Data Bank during 2002–2012, results by race/ethnicity varied depending on the outcome assessed. In a study of predominantly (70 percent) Hispanic patients, Hispanic ethnicity and insurance status along with markers of injury severity were predictive of discharge to rehabilitation facilities and to long-term acute care/nursing facilities (Budnick et al., 2017). In a study of almost 15,000 U.S. veterans diagnosed with TBI in 2006, Dismuke and colleagues (2015) found evidence that health care use might be a partial mediator between race/ethnicity and mortality. In that study, Hispanic veterans were found to have fewer total visits and fewer TBI clinic, neurology, rehabilitation, and other visits than non-Hispanic whites, with the only

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exception to the pattern being that Hispanic veterans had more mental health visits than non-Hispanic white veterans. Similar results involving differences in outcomes or follow-up by race/ethnicity have also been published (Arango-Lasprilla and Kreutzer, 2010; Berry et al., 2010; Bowman et al., 2007; Gary et al., 2009; Perrin et al., 2014; Schiraldi et al., 2015; Shafi et al., 2007; Staudenmayer et al., 2007).

Studies of other factors that might affect TBI outcomes are limited. A recent qualitative study described rural heath disparities for TBI services (Eliacin et al., 2018). In addition to generalized findings involving inadequate access to and the unavailability of specialized, age-appropriate, and long-term health services, the researchers reported that patients experienced transportation barriers to health services which limited access to care. Those barriers tended to amplify the health disparities between rural and urban or suburban patients. The amount of "safety-net burden" of hospitals, defined as the proportion of Medicaid and uninsured patient charges that were covered by the health care facility, was also found to affect TBI outcomes (Bakhsheshian et al., 2018). High-burden hospitals had greater mortality rates and more major complications than those with lower safety-net status. In a study investigating the lifetime prevalence of TBI among 2,881 African Americans and whites, Kisser et al. (2017) found a significant three-way interaction among race, poverty status, and age. The results, which were based on individuals' histories of TBI, indicated a higher prevalence of TBI in men, older African Americans in poverty, and younger whites in poverty.

Those studies suggest that post-TBI access to care issues, which are found to be associated with race/ethnicity, insurance coverage, and socioeconomic status, might be a primary factor in disparities in long-term outcomes in TBI patients. Preventive measures targeting the relevant TBI risk factors in those populations (Kisser et al., 2017) and policies to address systematic inequalities in access that may affect long-term functional outcomes (Shafi et al., 2007) are warranted.

EMERGING EVIDENCE ON NATURAL HISTORY OF MILD TBI

While considerable research has been conducted on mTBI, the diagnosis of mTBI and the prognosis offered after a finding of mTBI continue to be complicated and sometimes controversial. However, it is likely that three ongoing, large-scale, multi-center, observational, longitudinal studies that are now in the advanced stages of data collection, curation, and analysis will reveal new information about both the psychosocial and neurobiologic manifestations of mTBI.

Transforming Research and Clinical Knowledge in Traumatic Brain Injury (TRACK-TBI) is a prospective, multicenter, longitudinal observational study of civilian patients with TBI presenting to 18 Level I trauma centers throughout the United States. Funded by the National Institute on Neurological Diseases and Stroke, the project recruited between 2,700–3,000 adults who were evaluated in an emergency department within 24 hours of injury and had a clinical indication to require a computed tomography (CT) scan. As a result, the sample is predominately composed of persons with mTBI; however, the full spectrum of injury severity is included. Importantly, 300 orthopedic trauma controls were also enrolled. The data collected include CT scans, advanced imaging such as magnetic resonance images (MRIs), blood biospecimens, indices of premorbid characteristics, and detailed clinical outcomes with more than 20 outcome assessments. Follow-up interviews are conducted at 2 weeks, 3 months, 6 months, and 1 year

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post-injury. The research program also includes the recruitment of a friend control group without injury.

The Chronic Effects of Neurotrauma Consortium (CENC) was established in 2013 via a federal cooperative agreement responding to the National Research Action Plan for improved prevention, diagnosis, and treatment of service members and U.S. veterans with TBI. The centerpiece of CENC is a multicenter, longitudinal, observational study designed to address gaps in knowledge about who served in Operation Iraqi Freedom and Operation Enduring Freedom and experienced mTBI. Data are being collected from more than 30 academic universities, 15 VA medical centers, and 3 military treatment facilities. The study's overarching goal is to understand the associations among chronic effects of mTBI, neurodegenerative disorders, and common comorbidities, including psychological, neurologic (i.e., memory, seizure, autonomic dysfunction, and sleep disorders), sensory (i.e., visual, auditory, and vestibular dysfunction), movement, pain (which includes headache), and cognitive and neuroendocrine disorders. CENC will collect data and conduct annual follow-up interviews on the research participants.

The National Collegiate Athletic Association and DoD established the Concussion Assessment, Research and Education (CARE) Consortium to study the natural history of clinical and neurobiologic recovery following concussion in athletes from collegiate sports and in U.S. military academy cadets. The CARE Consortium is a 30-site investigation that intends to enroll approximately 25,000 athletes and cadets, with the goal of capturing 1,200 participants who experience concussions. The project, launched in 2014, includes data collection from 30 campuses across the country. The CARE Consortium has two major components: a clinical study core, which is investigating the natural history of how symptoms of concussion manifest and evolve over time, and the advanced research core, which studies the neurobiology of concussion and repetitive head impact exposure. The CARE Consortium is also intended to provide a framework for a future longitudinal study that will examine both the intermediate and long-term effects of concussion and repetitive head impact exposure.

Each of these studies is recruiting, or has recruited, a large cohort of people from whom a broad array of imaging, biologic, clinical, and psychosocial data are being collected. Each study is designed to examine the natural course of recovery over months to years. The three studies focus on different cohorts: persons treated in civilian Level I trauma centers (TRACK-TBI), post-9/11 veterans and service members exposed to combat and experiencing an mTBI (CENC), and students engaged in collegiate sports or attending U.S. military academies (CARE Consortium). Given the breadth of characteristics being studied and the naturalistic designs, it is reasonable to expect that new insights into the manifestation and consequences of mTBI will emerge from these studies. In particular, the discovery of one or more biomarkers of the chronic effects of TBI could be an important advancement for disability determination if these indicators were sensitive to both current functional effects and vulnerability to future consequences.

ESTABLISHING A TBI DIAGNOSIS

While the previously described studies may lead to the identification of biomarkers that can confirm the diagnosis of TBI long after injury, at the present time a clinical interview and self-report using a validated screening method is considered the gold standard for determining a comprehensive lifetime history of exposure to TBI. This section will review the screening instruments used to detect potential cases of TBI, the various clinical criteria and case definitions, the limitations of the current approaches in the clinical diagnosis of mTBI, and the

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role of neuroimaging in identifying patients with a potential TBI. Chapter 3 will discuss the tools specifically used by the VA to provide evidence for the disability determination for residuals of TBI.

Screening

A number of screening instruments have been developed to detect potential cases of TBI. Relying on medical records is often insufficient because many injuries are not treated, including, occasionally, even more severe injuries. Screening instruments vary in the extent to which their psychometrics have been established (e.g., Corrigan and Bogner, 2007a; Russell et al., 2013; Schneider et al., 2016; Terrio et al., 2009; Vanderploeg et al., 2012), with single-item screens tending to be the least reliable and unlikely to capture all TBIs (Diamond et al., 2007).

The primary method for screening for exposure to deployment-related TBI at the time of injury is the Military Acute Concussion Evaluation 2 (MACE 2). Because many mTBIs are not evaluated at the time of injury, injuries incurred during deployment are typically screened retroactively with the Brief Traumatic Brain Injury Screen (BTBIS) (DVBIC, 2007; Schwab et al., 2007), a four item measure that is typically completed by service members upon return from deployment as part of a comprehensive health screening. The VA's TBI screening tool is a modified version of the Defense and Veterans Brain Injury Center's (DVBIC's) BTBIS. The screening tool that the VA developed from the BTBIS errs on the side of being overly inclusive in identifying veterans at risk for having a TBI (GAO, 2008). A positive screen is followed by a more comprehensive evaluation (VA, 2010). The MACE 2 and the BTBIS are described in more detail below.

Military Acute Concussion Evaluation

In the field, the MACE 2 is completed immediately post-injury—specifically, following an event that might have resulted in a TBI—to determine cognitive deficits due to mTBI (DVBIC, 2006, 2018). The major goals of the MACE 2 are to confirm the diagnosis of mTBI and to provide further assessment data by using the Standardized Assessment of Concussion (McCrea et al., 1997) to record neurocognitive deficits. The MACE 2 can be used by medics and corpsmen and can be administered within 5 minutes of injury; there are no data to support its use beyond the acute injury period (French et al., 2008). The four cognitive domains tested are orientation, immediate memory, concentration, and delayed recall. Evaluations of the validity of the MACE 2 indicate that it is able to distinguish service members who have sustained mTBI from controls and that it accurately predicts the timing of return to duty (McCrea et al., 2014). If administered more than 12 hours post-injury, however, its sensitivity and specificity are lower, and it is not considered to be of clinical utility (Coldren et al., 2010).

The MACE 2 form consists of four sections (see Appendix G):

- Concussion screening: includes a description of the injury event (event as described by the service member or a witness, observable signs, type of event, and whether there was a blow or jolt to the head) and screening questions about loss of consciousness, alteration of consciousness, and posttraumatic amnesia. Also included in the concussion screening are a checklist of symptoms and specific questions regarding medical history related to concussion, headache, migraine, depression, anxiety, and other behavioral health concerns. If the evaluator answers "yes" to the service member having both a "blow or jolt to the head" AND "any alteration of consciousness or

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memory," the evaluator continues with the other portions of MACE 2. In the exam summary, the evaluator reviews the symptoms checklist and marks "1 or more symptoms" or "no symptoms." The evaluator also reviews the medical history results and marks "positive" or "negative."

- Cognitive exam: assigns scores for orientation, immediate memory, concentration, and delayed recall. The scores are totaled out of 30 possible points and reported at the end of the MACE 2 form.
- Neurologic exam: tests for speech fluency and word finding, grip strength and pronator drift (an indicator of muscle weakness and compensation), balance and gait, normal or abnormal pupil response to light, and eye tracking. The evaluator indicates an overall response of "normal" or "abnormal."
- Vestibular/ocular-motor screening (VOMS): tests for baseline symptoms, smooth pursuits, saccades, convergence, vestibular-ocular reflex, and visual motion sensitivity. The evaluator is instructed to consider deferring this test if the patient is overly symptomatic or a trained provider is unavailable. The evaluator scores the section as "abnormal," "normal," or "deferred."

The Brief Traumatic Brain Injury Screen

The BTBIS is a one-page paper-and-pencil questionnaire designed by the DVBIC to screen for TBI in service members (DVBIC, 2007; Schwab et al., 2007). It begins with a few questions about basic demographics and deployment history over the preceding 2 years, which are followed by three questions designed to identify possible TBI (see Box 2-1). The first of those asks about any injuries received during deployment, with checkboxes indicating blast, vehicular, bullet, falls, and other as categories of injuries. The next question asks about neurologic features of TBI, including any alterations in consciousness and loss of consciousness that resulted from injuries identified by the previous question. The question also includes the categories "having symptoms of concussion afterward" and "head injury," which are not part of the definition of TBI; those were included to provide further description of the injury for clinicians. The final question aims at identifying specific symptoms and problems that are thought to be possibly associated with a head injury or concussion. Generally, it takes about 3 to 4 minutes to complete the BTBIS. A critical review of the literature on the instrument concluded that sensitivity was poor, with 30–60 percent of cases being missed, but its specificity was acceptable (Belanger et al., 2016).

Clinical Criteria and Case Definitions

Clinical criteria provide guidance to clinicians on the specific signs, symptoms, or test results that indicate the presence of an illness, and they guide the classification of patients into diagnostic categories. Clinicians use diagnoses to manage illness, provide appropriate treatment, and predict prognosis. Case definitions are a specific type of diagnostic criteria used to define an illness, and they work well for illnesses for which the underlying pathology is understood and can be observed. Case definitions often are assessed in terms of sensitivity, or the ability to identify patients with an illness correctly.

Numerous organizations have developed case definitions and clinical guidance for determining the diagnosis and severity of TBI (e.g., the VA and DoD, the American Psychiatric

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BOX 2-1
Brief Traumatic Brain Injury Screen (BTBIS)
Defense and Veterans Brain Injury Center (DVBIC) TBI Screening Tool

1. Did you have any injury(ies) during your deployment from any of the following? (check all that apply):

A. Fragment

B. Bullet

C. Vehicular (any type of vehicle, including airplane)

D. Fall

E. Blast (Improvised Explosive Device, rocket-propelled grenade, land mine, grenade, etc.)

F. Other specify: _____

2. Did any injury received while you were deployed result in any of the following? (check all that apply):

A. Being dazed, confused, or "seeing stars" (NOTE: Endorsement of A–E meets criteria for positive TBI screen)

B. Not remembering the injury

C. Losing consciousness (knocked out) for less than a minute

D. Losing consciousness for 1–20 minutes

E. Losing consciousness for longer than 20 minutes

F. Having any symptoms of concussion afterward

NOTE: Confirm F and G through clinical interview (such as headache, dizziness, irritability, etc.)

G. Head injury

H. None of the above

3. Are you currently experiencing any of the following problems that you think might be related to a possible head injury or concussion?
(check all that apply):

A. Headaches

B. Dizziness

C. Memory problems

D. Balance problems

E. Ringing in the ears

F. Irritability

G. Sleep problems

H. Other specify

SOURCE: Schwab et al., 2006.

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Association) (see Appendix B). They all include similar criteria concerning which factors to consider; they vary primarily on the criteria for diagnosis of mTBI, whereas moderate to severe TBI is consistently defined as a loss of consciousness of greater than 30 minutes, posttraumatic amnesia lasting longer than 1 day, and a score on the Glasgow Coma Scale of less than 13, with or without abnormal imaging.

Department of Veterans Affairs and Department of Defense

mTBI diagnostic criteria range from observations relating to one or more of the common four factors (neuroimaging, loss of consciousness, posttraumatic amnesia, and the Glascow Coma Scale score) to the use of symptom checklists or some combination of these. The VA and DoD developed a joint clinical practice guideline for the management of concussion and mTBI (VA, 2016). These clinical practice guidelines are meant to assist in decision making rather than to prescribe a standard of care. The diagnosis of mTBI continues to be an emerging science which should be reflected in a learning system approach to the disability determination process.

The VA also provides instructions for coding any TBI using the *International Classification of Diseases, Tenth Revision, Clinical Modification* (ICD-10-CM) (see Appendix H). To ensure the most accurate and appropriate level of coding, the documentation for initial encounters must clearly state if there was a loss of consciousness due to injury based on the status of the patient at the time of injury and the duration of the loss of consciousness. If documentation does not clearly define that loss of consciousness, then an unspecified state of consciousness must be coded. Follow-up care should be coded for the sequelae of TBI using the symptom code(s) best representing the patient's chief symptoms (VA, 2015).

American Psychiatric Association

The fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)* addresses TBI and its neuropsychiatric sequelae with DSM's framework for neurocognitive disorders.[2] The DSM requires strict criteria for diagnosing major or mild neurocognitive disorders resulting from a TBI. These include, first, that the criteria are met for major or mild neurocognitive disorder[3] and then that there is evidence of a TBI and that the neurocognitive disorder presented immediately after the TBI or immediately after the recovery of consciousness and that it persists past the acute post-injury period (APA, 2013).

TBI is defined in the DSM-5 as an impact to the head or other mechanisms of rapid movement or displacement of the brain within the skull, with one or more of the following:

- loss of consciousness,
- posttraumatic amnesia,
- disorientation and confusion, and
- neurologic signs (e.g., neuroimaging demonstrating injury; a new onset of seizures; a marked worsening of a preexisting seizure disorder; visual field cuts; anosmia [loss of smell]; hemiparesis).

[2] Clinicians use the DSM to diagnose disorders affecting mood, personality, identity, cognition, etc. The DSM has been updated several times since it was first released in 1952, and it is published by the American Psychiatric Association.

[3] See criteria for a major or mild neurocognitive disorder in the *DSM-5* (APA, 2013).

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DSM-5 distinguishes major versus mild neurocognitive disorder with evidence of a severe versus modest cognitive decline from the patient's previous level of performance in one or more of the following cognitive domains: complex attention, executive function, learning and memory, language, perceptual-motor, and social cognition. The other distinction between major and mild neurocognitive disorder is whether the individual's cognitive deficits interfere with his or her ability to be independent in the activities of daily living (e.g., paying bills, taking medications). In major neurocognitive disorder, there must be significant interference with the activities of daily living.

DSM-5 describes a TBI severity rating for the initial injury, which includes the standard mild, moderate, and severe TBI measures. However, *DSM-5* notes that the initial severity rating of the TBI is not necessarily predictive of the severity of the resulting neurocognitive disorder. *DSM-5* identifies age, a prior history of brain damage, and a history of substance abuse as factors that might impede recovery following any type of TBI. *DSM-5* lists the common symptoms that further support the diagnosis of major or mild neurocognitive disorder due to traumatic brain injury. These symptoms occur with disturbances in the following areas:

- Emotional function: irritability, easy frustration, tension and anxiety, emotional lability
- Personality changes: disinhibition, apathy, suspiciousness, aggression
- Physical symptoms: headache, fatigue, sleep disorder, vertigo, tinnitus, anosmia
- Neurologic symptoms: seizures, visual disturbance, cranial nerve deficits
- Orthopedic injuries

Finally, *DSM-5* states that except in cases of severe TBI, the typical course of TBI involves an improvement in the neurocognitive, neurologic and psychiatric signs and symptoms. However, some individuals will continue beyond 1 year post-injury to experience symptoms such as headaches, fatigue, depression, anxiety, and irritability and to experience post-concussive syndrome (McInnes et al., 2017), and there is evidence to suggest that a single concussion can disrupt the neurologic mechanisms underlying cognition (Xiong et al., 2014).

The World Health Organization and the National Center for Health Statistics

The World Health Organization owns and publishes the *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* (ICD-10). It is a useful tool in the classification of morbidity data for indexing health records, medical care review, and ambulatory and other health care programs as well as for basic health statistics.

The ICD-10, Clinical Modification (ICD-10-CM) is published by the U.S. government in recognition of its responsibility to promulgate this classification throughout the United States for morbidity coding (CDC, 2018). Specifically, the National Center for Health Statistics, part of the Centers of Disease Control and Prevention (CDC), is responsible for use of the ICD-10 in the United States, and it has developed the clinical modification of the classification for morbidity purposes. The ICD-10 is also used to code and classify mortality data from death certificates. The ICD-10-CM is comparable to the ICD-10. As noted on the CDC website, the term "clinical" is used to emphasize the modification's intent.

Finally, there are many misconceptions about TBI and, particularly, about mTBI; some of these are presented in Table 2-1.

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TABLE 2-1 Common Misconceptions About Traumatic Brain Injury

Misconception	Fact
Symptoms that are not recognized immediately post-injury are not due to the TBI.	Individuals may not be able to distinguish alterations in consciousness associated with mTBI from changes in mental state due to other sources, such as sleep deprivation, acute stress, or confusion of the combat setting (Chapman and Diaz-Arrastia, 2014).
Sequelae that are not reported immediately post-injury are not due to the TBI.	Problems may be temporarily masked by discomfort/pain associated with polytrauma and by medications that can impede cognitive functioning. Awareness of cognitive or other changes may not emerge until the person returns to challenging situations, such as a return to duty. In addition, secondary brain injury, such as the development of a subdural hematoma, could result in the emergence of sequelae being delayed (Ghajar, 2000; Kiraly and Kiraly, 2007).
Symptoms from mTBI should resolve within 3 months; more chronic symptoms are likely due to psychologic factors or to secondary gains.	While many people recover from a single mild TBI quickly, some do not. Emerging research suggests that our previous expectations of recovery were too simplistic. For example, neuroinflammation has been found to persist for months post-injury and has been associated with persistent behavioral symptoms such as PTSD (Devoto et al., 2017). Repetitive TBI or subconcussive blows to the head, as commonly experienced by military personnel, can exacerbate underlying pathology and increase the likelihood of delayed or persistent symptoms (Fehily and Fitzgerald, 2017).
mTBIs should always be associated with mild sequelae. More severe sequelae are likely due to psychologic factors.	The severity of injury sequelae is influenced by many factors beyond the initial injury presentation. For example, changes in the structure and function of the brain may not be identified using conventional neuroimaging (Veeramuthu et al., 2015); prior injuries or compromised brain health can exacerbate the effects of new injuries (Fehily and Fitzgerald, 2017); multiple comorbid conditions can intensify the effects (Pugh et al., 2016).

Neuroimaging

Neuroimaging plays an essential role in identifying patients with a brain (intracranial) injury, both acute injuries and, in some cases, injuries with persistent symptoms. Common imaging techniques include CT scans and MRI scans. Rapid imaging helps differentiate patients who require urgent neurosurgical intervention from those who can be monitored or sent home. When imaging is clinically indicated in the evaluation of TBI, non-contrast CT (NCCT) is the primary choice (Mutch et al., 2016). However, many patients with TBI do not show evidence of injury on CT scans, and MRI has been shown to have superior sensitivity for identifying small, focal traumatic intracranial lesions (Lee et al., 2008), and new generations of imaging technology continue to reveal abnormalities unrecognized by standard imaging.

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CT Imaging

NCCT is the most common imaging technology used to assess TBI because it readily detects trauma-related fractures, hemorrhage, intracranial injury, extra-axial fluid collection, brain tissue swelling, and radio-opaque foreign bodies (e.g., shrapnel) (Jagoda, 2008; Wintermark et al., 2015). There is a consensus and evidence that NCCT should be the initial diagnostic imaging test for patients with acute moderate to severe TBI (Wintermark et al., 2015).

The early detection of expanding hemorrhage is key for rapid neurosurgical decompression, which can be lifesaving. It is recommended that all patients with a Glasgow Coma Scale (GCS) score of less than 15 get head CT scanning. For those with GCS of 15, among whom the prevalence of intracranial injury is less than 10 percent (Easter et al., 2015), clinical decision rules can be used to identify high-risk patients in need of head CT scanning. Typical post-TBI CT findings include subdural hematoma,[4] epidural hematoma,[5] intra parenchymal hemorrhage,[6] contusion, and traumatic subarachnoid hemorrhage. Contusions and subdural hemotoma are the most common intracranial injury, followed by subarachnoid hemorrhage, and then by epidural hematoma, which are relatively uncommon.

When imaging is clinically indicated for the evaluation of acute mTBI, then NCCT is the initial choice. The advantages of CT include 24-hour availability in most emergency medical facilities, minimal imaging time, and no contraindications for patients with ferromagnetic substances (e.g., metallic foreign body or cardiac pacemakers). Following clinical screening, the majority of mTBI patients will have normal NCCTs (i.e., uncomplicated mTBI), but this is not sufficient to establish whether a patient has sustained a TBI.

MRI

Although many patients with mTBI will have normal findings on CT, that does not mean they do not have brain injury. Despite the many advantages of CT, MRI has superior sensitivity for the identification of hemorrhagic axonal injury and small contusions and has been shown to identify these lesions in patients with normal CT scans (Yuh et al., 2013). Over the past decade, there has been increasing use of MRI following the initial TBI assessment and treatment, especially in patients with persistent unexplained neurologic findings (Wintermark et al., 2015). While MRI is currently less available in the acute setting, takes longer to perform, and is more expensive than CT, newer MRI imaging techniques are advancing our understanding of TBI and will likely play a larger role in the diagnosis and management of TBI.

Advanced Imaging Techniques

Diagnosing brain injury for all levels of TBI severity is a particularly active area of research. Advanced MRI imaging techniques such as diffuse tensor imaging (DTI) might have prognostic utility in patients with TBI (Edlow et al., 2016; Yuh et al., 2014). Subtle alterations of brain tracts or fiber pathways have been visualized using DTI, which enables better imaging of the extent of early microstructural changes post-mTBI (Veeramuthu et al., 2015). DTI has

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[4] Subdural hematoma is an accumulation of blood above the brain but below the dura, which appears as a crescentic or concave opacity overlying the brain on CT.

[5] Epidural hematoma is a traumatic accumulation of blood between the inner table of the skull and the stripped-off dural membrane.

[6] Intra parenchymal hemorrhage is one form of intracerebral bleeding in which there is bleeding within brain parenchyma.

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provided evidence that all TBIs, ranging from mild to severe, can result in a degree of axonal damage, with the more severe injuries showing damage to both axons and myelin (Pan et al., 2016).

Finally, positron emission tomography (PET) scans are useful for looking at brain metabolism and molecular imaging. PET scanning can reveal anomalies in TBI patients with unremarkable CT and MRI scans (Shin et al., 2017). However, the utility of PET and other advanced imaging techniques in diagnosing mTBI remains to be determined.

Limitations of Current Approaches in the Clinical Diagnosis of Mild Traumatic Brain Injury

The current methods of mTBI diagnosis rely on a report of certain symptoms at the time of injury from the person who was injured or from a witness. The immediate symptoms that indicate mTBI are a brief loss of consciousness or a period of amnesia or confusion, or both. Some definitions also include an immediate headache. There are few specific tests, such as X-ray, blood test, or CT scan, widely available to help make the diagnosis of mTBI. The Food and Drug Administration (FDA) has cleared the following tests for the prediction of intracranial hemorrhage on a head CT scan performed within 12 hours of TBI: a blood test combining glial fibrillary acidic protein and ubiquitin carboxy-terminal hydrolase L1; the Banyan Biomarkers' brain trauma indicator, which identifies and measures the levels of two brain-specific proteins that appear in the blood within 12 hours of a brain injury when bleeding has occurred; a portable quantitative electroencephography test (BrainScope's Ahead® 100), which provides an interpretation of the structural condition of the patient's brain after head injury; and a portable near-infrared spectroscopy (NIRS) to detect intracranial bleeding.

Despite those options, the current widely used methods of diagnosing mTBI are far from ideal, as they can produce both false positive and false negative diagnoses. Common issues in the diagnosis of mTBI are described below.

Some Patients Who Experience mTBI Symptoms Cannot or Do Not Report Them

Because mTBI can result in retrospective amnesia or confusion at the time of injury, patients might not be able to recall the details of their injuries. Furthermore, within the combat setting, sleep deprivation, acute stress, sensory overload, and prolonged missions can impede a service member's ability to recognize an alteration of consciousness, and those same complicating factors can potentially affect recovery (Chapman and Diaz-Arrastia, 2014). The recollection of the events associated with an injury might also be altered by drug or alcohol use or by preexisting dementia, both of which are common among civilians with mTBI. And two patient groups, active duty troops and athletes, might well remember injury events and symptoms but be reluctant to report them for fear of being pulled from their unit or team. Thus, given the current state of diagnosis, mTBIs are often overlooked.

A recent study found that one-third of athletes did not realize they had a concussion (Meehan et al., 2013). Patients treated in hospital settings do not fare much better. Three studies of patients with head injuries presenting to emergency departments found that concussions were missed in 56 to 89 percent of cases (De Maio et al., 2014; Delaney et al., 2005; Powell et al., 2008). Another difficulty in diagnosing mTBI occurs in the case of complex polytrauma where other injuries might appear to be more severe and the head injury is not assessed.

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Some Patients Who Experience mTBI Symptoms and Report Them Might Not Have Brain Injury

A headache following a head injury might be due to a traumatically triggered migraine headache or to neck muscle strain, particularly if the headache begins hours after the injury. A brief loss of consciousness during contact sport or combat activities might be a result of severe dehydration, occult bleeding, or neurocardiogenic syncope (Williams and Bernhardt, 1995).

Some Patients Who Do Not Experience Concussion Symptoms Might Actually Have a Brain Injury

Multiple studies have found that repetitive head injury and blast exposures that do not produce immediate mTBI symptoms can result in white matter changes observable with diffuse tensor imaging (Asken et al., 2018) or in elevations of brain proteins in peripheral blood (Lucke-Wold et al., 2014). It is unclear if a single head injury not resulting in immediate mTBI symptoms demonstrates similar evidence of brain injury.

Thus, when considering the diagnosis of TBI in the clinical setting, it is important to understand the role that patient and family self-report have in providing evidence of an injury. While prospective evaluation is often able to document an initial injury, prior injuries are typically undocumented or elicited via informal methods (Corrigan and Bogner, 2007a). TBI is often confused with a variety of other conditions, including aging, depression, and emotional problems such as anxiety or posttraumatic stress disorder (Dams-O'Connor et al., 2014; Spencer et al., 2010). Even when medical records are available, a large percentage of prior injuries often do not receive recognition or medical attention (Setnik and Bazarian, 2007). Therefore, patient self-report of previous head trauma is often used in both clinical practice and research as a screening method to identify TBI. However, the most common practice of asking one or two questions to identify a history of previous TBI has been found to be inadequate in that all but the most severe or recent injuries are missed (Corrigan and Bogner, 2007b).

The problem of recall is most apparent in adults attempting to report TBI that occurred in childhood. Even when carefully cued, adults with TBI events occurring before age 4 were unable to report prior injuries 25 percent of the time even when hospitalization was involved (McKinlay et al., 2016). In general, most previously unreported childhood TBI is not recollected, although having been older at the time of injury and having experienced a more severe injury were found to increase the likelihood of remembering prior injury (McKinlay and Horwood, 2017). Failure to recognize the etiology of symptoms precludes appropriate treatment or symptom management (Yi and Dams-O'Connor, 2013).

While the literature provides evidence that self-report might be helpful for the initial screening of TBI and its symptoms, the evaluation is greatly enhanced by structured interviews using validated instruments. Furthermore, self-report does not replace the need for a clinical evaluation for TBI and comprehensive neuropsychiatric testing (Corrigan and Bogner, 2007a).

Health Care Professionals Trained to Diagnose Traumatic Brain Injury

Given the complexities in diagnosing TBI, especially mTBI, and the time that might have elapsed since the original injury, a diagnostician needs to be trained on and familiar with the standard diagnostic tools (discussed earlier in the chapter) used in making a determination of brain injury and its severity.

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Currently the VA requires one of four medical specialists to diagnose TBI: a neurologist, neurosurgeon, physiatrist, or psychiatrist. The physician making the diagnosis should be familiar with the signs and symptoms of TBI, abnormal structural imaging, and abnormal physical findings on exams (such as neurologic exams). Additionally, the diagnostician should be aware of common psychological comorbidities that often present with TBI and should be prepared to refer the patient for additional evaluation. For example, in cases where the neurologic exam is normal in an individual with mTBI, a physician specializing in concussions might need to work with a psychologist as part of a team approach to ensure a comprehensive evaluation and diagnosis. Additional specialties might need to be available, as part of a team, and the physician should not hesitate to call on those team members who might assist in making the diagnosis. Thus, making a diagnosis of brain injury might include

- A detailed neurologic exam (including a headache specialist, a vision specialist, and a balance specialist to assess vestibular dysfunction),
- Brain imaging (likely MRI to look for signs of cortical or subcortical injury),
- Cognitive evaluation by a psychologist with formal training in the assessment of TBI-related cognitive and executive functioning deficits, and
- Evaluations by physical, occupational, and speech therapists to clarify the extent of the TBI and the deficits that might present, including exertional symptoms.

There are many medical/clinical specialties and subspecialties involved in making the diagnosis of a brain injury, particularly if the diagnosis occurs months to years following the injury. Clinical psychology and clinical neuropsychology, for example, are disciplines where specialized training in assessment of TBI consequences is common and documentable (Podell et al., 2010; Prince and Bruhns, 2017). Even if the sole determination is not made by a professional of one of these specialties, it is difficult to see how adequate information about cognitive consequences of TBI could be collected without a formal assessment.

Given today's increased awareness of TBI, more medical specialties now include training in TBI within their curriculum and have continued updates concerning the current state of the science. Additionally, there are at least 18 Accreditation Council for Graduate Medical Education (ACGME) accredited brain injury fellowships (e.g., Rutgers New Jersey Medical School, New York University School of Medicine, University of Washington) that train physicians of many specialties to assist in the diagnosis, treatment, and rehabilitation of individuals diagnosed with brain injury. Thus, the VA should allow health care professionals, including non-physicians, with additional training and experience in brain injury, to make TBI diagnoses. The committee believes that it is the training and experience, not necessarily the medical specialty that renders a health care specialist capable of an accurate diagnosis.

The committee recommends that the Department of Veterans Affairs allow health care professionals who have specific traumatic brain injury (TBI) training and experience, in addition to the current required specialists, to make a TBI diagnosis. Furthermore, the committee recommends pertinent and ongoing clinical training that is up to date with the state of current knowledge regarding TBI.

The committee notes, however, that specific and ongoing clinical training does not automatically guarantee knowledge and skill acquisition. Thus, the VA should consider

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implementing a mechanism to prove the success of educational initiatives through demonstration of competency in assessing and diagnosing TBI.

CO-OCCURRING TBI, PTSD, DEPRESSION, PAIN, AND SLEEP DISTURBANCE

In addition to the complexity of diagnosing TBI as described above, common co-occurring conditions including PTSD, depression, pain, and sleep disturbance may also complicate the diagnosis. TBI has been associated with behavioral health problems such as persistent pain, depression, sleep, anxiety, aggression, and impulse control and overlaps with the symptoms of PTSD (Collins et al., 2012; Stein et al., 1997). PTSD and other mental disorders are often diagnosed concurrent with or following a brain injury. Thus, a TBI evaluation is often incomplete without a skilled assessment for PTSD and other common comorbidities. PTSD and TBI share some key neuropsychologic and functional neuroanatomic characteristics, and both are associated with cognitive impairment and sleep disruption (Tanev et al., 2014). Dissociative symptoms are often observed in PTSD, and there is evidence that TBI can result in dissociative-like symptoms, such as emotional numbing, derealization, reduced awareness of surroundings, depersonalization, and amnesia (Bryant et al., 2011). Further complicating the issue of comorbidity is that TBI, PTSD, and depression are also associated with chronic pain, which similarly overlaps with those conditions (Bryant et al., 2011).

Farmer and colleagues (2017) used Military Health System electronic health record data to characterize common symptoms associated with an mTBI diagnosis in the Military Health System. The symptoms included headache, sleep dysfunction, dizziness, and balance disorders. Additionally, the report reinforced earlier findings that individuals with an mTBI diagnosis are also frequently diagnosed with behavioral health conditions such as depression and PTSD. Farmer et al. (2017) reported that behavioral health diagnoses were twice as common in those with a history of a TBI diagnosis, regardless of severity, as those without. The most common behavioral health diagnoses were adjustment disorder (16 percent) and anxiety disorder (14 percent), followed by a diagnosis of depression.

Given the significant overlapping symptoms between TBI and PTSD, differential diagnosis is difficult. Patients with TBI often meet the diagnostic criteria for PTSD on screening instruments for TBI, and vice versa. Many veterans of the wars in Iraq and Afghanistan who have experienced mTBI also have PTSD related to their combat experience (e.g., Silver et al., 2001). Numerous studies have examined the link between TBI and PTSD, and they have consistently found that veterans with positive TBI screens are more likely to have PTSD than veterans with negative TBI screens (Carlson et al., 2010; Hoge et al., 2008, 2014; Zatzick et al., 2010). Hoge et al. (2014) found that even after accounting for predeployment symptoms, prior TBI, and combat intensity, TBI was the strongest predictor of postdeployment PTSD symptoms. A study by Hoge et al. (2008) found that soldiers with mTBI, primarily those who had a loss of consciousness, were significantly more likely to report poor general health, missed workdays, medical visits, and a high number of somatic and postconcussive symptoms than were soldiers with other injuries. However, after the researchers adjusted for PTSD and depression, they found that mTBI was no longer significantly associated with those physical health outcomes or symptoms, except for headache. Thus, mTBI is strongly associated with PTSD and physical problems in soldiers returning from Iraq. Furthermore, the study found that PTSD and depression are important mediators of the relationship between mTBI and physical health problems (Hoge et al., 2008).

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A recent study of veterans without TBI who had returned from Iraq and Afghanistan reported prevalence rates of 23 percent for PTSD, 17 percent to 21 percent for depression, and 7 to 15 percent for alcohol-related problems. The rates were much higher among veterans with TBI, with 89 percent having a comorbid psychiatric diagnosis, including 44 to 54 percent who had a diagnosis of PTSD and 70 percent who had pain diagnoses (Armistead-Jehle et al., 2017).

The relationships among TBI, post-concussive symptoms, anxiety, depression, PTSD, and chronic pain are complex. TBI may result in co-occurring mental and physical symptoms, mental health symptoms may exacerbate pain and other post-concussive symptoms, and symptoms may occur coincident to one another. Pain, the use of medications, alcohol or drug use or intoxication, or PTSD, which can be present either in isolation or in addition to a brain injury, can confound or complicate the diagnosis (Hoge et al., 2008, 2014; Roozenbeek et al., 2013).

SUMMARY AND RECOMMENDATION

Damage to the brain after trauma is referred to as traumatic brain injury. TBI may be blunt, non-penetrating, penetrating, or due to blast. The resulting neuropathology consists of a primary injury that is a direct consequence of the traumatic insult and a secondary injury that results from a cascade of molecular and cellular events triggered by the primary injury and that leads to cell death, axonal injury, and inflammation. According to CDC, mTBI (often referred to as a concussion) manifests initially as a brief change in mental status or unconsciousness, whereas severe TBI results in an extended period of unconsciousness or amnesia.

TBI severity is typically defined at the time of initial injury; the GCS has been the gold standard of neurologic assessment of trauma patients since its development by Teasdale and Jennett in 1974. Other TBI severity-classification systems grade single indicators, such as loss of consciousness and duration of posttraumatic amnesia. The predictive value of those measures has been demonstrated, but each may be influenced by factors unrelated to, or only indirectly related to, the severity of the TBI (e.g., intoxication). Ultimately, the severity of the injury defined initially does not necessarily predict the trajectory or natural history of TBI, as individuals diagnosed with mTBI can experience ongoing impairment.

In the absence of clear biomarkers, self-report based on a validated screening method is currently considered the gold standard for obtaining a comprehensive lifetime history of exposure to TBI. Reliance on medical records is often insufficient because many injuries are not treated, including, occasionally, even more severe injuries. Screening instruments vary in the extent to which their psychometrics have been established, with single-item screens tending to be the least reliable and least likely to capture all TBIs. Because many mTBIs are not evaluated at the time of injury, injuries incurred during deployment are typically screened retrospectively with the Brief Traumatic Brain Injury Screen (DVBIC, 2007; Schwab et al., 2007), a four-item measure that is typically completed upon return from deployment as part of a comprehensive health screening. A positive screen is followed by a more comprehensive evaluation, the VA Comprehensive TBI Evaluation (VA, 2010).

The current method of TBI diagnosis after initial injury relies on the report of certain symptoms at the time of injury from the person who was injured or from a witness. However, not all individuals who have sustained a TBI are identified at the time of the initial injury as, in the case of complex polytrauma, for example, other injuries might appear to be more severe and the head injury is not assessed, or, in the case of mTBI, the individual might not present for medical care. Furthermore, there are no current tests to help make, and perhaps document, the diagnosis

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more than 24 hours after injury, although new tests have been approved by FDA for use early after injury.

Thus, when considering the diagnosis of TBI in the clinical setting, it is important to understand the role that patient and family self-report have in providing evidence of injury. While prospective evaluation is often able to document an initial injury, prior injuries are typically undocumented or elicited via informal methods. Furthermore, TBI is often confused with a variety of other conditions including aging, depression, and emotional problems such as PTSD. Even when medical records are available, a large percentage of prior injuries often do not receive recognition or medical attention. Therefore, patient self-report of previous head trauma is often used in both clinical practice and research as a screening method to identify TBI.

TBI has been associated with such behavioral outcomes as depression, anxiety, aggression, and impulse control and overlaps with the symptoms of PTSD. Thus, a TBI evaluation might be incomplete unless the diagnostician is familiar with the symptoms of PTSD and other common comorbidities. PTSD and other psychiatric conditions are often diagnosed concurrent with or following a brain injury. PTSD and TBI share some pathophysiological characteristics and both are associated with cognitive impairment and sleep disruption. It is important to recognize that mental health symptoms might have causes other than TBI. These causes include pain, the use of medications, alcohol or drugs use or intoxication, or PTSD, all of which can be present either in isolation or in addition to a brain injury and, as noted, confound or complicate the diagnosis.

Given the complexities in diagnosing TBI and the time that might have elapsed since the original injury, a diagnostician needs to have experience with TBI and be trained and familiar with the state of the science in order to accurately make a determination of brain injury and its severity. In addition, there is ongoing research and new theoretical views on the trajectory of recovery after TBI, so new developments are likely forthcoming that would help providers who have training and experience with TBI to accurately diagnose TBI. Currently the VA requires one of four medical specialists to diagnose TBI: a neurologist, neurosurgeon, physiatrist, or psychiatrist. There are many specialties and subspecialties involved in making the diagnosis of a brain injury, particularly if the diagnosis occurs months to years following the injury. Universities and medical schools offer special training in brain injury to train physicians and other health care professionals with an interest in the field to assist in the diagnosis, treatment, and rehabilitation of individuals diagnosed with brain injury. Thus, the VA should consider allowing other health care professionals with experience and pertinent ongoing training in brain injury to make TBI diagnoses. The committee believes that it is the training and experience and not necessarily the specialty that renders a health care professional capable of an accurate diagnosis.

The committee recommends that the Department of Veterans Affairs allow health care professionals who have specific traumatic brain injury (TBI) training and experience, in addition to the current required specialists, to make a TBI diagnosis. Furthermore, the committee recommends pertinent and ongoing clinical training that is up to date with the state of current knowledge regarding TBI.

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REFERENCES

Albrecht, J. S., L. Barbour, S. A. Abariga, V. Rao, and E. M. Perfetto. 2018. Risk of depression after traumatic brain injury in a large national sample. *Journal of Neurotrauma*, August 10 [Epub ahead of print].

Amara, J., K. M. Iverson, M. Krengel, T. K. Pogoda, and A. Hendricks. 2014. Anticipating the traumatic brain injury-related health care needs of women veterans after the Department of Defense change in combat assignment policy. *Women's Health Issues* 24(2):e171–e176.

APA (American Psychiatric Association). 2013. *Diagnostic and statistical manual of mental disorders, fifth edition (DSM-5)*. Arlington, VA: American Psychiatric Association.

Arango-Lasprilla, J. C., and J. S. Kreutzer. 2010. Racial and ethnic disparities in functional, psychosocial, and neurobehavioral outcomes after brain injury. *Journal of Head Trauma Rehabilitation* 25(2):128–136.

Armistead-Jehle, P., J. R. Soble, D. B. Cooper, and H. G. Belanger. 2017. Unique aspects of traumatic brain injury in military and veteran populations. *Physical Medicine and Rehabilitation Clinics of North America* 28(2):323–337.

Asemota, A. O., B. P. George, C. J. Cumpsty-Fowler, A. H. Haider, and E. B. Schneider. 2013. Race and insurance disparities in discharge to rehabilitation for patients with traumatic brain injury. *Journal of Neurotrauma* 30(24):2057–2065.

Asken, B. M., M. J. Sullan, S. T. DeKosky, M. S. Jaffee, and R. M. Bauer. 2017. Research gaps and controversies in chronic traumatic encephalopathy: A review. *JAMA Neurology* 74(10):1255–1262.

Asken, B. M., S. T. DeKosky, J. R. Clugston, M. S. Jaffee, and R. M. Bauer. 2018. Diffusion tensor imaging (DTI) findings in adult civilian, military, and sport-related mild traumatic brain injury (mTBI): A systematic critical review. *Brain Imaging Behavior* 12(2):585–612.

Bakhsheshian, J., L. Ding, A. Tang, T. Wen, A. Patel, B. A. Strickland, R. C. Rennert, A. Amar, P. Gruen, S. Giannotta, W. J. Mack, and F. J. Attenello. 2018. Safety-net hospitals have higher complication and mortality rates in the neurosurgical management of traumatic brain injuries. *World Neurosurgery* 119:e284–e293.

Bazarian, J. J., B. Blyth, S. Mookerjee, H. He, and M. P. McDermott. 2010. Sex differences in outcome after mild traumatic brain injury. *Journal of Neurotrauma* 27(3):527–539.

Belanger, H. G., R. D. Vanderploeg, and N. Sayer. 2016. Screening for remote history of mild traumatic brain injury in VHA: A critical literature review. *Journal of Head Trauma Rehabilitation* 31(3):204–214.

Berry, C., E. J. Ley, J. Mirocha, and A. Salim. 2010. Race affects mortality after moderate to severe traumatic brain injury. *Journal of Surgical Research* 163(2):303–308.

Black, K. L., R. A. Hanks, D. L. Wood, R. D. Zafonte, N. Cullen, D. X. Cifu, J. Englander, and G. E. Francisco. 2002. Blunt versus penetrating violent traumatic brain injury: Frequency and factors associated with secondary conditions and complications. *Journal of Head Trauma Rehabilitation* 17(6):489–496.

Bowman, S. M., D. P. Martin, S. R. Sharar, and F. J. Zimmerman. 2007. Racial disparities in outcomes of persons with moderate to severe traumatic brain injury. *Medical Care* 45(7):686–690.

Bryant, R. A., M. L. O'Donnell, M. Creamer, A. C. McFarlane, and D. Silove. 2011. Posttraumatic intrusive symptoms across psychiatric disorders. *Journal of Psychiatric Research* 45(6):842–847.

Budnick, H. C., A. H. Tyroch, and S. A. Milan. 2017. Ethnic disparities in traumatic brain injury care referral in a Hispanic-majority population. *Journal of Surgical Research* 215:231–238.

Carlson, K. F., D. Nelson, R. J. Orazem, S. Nugent, D. X. Cifu, and N. A. Sayer. 2010. Psychiatric diagnoses among Iraq and Afghanistan war veterans screened for deployment-related traumatic brain injury. *Journal of Traumatic Stress* 23(1):17–24.

CDC (Centers for Disease Control and Prevention). 2018. *ICD-10-CM: International Classification of Diseases, Tenth Revision, Clinical Modification*. Herndon, VA: Stylus Publishing, LLC.

Copyright National Academy of Sciences. All rights reserved.

Chapman, J. C., and R. Diaz-Arrastia. 2014. Military traumatic brain injury: A review. *Alzheimer's and Dementia* 10(3 Suppl):S97–S104.

Coldren, R. L., M. P. Kelly, R. V. Parish, M. Dretsch, and M. L. Russell. 2010. Evaluation of the military acute concussion evaluation for use in combat operations more than 12 hours after injury. *Military Medicine* 175(7):477–481.

Collins, A., M. Gutièrrez-Mecinas, A. F. Trollope, and J. M. H. M. Reul. 2012. Epigenetics of stress. In *Epigenetics of lifestyle*. Sharjah U.A.E.: Bentham Science Publishers. Pp. 70-89.

Collins, C. L., E. N. Fletcher, S. K. Fields, L. Kluchurosky, M. K. Rohrkemper, R. D. Comstock, and R. C. Cantu. 2014. Neck strength: A protective factor reducing risk for concussion in high school sports. *Journal of Primary Prevention* 35(5):309–319.

Collins, M. W., A. P. Kontos, D. O. Okonkwo, J. Almquist, J. Bailes, M. Barisa, J. Bazarian, O. J. Bloom, D. L. Brody, R. Cantu, J. Cardenas, J. Clugston, R. Cohen, R. Echemendia, R. J. Elbin, R. Ellenbogen, J. Fonseca, G. Gioia, K. Guskiewicz, R. Heyer, G. Hotz, G. L. Iverson, B. Jordan, G. Manley, J. Maroon, T. McAllister, M. McCrea, A. Mucha, E. Pieroth, K. Podell, M. Pombo, T. Shetty, A. Sills, G. Solomon, D. G. Thomas, T. C. Valovich McLeod, T. Yates, and R. Zafonte. 2016. Statements of agreement from the Targeted Evaluation and Active Management (TEAM) Approaches to Treating Concussion meeting held in Pittsburgh, October 15–16, 2015. *Neurosurgery* 79(6):912–929.

Coronado, V. G., L. Xu, S. V. Basavaraju, L. C. McGuire, M. M. Wald, M. D. Faul, B. R. Guzman, and J. D. Hemphill. 2011. Surveillance for traumatic brain injury-related deaths—United States, 1997–2007. *Morbidity and Mortality Weekly Report Surveillance Summary* 60(5):1–32.

Corrigan, J. D., and J. Bogner. 2007a. Screening and identification of TBI. *Journal of Head Trauma Rehabilitation* 22(6):315–317.

Corrigan, J. D., and J. Bogner. 2007b. Initial reliability and validity of the Ohio State University TBI identification method. *Journal of Head Trauma Rehabilitation* 22(6):318–329.

Dams-O'Connor, K., J. B. Cantor, M. Brown, M. P. Dijkers, L. A. Spielman, and W. A. Gordon. 2014. Screening for traumatic brain injury: Findings and public health implications. *Journal of Head Trauma Rehabilitation* 29(6):479–489.

De Maio, V. J., D. O. Joseph, H. Tibbo-Valeriote, J. G. Cabanas, B. Lanier, C. H. Mann, and J. Register-Mihalik. 2014. Variability in discharge instructions and activity restrictions for patients in a children's ED postconcussion. *Pediatric Emergency Care* 30(1):20–25.

DeKosky, S. T., P. M. Kochanek, R. S. Clark, J. R. Ciallella, and C. E. Dixon. 1998. Secondary injury after head trauma: Subacute and long-term mechanisms. *Seminars in Clinical Neuropsychiatry* 3(3):176–185.

Delaney, J. S., F. Abuzeyad, J. A. Correa, and R. Foxford. 2005. Recognition and characteristics of concussions in the emergency department population. *Journal of Emergency Medicine* 29(2):189–197.

Devoto, C., L. Arcurio, J. Fetta, M. Ley, T. Rodney, R. Kanefsky, and J. Gill. 2017. Inflammation relates to chronic behavioral and neurological symptoms in military personnel with traumatic brain injuries. *Cell Transplantation* 26(7):1169–1177.

Diamond, P. M., A. J. Harzke, P. R. Magaletta, A. G. Cummins, and R. Frankowski. 2007. Screening for traumatic brain injury in an offender sample: A first look at the reliability and validity of the traumatic brain injury questionnaire. *Journal of Head Trauma Rehabilitation* 22(6):330–338.

Dikmen, S., J. Machamer, N. Temkin, and A. McLean. 1990. Neuropsychological recovery in patients with moderate to severe head injury: 2 year follow-up. *Journal of Clinical and Experimental Neuropsychology* 12(4):507–519.

Dismuke, C. E., M. Gebregziabher, D. Yeager, and L. E. Egede. 2015. Racial/ethnic differences in combat- and non-combat-associated traumatic brain injury severity in the Veterans Health Administration: 2004–2010. *American Journal of Public Health* 105(8):1696–1702.

Copyright National Academy of Sciences. All rights reserved.

Dollé, J. P., A. Jaye, S. A. Anderson, H. Ahmadzadeh, V. B. Shenoy, and D. H. Smith. 2018. Newfound sex differences in axonal structure underlie differential outcomes from in vitro traumatic axonal injury. *Experimental Neurology* 300:121–134.

DVBIC (Defense and Veterans Brain Injury Center). 2006. *Evaluation of traumatic brain injury: Brain potentials in diagnosis, function, and prognosis*. https://dvbic.dcoe.mil/research/evaluation-traumatic-brain-injury-brain-potentials-diagnosis-function-and-prognosis (accessed August 24, 2018).

DVBIC. 2007. *Screening for traumatic brain injury in troops returning from deployment in Afghanistan and Iraq: Initial investigation of the usefulness of a short screening tool for traumatic brain injury*. https://dvbic.dcoe.mil/research/screening-traumatic-brain-injury-troops-returning-deployment-afghanistan-and-iraq-initial (accessed August 24, 2018).

DVBIC. 2018. *The Military Acute Concussion Evaluation 2 Pocket Card (MACE 2)*. https://dvbic.dcoe.mil/files/resources/dvbic_4901_mace2-pocket-card_v2.0_2018-10-23.pdf (accessed January 8, 2019).

Easter, J. S., J. S. Haukoos, W. P. Meehan, V. Novack, and J. A. Edlow. 2015. Will neuroimaging reveal a severe intracranial injury in this adult with minor head trauma? The rational clinical examination systematic review. *JAMA* 314(24):2672–2681.

Edlow, B. L., W. A. Copen, S. Izzy, K. Bakhadirov, A. van der Kouwe, M. B. Glenn, S. M. Greenberg, D. M. Greer, and O. Wu. 2016. Diffusion tensor imaging in acute-to-subacute traumatic brain injury: A longitudinal analysis. *BMC Neurology* 16(1).

Eisenberg, M. A., J. Andrea, W. Meehan, and R. Mannix. 2013. Time interval between concussions and symptom duration. *Pediatrics* 132(1):8–17.

Eliacin, J., S. Fortney, N. A. Rattray, and J. Kean. 2018. Access to health services for moderate to severe TBI in Indiana: Patient and caregiver perspectives. *Brain Injury* 32(12):1510–1517.

Farmer, C. M., H. Krull, T. W. Concannon, M. Simmons, F. Pillemer, T. Ruder, A. Parker, M. P. Purohit, L. Hiatt, B. S. Batorsky, and K. A. Hepner. 2017. Understanding treatment of mild traumatic brain injury in the military health system. *RAND Health Quarterly* 6(2):11.

Faul, M., and V. Coronado. 2015. Chapter 1: Epidemiology of traumatic brain injury. In J. Grafman and A. M. Salazar (eds.), *Handbook of Clinical Neurology,* Vol. 127. New York: Elsevier. Pp. 3–13.

Fehily, B., and M. Fitzgerald. 2017. Repeated mild traumatic brain injury: Potential mechanisms of damage. *Cell Transplantation* 26(7):1131–1155.

Freeman, L. C., and J. P.-Y. Ting. 2016. The pathogenic role of the inflammasome in neurodegenerative diseases. *Journal of Neurochemistry* 136(S1):29–38.

French, L. M. 2010. Military traumatic brain injury: An examination of important differences. *Annals of the New York Academy of Sciences* 1208:38–45.

French, L., M. McCrae, and M. Baggett. 2008. The Military Acute Concussion Evaluation (MACE). *Journal of Special Operations Medicine* 8:68–74.

GAO (Government Accountability Office). 2008. VA health care: Injury screening and evaluation implemented for OEF/OIF veterans, but challenges remain. https://www.gao.gov/new.items/d08276.pdf (accessed January 11, 2019).

Gardner, R. C., J. F. Burke, J. Nettiksimmons, A. Kaup, D. E. Barnes, and K. Yaffe. 2014. Dementia risk after traumatic brain injury vs. nonbrain trauma: The role of age and severity. *JAMA Neurology* 71(12):1490–1497.

Gennarelli, T. A., and D. I. Graham. 2005. Neuropathology. In *Textbook of traumatic brain injury.*, edited by J. M. Silver, T. W. McAllister and Y. S. C. Washington DC: American Psychiatric Publishing, Inc. Pp. 27 - 50.

Gary, K. W., J. C. Arango-Lasprilla, J. M. Ketchum, J. S. Kreutzer, A. Copolillo, T. A. Novack, and A. Jha. 2009. Racial differences in employment outcome after traumatic brain injury at 1, 2, and 5 years postinjury. *Archives of Physical Medicine and Rehabilitation* 90(10):1699–1707.

Ghajar, J. 2000. Traumatic brain injury. *Lancet* 356(9233):923–929.

Giza, C. C., and D. A. Hovda. 2014. The new neurometabolic cascade of concussion. *Neurosurgery* 75(Suppl 4):S24–S33.

Copyright National Academy of Sciences. All rights reserved.

Giza, C. C., and J. S. Kutcher. 2014. An introduction to sports concussions. *Continuum* 20:1545–1551.

Graham, D. I., T. K. McIntosh, W. L. Maxwell, and J. A. Nicoll. 2000. Recent advances in neurotrauma. *Journal of Neuropathology & Experimental Neurology* 59(8):641–651.

Graham, D. I., T. A. Gennarelli, and T. K. McIntosh. 2002. Trauma. In *Greenfield's Neuropathology*, edited by D. I. Graham and P.L. Lantos. London: Arnold. Pp. 823–898.

Graham, J. E., D. M. Radice-Neumann, T. A. Reistetter, F. M. Hammond, M. Dijkers, and C. V. Granger. 2010. Influence of sex and age on inpatient rehabilitation outcomes among older adults with traumatic brain injury. *Archives of Physical Medicine and Rehabilitation* 91(1):43–50.

Gross, T., and F. Amsler. 2018. One-year outcome following brain injury: A comparison of younger versus elderly major trauma patients. *Archives of Orthopaedic and Trauma Surgery* 138(10):1375–1387.

Haider, A. H., D. C. Chang, D. T. Efron, E. R. Haut, M. Crandall, and E. E. Cornwell III. 2008. Race and insurance status as risk factors for trauma mortality. *Archives of Surgery* 143(10):945–949.

Herrera-Melero, M. C., J. J. Egea-Guerrero, A. Vilches-Arenas, M. D. Rincon-Ferrari, J. M. Flores-Cordero, J. Leon-Carrion, and F. Murillo-Cabezas. 2015. Acute predictors for mortality after severe TBI in Spain: Gender differences and clinical data. *Brain Injury* 29(12):1439–1444.

Hoge, C. W., J. L. Auchterlonie, and C. S. Milliken. 2006. Mental health problems, use of mental health services, and attrition from military service after returning from deployment to Iraq or Afghanistan. *JAMA* 295(9):1023–1032.

Hoge, C. W., D. McGurk, J. L. Thomas, A. L. Cox, C. C. Engel, and C. A. Castro. 2008. Mild traumatic brain injury in U.S. soldiers returning from Iraq. *New England Journal of Medicine* 358(5):453–463.

Hoge, C. W., C. A. Castro, K. A. Yurgil, D. A. Barkauskas, J. J. Vasterling, C. M. Nievergelt, G. E. Larson, N. J. Schork, B. T. Litz, W. P. Nash, and D. G. Baker. 2014. Treatment of generalized war-related health concerns: Placing TBI and PTSD in context. *JAMA* 312(16):1685–1686.

IOM (Institute of Medicine). 2001. *Exploring the biological contributions to human health: Does sex matter?* Washington, DC: National Academy Press.

Iverson, G. L., A. J. Gardner, D. P. Terry, J. L. Ponsford, A. K. Sills, D. K. Broshek, and G. S. Solomon. 2017. Predictors of clinical recovery from concussion: A systematic review. *British Journal of Sports Medicine* 51(12):941–948.

Jagoda, A. S., J. J. Bazarian, J. J. Bruns, Jr., S. V. Cantrill, A. D. Gean, P. K. Howard, J. Ghajar, S. Riggio, D. W. Wright, R. L. Wears, A. Bakshy, P. Burgess, M. M. Wald, and R. R. Whitson. 2008. Clinical policy: Neuroimaging and decisionmaking in adult mild traumatic brain injury in the acute setting. *Annals of Emergency Medicine* 52(6):714–748.

Johnson, V. E., W. Stewart, J. D. Arena, and D. H. Smith. 2017. Traumatic brain injury as a trigger of neurodegeneration. *Advances in Neurobiology* 15:383–400.

Kiraly, M., and S. J. Kiraly. 2007. Traumatic brain injury and delayed sequelae: A review—traumatic brain injury and mild traumatic brain injury (concussion) are precursors to later-onset brain disorders, including early-onset dementia. *Scientific World Journal* 7:1768–1776.

Kisser, J., S. R. Waldstein, M. K. Evans, and A. B. Zonderman. 2017. Lifetime prevalence of traumatic brain injury in a demographically diverse community sample. *Brain Injury* 31(5):620–623.

Kontos, A. P., R. S. Kotwal, R. J. Elbin, R. H. Lutz, R. D. Forsten, P. J. Benson, and K. M. Guskiewicz. 2013. Residual effects of combat-related mild traumatic brain injury. *Journal of Neurotrauma* 30(8):680–686.

Kurowski, B. G., A. Treble-Barna, A. J. Pitzer, S. L. Wade, L. J. Martin, R. S. Chima, and A. Jegga. 2017. Applying systems biology methodology to identify genetic factors possibly associated with recovery after traumatic brain injury. *Journal of Neurotrauma* 34(14):2280–2290.

Laskowitz, D., and G. Grant. 2016. Frontiers in neuroscience. In *Translational research in traumatic brain injury*, edited by D. Laskowitz and G. Grant. Boca Raton, FL: CRC Press/Taylor and Francis Group.

Copyright National Academy of Sciences. All rights reserved.

Lee, H., M. Wintermark, A. D. Gean, J. Ghajar, G. T. Manley, and P. Mukherjee. 2008. Focal lesions in acute mild traumatic brain injury and neurocognitive outcome: CT versus 3T MRI. *Journal of Neurotrauma* 25(9):1049–1056.

Levin, H. S. 1990. Memory deficit after closed head injury. *Journal of Clinical and Experimental Neuropsychology* 12(1):129–153.

Levin, H. S. 1995. Prediction of recovery from traumatic brain injury. *Journal of Neurotrauma* 12(5):913-922.

Levin, H. S., H. E. Gary, Jr., H. M. Eisenberg, R. M. Ruff, J. T. Barth, J. Kreutzer, W. M. High, Jr., S. Portman, M. A. Foulkes, J. A. Jane, A. Marmarou, and L. F. Marshall. 1990. Neurobehavioral outcome 1 year after severe head injury. Experience of the traumatic coma data bank. *Journal of Neurosurgery* 73(5):699–709.

Lew, H. L., J. H. Poole, R. D. Vanderploeg, G. L. Goodrich, S. Dekelboum, S. B. Guillory, B. Sigford, and D. X. Cifu. 2007. Program development and defining characteristics of returning military in a VA polytrauma network site. *Journal of Rehabilitation Research and Development* 44(7):1027–1034.

Lucke-Wold, B. P., R. C. Turner, A. F. Logsdon, J. E. Bailes, J. D. Huber, and C. L. Rosen. 2014. Linking traumatic brain injury to chronic traumatic encephalopathy: Identification of potential mechanisms leading to neurofibrillary tangle development. *Journal of Neurotrauma* 31(13):1129–1138.

Maas, A. 2016. Traumatic brain injury: Changing concepts and approaches. *Chinese Journal of Traumatology—English Edition* 19(1):3–6.

Maiti, T. K., S. Konar, S. Bir, P. Kalakoti, P. Bollam, and A. Nanda. 2015. Role of apolipoprotein E polymorphism as a prognostic marker in traumatic brain injury and neurodegenerative disease: A critical review. *Neurosurgery Focus* 39(5).

Manners, J. L., R. D. Forsten, R. S. Kotwal, R. J. Elbin, M. W. Collins, and A. P. Kontos. 2016. Role of pre-morbid factors and exposure to blast mild traumatic brain injury on post-traumatic stress in United States military personnel. *Journal of Neurotrauma* 33(19):1796–1801.

McCrea, M., J. P. Kelly, J. Kluge, B. Ackley, and C. Randolph. 1997. Standardized assessment of concussion in football players. *Neurology* 48(3):586–588.

McCrea, M., K. Guskiewicz, S. Doncevic, K. Helmick, J. Kennedy, C. Boyd, S. Asmussen, K. W. Ahn, Y. Wang, J. Hoelzle, and M. Jaffee. 2014. Day of injury cognitive performance on the Military Acute Concussion Evaluation (MACE) by U.S. military service members in OEF/OIF. *Military Medicine* 179(9):990–997.

McInnes, K., C. L. Friesen, D. E. MacKenzie, D. A. Westwood, and S. G. Boe. 2017. Mild traumatic brain injury (mTBI) and chronic cognitive impairment: A scoping review. *PLOS ONE* 12(4):e0174847.

McKee, A. C., and D. H. Daneshvar. 2015. The neuropathology of traumatic brain injury. In *Handbook of clinical neurology*. Vol. 127, edited by J. Grafman and A. M. Salazar: Elsevier. Pp. 45–66.

McKinlay, A., and L. J. Horwood. 2017. The accuracy of adult recall for early mild traumatic brain injury. *Disability and Rehabilitation* 39(13):1296–1299.

McKinlay, A., L. J. Horwood, and D. M. Fergusson. 2016. Accuracy of self-report as a method of screening for lifetime occurrence of traumatic brain injury events that resulted in hospitalization. *Journal of the International Neuropsychological Society* 22(7):717–723.

McQuistion, K., T. Zens, H. S. Jung, M. Beems, G. Leverson, A. Liepert, J. Scarborough, and S. Agarwal. 2016. Insurance status and race affect treatment and outcome of traumatic brain injury. *Journal of Surgical Research* 205(2):261–271.

Meagher, A. D., C. A. Beadles, J. Doorey, and A. G. Charles. 2015. Racial and ethnic disparities in discharge to rehabilitation following traumatic brain injury. *Journal of Neurosurgery* 122(3):595–601.

Meehan, W. P., R. C. Mannix, M. J. Oêbrien, and M. W. Collins. 2013. The prevalence of undiagnosed concussions in athletes. *Clinical Journal of Sport Medicine* 23(5):339–342.

Copyright National Academy of Sciences. All rights reserved.

Morales, D. M., N. Marklund, D. Lebold, H. J. Thompson, A. Pitkanen, W. L. Maxwell, L. Longhi, H. Laurer, M. Maegele, E. Neugebauer, D. I. Graham, N. Stocchetti, and T. K. McIntosh. 2005. Experimental models of traumatic brain injury: Do we really need to build a better mousetrap? *Neuroscience* 136(4):971–989.

Mutch, C. A., J. F. Talbott, and A. Gean. 2016. Imaging evaluation of acute traumatic brain injury. *Neurosurgery Clinics of North America* 27(4):409–439.

Oppelt, K., D. Hahnlein, J. Boschert, M. Kuffer, P. A. Grutzner, M. Munzberg, and M. Kreinest. 2018. Influence of demographic factors and clinical status parameters on long-term neurological, psychological and vegetative outcome following traumatic brain injury. *Brain Injury* 32(12):1500–1509.

Padgett, C. R., M. J. Summers, and C. E. Skilbeck. 2016. Is ApoE ε4 associated with poorer cognitive outcome following traumatic brain injury? A meta-analysis. *Neuropsychology* 30(7):775–790.

Pan, J., I. D. Connolly, S. Dangelmajer, J. Kintzing, A. L. Ho, and G. Grant. 2016. Sports-related brain injuries: Connecting pathology to diagnosis. *Neurosurgical Focus* 40(4):E14.

Panenka, W. J., A. J. Gardner, M. N. Dretsch, G. C. Crynen, F. C. Crawford, and G. L. Iverson. 2017. Systematic review of genetic risk factors for sustaining a mild traumatic brain injury. *Journal of Neurotrauma* 34(13):2093–2099.

Papa, L., D. Edwards, and M. Ramia. 2015. Frontiers in neuroengineering. In *Brain neurotrauma: Molecular, neuropsychological, and rehabilitation aspects*, edited by F. H. Kobeissy. Boca Raton, FL: CRC Press/Taylor & Francis © 2015 by Taylor & Francis Group, LLC.

Perrin, P. B., D. Krch, M. Sutter, D. J. Snipes, J. C. Arango-Lasprilla, S. A. Kolakowsky-Hayner, J. Wright, and A. Lequerica. 2014. Racial/ethnic disparities in mental health over the first 2 years after traumatic brain injury: A model systems study. *Archives of Physical Medicine and Rehabilitation* 95(12):2288–2295.

Peeters, W., R. van den Brande, S. Polinder, A. Brazinova, E. W. Steyerberg, H. F. Lingsma, and A. I. R. Maas. 2015. Epidemiology of traumatic brain injury in Europe. *Acta Neurochirurgica (Wien)* 157(10):1683–1696.

Podell, K., K. Gifford, D. Bougakov, and E. Goldberg. 2010. Neuropsychological assessment in traumatic brain injury. *The Psychiatric Clinics of North America* 33(4):855–876.

Powell, J. M., J. V. Ferraro, S. S. Dikmen, N. R. Temkin, and K. R. Bell. 2008. Accuracy of mild traumatic brain injury diagnosis. *Archives of Physical Medicine and Rehabilitation* 89(8):1550–1555.

Prince, C., and M. E. Bruhns. 2017. Evaluation and treatment of mild traumatic brain injury: The role of neuropsychology. *Brain Sciences* 7(8).

Pugh, M. J., E. P. Finley, C. P. Wang, L. A. Copeland, C. A. Jaramillo, A. A. Swan, C. A. Elnitsky, L. K. Leykum, E. M. Mortensen, B. A. Eapen, P. H. Noel, J. A. Pugh, and The demenTia Research And Care Clinic (TRACC) Research Team. 2016. A retrospective cohort study of comorbidity trajectories associated with traumatic brain injury in veterans of the Iraq and Afghanistan wars. *Brain Injury* 30(12):1481–1490.

Rakholia, M. V., R. G. Kumar, B. M. Oh, P. R. Ranganathan, S. L. Berga, P. M. Kochanek, and A. K. Wagner. 2018. Systemic estrone production and injury-induced sex hormone steroidogenesis after severe traumatic brain injury: A prognostic indicator of traumatic brain injury-related mortality. *Journal of Neurotrauma*, August 24 [Epub ahead of print].

Ranganathan, P., R. G. Kumar, K. Davis, E. H. McCullough, S. L. Berga, and A. K. Wagner. 2016. Longitudinal sex and stress hormone profiles among reproductive age and post-menopausal women after severe TBI: A case series analysis. *Brain Injury* 30(4):452-461.

Rigon, A., L. Turkstra, B. Mutlu, and M. Duff. 2016. The female advantage: Sex as a possible protective factor against emotion recognition impairment following traumatic brain injury. *Cognitive, Affective, & Behavioral Neuroscience* 16(5):866–875.

Roozenbeek, B., A. I. Maas, and D. K. Menon. 2013. Changing patterns in the epidemiology of traumatic brain injury. *Nature Reviews Neurology* 9(4):231–236.

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Russell, L. M., M. D. Devore, S. M. Barnes, J. E. Forster, T. A. Hostetter, A. E. Montgomery, R. Casey, V. Kane, and L. A. Brenner. 2013. Challenges associated with screening for traumatic brain injury among U.S. veterans seeking homeless services. *American Journal of Public Health* 103(Suppl 2):S211–S212.

Santiago, L. A., B. C. Oh, P. K. Dash, J. B. Holcomb, and C. E. Wade. 2012. A clinical comparison of penetrating and blunt traumatic brain injuries. *Brain Injury* 26(2):107–125.

Schiraldi, M., C. G. Patil, D. Mukherjee, B. Ugiliweneza, M. Nuño, S. P. Lad, and M. Boakye. 2015. Effect of insurance and racial disparities on outcomes in traumatic brain injury. *Journal of Neurological Surgery, Part A: Central European Neurosurgery* 76(3):224–232.

Schneider, A. L., T. A. Hostetter, B. Y. Homaifar, J. E. Forster, J. H. Olson-Madden, B. B. Matarazzo, J. Huggins, and L. A. Brenner. 2016. Responses to traumatic brain injury screening questions and suicide attempts among those seeking Veterans Health Administration mental health services. *Frontiers in Psychiatry* 7:59.

Schwab, K. A., G. Baker, B. Ivins, M. Sluss-Tiller, W. Lux, and D. Warden. 2006. The Brief Traumatic Brain Injury Screen (BTBIS): Investigating the validity of a self-report instrument for detecting traumatic brain injury (TBI) in troops returning from deployment in Afghanistan and Iraq. *Neurology* 66(5)(Suppl 2):A235.

Schwab, K. A., B. Ivins, G. Cramer, W. Johnson, M. Sluss-Tiller, K. Kiley, W. Lux, and D. Warden. 2007. Screening for traumatic brain injury in troops returning from deployment in Afghanistan and Iraq: Initial investigation of the usefulness of a short screening tool for traumatic brain injury. *Journal of Head Trauma Rehabilitation* 22(6):377–389.

Setnik, L., and J. J. Bazarian. 2007. The characteristics of patients who do not seek medical treatment for traumatic brain injury. *Brain Injury* 21(1):1–9.

Shafi, S., C. Marquez de la Plata, R. Diaz-Arrastia, K. Shipman, M. Carlile, H. Frankel, J. Parks, and L. M. Gentilello. 2007. Racial disparities in long-term functional outcome after traumatic brain injury. *Journal of Trauma* 63(6):1263–1270.

Sherer, M., S. A. Yablon, R. Nakase-Richardson, and T. G. Nick. 2008. Effect of severity of post-traumatic confusion and its constituent symptoms on outcome after traumatic brain injury. *Archives of Physical Medicine and Rehabilitation* 89(1):42–47.

Shin, S. S., J. W. Bales, C. Edward Dixon, and M. Hwang. 2017. Structural imaging of mild traumatic brain injury may not be enough: Overview of functional and metabolic imaging of mild traumatic brain injury. *Brain Imaging and Behavior* 11(2):591–610.

Silver, J. M., R. Kramer, S. Greenwald, and M. Weissman. 2001. The association between head injuries and psychiatric disorders: Findings from the New Haven NIMH epidemiologic catchment area study. *Brain Injury* 15(11):935–945.

Smith, D. H. 2013. Diagnosing concussion. *Canadian Medical Association Journal* 185(18):1602.

Spencer, R. J., L. L. Drag, S. J. Walker, and L. A. Bieliauskas. 2010. Self-reported cognitive symptoms following mild traumatic brain injury are poorly associated with neuropsychological performance in OIF/OEF veterans. *Journal of Rehabilitation Research and Development* 47(6):521–530.

Staudenmayer, K. L., R. Diaz-Arrastia, A. de Oliveira, L. M. Gentilello, and S. Shafi. 2007. Ethnic disparities in long-term functional outcomes after traumatic brain injury. *Journal of Trauma* 63(6):1364–1369.

Stein, M. B., J. R. Walker, A. L. Hazen, and D. R. Forde. 1997. Full and partial posttraumatic stress disorder: Findings from a community survey. *American Journal of Psychiatry* 154(8):1114–1119.

Sullivan, K. A., C. B. Kempe, S. L. Edmed, and G. A. Bonanno. 2016. Resilience and other possible outcomes after mild traumatic brain injury: A systematic review. *Neuropsychology Review* 26(2):173–185.

Tanev, K. S., K. Z. Pentel, M. A. Kredlow, and M. E. Charney. 2014. PTSD and TBI co-morbidity: Scope, clinical presentation and treatment options. *Brain Injury* 28(3):261–270.

Taylor, D. D., and C. Gercel-Taylor. 2014. Exosome platform for diagnosis and monitoring of traumatic brain injury. *Philosophical Transactions of the Royal Society B: Biological Sciences* 369(1652).

Copyright National Academy of Sciences. All rights reserved.

Teasdale, G., and B. Jennett. 1974. Assessment of coma and impaired consciousness. A practical scale. *Lancet* 2(7872):81–84.

Terrio, H., L. A. Brenner, B. J. Ivins, J. M. Cho, K. Helmick, K. Schwab, K. Scally, R. Bretthauer, and D. Warden. 2009. Traumatic brain injury screening: Preliminary findings in a U.S. Army brigade combat team. *Journal of Head Trauma Rehabilitation* 24(1):14–23.

Trotter, B. B., M. E. Robinson, W. P. Milberg, R. E. McGlinchey, and D. H. Salat. 2015. Military blast exposure, ageing and white matter integrity. *Brain* 138(8):2278–2292.

VA (Department of Veterans Affairs). 2010. *Screening and evaluation of possible traumatic brain injury in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) veterans*. VHA Directive 2010-012. Washington, DC: Department of Veterans Affairs.

VA. 2015. Traumatic brain injury (TBI) instruments user manual. Washington DC: Department of Veterans Affairs.

VA. 2016. *VA/DOD clinical practice guideline for the management of concussion-mild traumatic brain injury*. Washington, DC: Department of Veterans Affairs.

Van Giau, V., S. S. A. An, E. Bagyinszky, and S. Y. Kim. 2015. Gene panels and primers for next generation sequencing studies on neurodegenerative disorders. *Molecular and Cellular Toxicology* 11(2):89–143.

Vanderploeg, R. D., S. Groer, and H. G. Belanger. 2012. Initial developmental process of a VA semistructured clinical interview for TBI identification. *Journal of Rehabilitation Research and Development* 49(4):545–556.

Veeramuthu, V., V. Narayanan, T. L. Kuo, L. Delano-Wood, K. Chinna, M. W. Bondi, V. Waran, D. Ganesan, and N. Ramli. 2015. Diffusion tensor imaging parameters in mild traumatic brain injury and its correlation with early neuropsychological impairment: A longitudinal study. *Journal of Neurotrauma* 32(19):1497–1509.

Vincent, A. S., T. M. Roebuck-Spencer, and A. Cernich. 2014. Cognitive changes and dementia risk after traumatic brain injury: Implications for aging military personnel. *Alzheimer's and Dementia* 10(3 Suppl):S174–S187.

Williams, C. C., and D. T. Bernhardt. 1995. Syncope in athletes. *Sports Medicine* 19(3):223–234.

Wintermark, M., P. C. Sanelli, Y. Anzai, A. J. Tsiouris, C. T. Whitlow, T. J. Druzgal, A. D. Gean, Y. W. Lui, A. M. Norbash, C. Raji, D. W. Wright, and M. Zeineh. 2015. Imaging evidence and recommendations for traumatic brain injury: Advanced neuro- and neurovascular imaging techniques. *American Journal of Neuroradiology* 36(2):E1–E11.

Witcher, K. G., D. S. Eiferman, and J. P. Godbout. 2015. Priming the inflammatory pump of the CNS after traumatic brain injury. *Trends in Neuroscience* 38(10):609–620.

Wright, D. W., T. R. Espinoza, L. H. Merck, J. J. Ratcliff, A. Backster, and D. G. Stein. 2014. Gender differences in neurological emergencies, part II: A consensus summary and research agenda on traumatic brain injury. *Academic Emergency Medicine* 21(12):1414–1420.

Xiong, K., Y. Zhu, Y. Zhang, Z. Yin, J. Zhang, M. Qiu, and W. Zhang. 2014. White matter integrity and cognition in mild traumatic brain injury following motor vehicle accident. *Brain Research* 1591(1):86–92.

Yamamoto, S., D. S. DeWitt, and D. S. Prough. 2018. Impact and blast traumatic brain injury: Implications for therapy. *Molecules* 23(2):E245.

Yeates, K. O., H. G. Taylor, J. Rusin, B. Bangert, A. Dietrich, K. Nuss, M. Wright, D. S. Nagin, and B. L. Jones. 2009. Longitudinal trajectories of postconcussive symptoms in children with mild traumatic brain injuries and their relationship to acute clinical status. *Pediatrics* 123(3):735–743.

Yi, A., and K. Dams-O'Connor. 2013. Psychosocial functioning in older adults with traumatic brain injury. *NeuroRehabilitation* 32(2):267–273.

Yuh, E. L., P. Mukherjee, H. F. Lingsma, J. K. Yue, A. R. Ferguson, W. A. Gordon, A. B. Valadka, D. M. Schnyer, D. O. Okonkwo, A. I. R. Maas, and G. T. Manley. 2013. Magnetic resonance imaging improves 3-month outcome prediction in mild traumatic brain injury. *Annals of Neurology* 73(2):224–235.

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Yuh, E. L., S. R. Cooper, P. Mukherjee, J. K. Yue, H. F. Lingsma, W. A. Gordon, A. B. Valadka, D. O. Okonkwo, D. M. Schnyer, M. J. Vassar, A. I. Maas, G. T. Manley, S. S. Casey, M. Cheong, K. Dams-O'Connor, A. J. Hricik, T. Inoue, D. K. Menon, D. J. Morabito, J. L. Pacheco, A. M. Puccio, and T. K. Sinha. 2014. Diffusion tensor imaging for outcome prediction in mild traumatic brain injury: A TRACK-TBI study. *Journal of Neurotrauma* 31(17):1457–1477.

Zatzick, D. F., F. P. Rivara, G. J. Jurkovich, C. W. Hoge, J. Wang, M. Y. Fan, J. Russo, S. G. Trusz, A. Nathens, and E. J. Mackenzie. 2010. Multisite investigation of traumatic brain injuries, posttraumatic stress disorder, and self-reported health and cognitive impairments. *Archives of General Psychiatry* 67(12):1291–1300.

Zeiler, F. A., C. McFadyen, V. F. J. Newcombe, A. Synnot, E. L. Donoghue, S. Ripatti, E. W. Steyerberg, R. L. Gruen, T. W. McAllister, J. Rosand, A. Palotie, A. I. R. Maas, and D. K. Menon. 2018. Genetic influences on patient-oriented outcomes in traumatic brain injury: A living systematic review of non-apolipoprotein E single-nucleotide polymorphisms. *Journal of Neurotrauma,* August 10 [Epub ahead of print].

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3

Disability Determination Process for Veterans with Traumatic Brain Injury

The Department of Veterans Affairs (VA) requested that the committee review the adjudication process by which impairments that result from traumatic brain injury (TBI) are assessed for awarding disability compensation. The committee specifically was asked to assess the adequacy of the tools and protocols used by the VA to provide examinations and also to review the credentials and training of the providers who perform examinations. Chapter 3 begins by defining disability and providing an overview of the VA's disability determination process for the residuals of TBI (i.e., those conditions which result from sustaining a TBI) from the submission of the claim through the appeals process. The chapter then focuses on the tools and protocols used in evaluating the residuals of TBI as well as the credentials and training required in the clinical assessment and disability rating of TBI residuals. Finally, the chapter describes the VA's efforts at quality assurance for the adjudication process.

DISABILITY AND DISABILITY COMPENSATION

Disability compensation is a monetary benefit awarded to veterans for one or more injuries or illnesses that the VA determines were "service connected," that is, were incurred during active military service (VA, 2018a).[1] Each disabling, service-connected condition is assigned a rating, ranging from 0 to 100 percent disability, in 10 percent increments. The degree of disability for a given disabling condition depends on a number of factors, including the diagnosis (coded according to the Veterans Affairs Schedule for Rating Disabilities [VASRD], which provides criteria for translating medical information into a disability rating) associated with the disability and a variety of functional measures. A veteran who has more than one service-connected disability receives a rating for each condition, and the VA then applies a formula to determine the overall disability rating (VA, 2018a). Finally, the overall disability rating is mapped to a benefits table (see Chapter 1, Table 1-1), which shows the monthly amount paid by VA to the veteran commensurate with the degree of disability and the number of eligible dependents (VA, 2015a).

[1] In addition to monetary benefits, veterans may be eligible for other benefits, including health care, housing, and insurance benefits. The focus of this chapter is monetary benefits.

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The VA regards disability as an intersection of service connection, diagnosis, and function, and the compensation decision is for the most part not associated with the veteran's ability to work.[2] This can be contrasted with how the Social Security Administration (SSA) views disability. SSA, another federal agency that provides disability benefits, views disability compensation as a binary decision where the compensation is awarded based on the claimant's inability to work or perform "substantial gainful activity" by reason of a medical impairment (SSA, 2017). While SSA awards disability compensation to individuals who cannot work, the VA awards disability compensation to people who sustain injuries from military service, regardless of their ability to work. Veterans may also receive disability benefits from SSA while receiving benefits from the VA, although eligibility for one does not necessarily confer eligibility for the other (VA Law, 2018).

In fiscal year 2017, 155,321 veterans received compensation benefits for residuals of TBI. Table 3-1 shows the number of unique veterans who received VA disability compensation benefits for residuals of TBI, displayed by their overall disability ratings, inclusive of TBI and any other non-TBI rated conditions.

TABLE 3-1 Overall Disability Ratings for Veterans with a Rating for Residuals of Traumatic Brain Injury

Overall Disability Rating	FY 2017	FY 2018 to date (as of July 2018)
0%	39,494	41,314
10%	55,648	56,999
20%	485	465
30%	8,779	9,168
40%	20,757	21,676
50%	8,113	9,371
60%	163	159
70%	15,698	18,077
80%	143	137
90%	18	18
100%	6,023	6,654
Total	155,321	164,038

NOTE: Fiscal year (FY) to date includes data from October 1, 2017, to June 30, 2018. Those with 0% were evaluated but determined to have no disability.
SOURCE: Communication with Veterans Benefits Administration, July 2018.

DEPARTMENT OF VETERANS AFFAIRS DISABILITY DETERMINATION PROCESS FOR RESIDUALS OF TRAUMATIC BRAIN INJURY

The adjudication process for VA disability compensation involves the following key stakeholders: the veteran, the Veterans Health Administration (VHA), the Veterans Benefits Administration (VBA), and staff offices that work with veterans on appeals; however, not all

[2] An exception is that for certain disabilities a veteran receiving a 100 percent disability rating cannot work full time or make over a certain income (usually the federal poverty line) (VA Law, 2018).

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cases involve all of those stakeholders. This section describes the process by which the stakeholders work together to adjudicate claims for residuals of TBI. The overall adjudication process is not unique to residuals of TBI claims, but there are specific tools and protocols that are unique to those claims. Figure 3-1 provides a simplified version of the adjudication process:

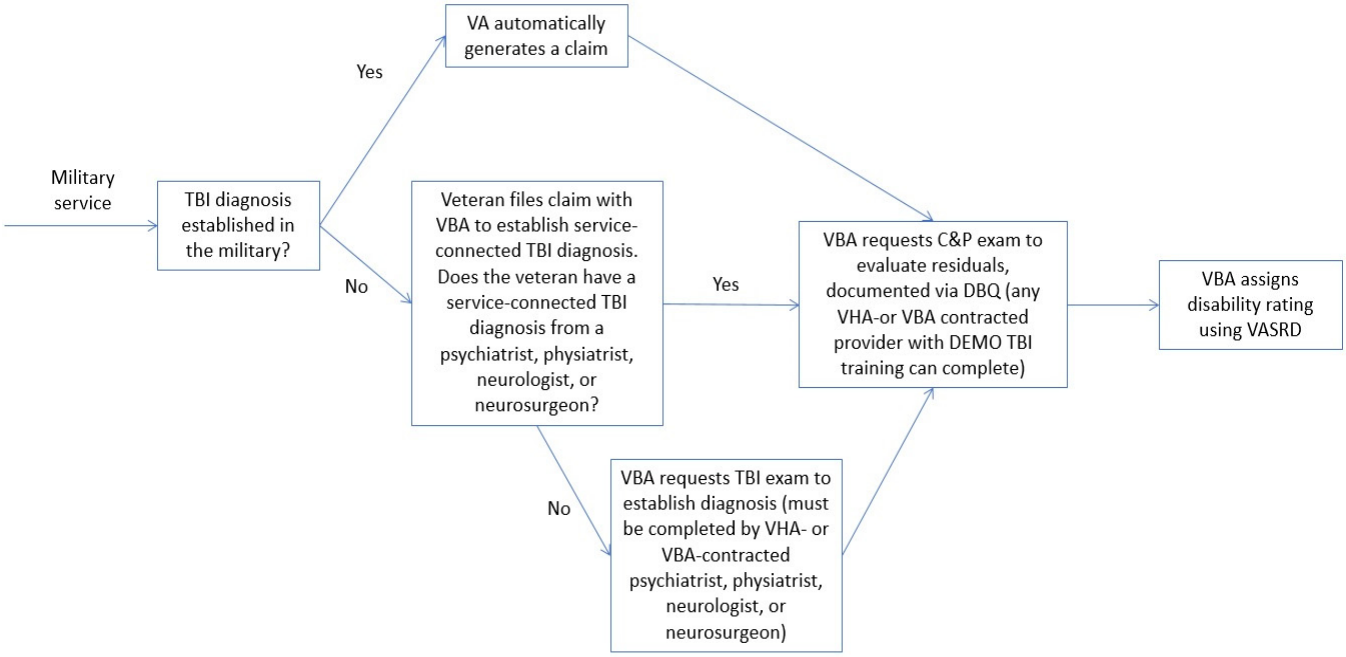

FIGURE 3-1 Overview of the VA adjudication process for disability compensation.
NOTES: A veteran may file for an appeal at any step in the process (e.g., service connection, initial decision, a decision for an increased rating). C&P = compensation and pension; DBQ = Disability Benefits Questionnaire; DEMO = Disability Examination Management Office; TBI = traumatic brain injury; VA = Department of Veterans Affairs; VASRD = Veterans Affairs Schedule for Rating Disabilities; VBA = Veterans Benefits Administration; VHA = Veterans Health Administration.

Broadly speaking, the VA disability determination process for residuals of TBI involves the following steps, as described in the VA's Compensation and Pension Manual, M21 (see Appendix I for M21 Table of Contents) (VA, 2018b):

1. If the service member is being medically discharged from the military because of residuals of TBI that render him or her unfit for duty, the disability evaluation process begins while the service member is still serving in the military. At any point after leaving the military, a veteran may file a claim with the VA for a disability. Disability claims can be filed through the VA's eBenefits, in person with a veterans service organization (VSO), or with a VA representative at a military installation (health.mil, 2018).
2. VBA receives the claim. If VBA receives a "substantially complete application," meaning it includes sufficient information to verify the veteran's service and claimed medical condition, it will begin to process the claim. If VBA does not receive a substantially complete application, VBA must give the claimant written notice of the evidence necessary to substantiate the claim. It must also inform the claimant whether

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the VA or the claimant is responsible for obtaining that evidence. A veteran submitting a claim for residuals of TBI must first establish a TBI diagnosis by a psychiatrist, physiatrist, neurologist, or neurosurgeon if the veteran did not receive a diagnosis while on active duty (VA, 2018b).

3. Once the TBI diagnosis has been established, the residuals of TBI must be assessed. That may happen in a number of ways. VBA might accept a medical report from a private physician if it determines that report is "adequate for rating purposes."[3] However, in most cases, standard medical examinations are not "adequate for rating purposes" because the diagnostic and treatment information obtained in a standard medical examination does not cover functional impacts of the impairment. In those cases, VBA orders a compensation and pension (C&P) examination performed by a VHA clinician or a VBA clinician contractor. The C&P examiner evaluates the degree of impairment, functional limitation, and disability, which is recorded in the Disability Benefits Questionnaire (DBQ), which is unique to residuals of TBI (see Appendix D).
4. The C&P examination results are sent to VBA via the C&P record interchange. A VBA rating specialist determines the percentage rating by comparing medical evidence recorded in the DBQ for residuals of TBI with criteria in the VASRD for residuals of TBI, in addition to other information such as the veteran's medical and service records.
5. The veteran begins receiving disability benefits. The disability rating may be adjusted as the veteran's condition worsens or improves over time. That adjustment requires reevaluation of the veteran's condition(s). Veterans receiving benefits for residuals of TBI may request to be reevaluated at any time.
6. If the veteran does not agree with the rating decision, he or she can submit an appeal to have the case reviewed by the Board of Veterans Appeals. The appeals process gathers and develops new evidence and re-reviews the case to issue a final decision on behalf of the VA secretary for disability compensation claims (and other veterans' benefits).

In December 2018, the average reported length of time for the VA to process disability claims was 110 days (VA, 2018c).

THE RATING PROCESS

VBA is the administration within the VA that makes the decision about the rating, with information gathered from the veteran's records and, often, with health information established from VHA or VBA-contracted clinicians. VBA staff work across 57 regional offices to process claims. Claims processors are veterans service representatives (VSRs), who gather the evidence needed to determine entitlement, and rating veterans service representatives (RVSRs), who decide rating percentages. In fiscal year (FY) 2017, 50,155 veterans submitted claims for TBI: 38,659 were filed for service connection, while 11,496 were filed for an increase in benefits (communication with VBA, July 2018). In 2018 the maximum award was $2,973.86 per month for 100 percent disability rating for a veteran alone, and $3,261.10 for 100 percent disability rating for a veteran with a spouse and child (Veterans Aid Benefit, 2018).

The VBA's predetermination team and the rating team work together to make a rating decision. Those teams include VSRs, who gather the evidence needed to determine entitlement,

[3] 38 CFR 3.326.

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including requesting medical exams, reviewing information from VHA, and gathering other data required to make a claim decision, and RVSRs, who determine whether the condition is service connected, determine the disability rating, and assign an effective date. The predetermination team's job of developing the evidence necessary to make a rating decision is often time-consuming, as multiple requests might be necessary to obtain all the needed information. The predetermination team sets deadlines for receipt of requested information and determines whether VHA should complete a C&P exam (IOM, 2007).

The rating team makes decisions on claims that require the consideration of medical evidence. In addition to medical records, VSRs retrieve the military personnel file.[4] A routing tool determines whether the examination goes to a VA medical center clinician or a VBA-contracted clinician, based on the veteran's zip code. The determination is made based on the distance and availability of VHA clinicians. If there are no VHA clinicians available within a month of the scheduling goal, the veteran may see a VBA contractor. However, VA does set a limit for the number of exams performed by contractors (personal communication with VBA, August 6, 2018).

RVSRs take the information from the cases determined by the VSR to be "ready to rate" and make a decision on service connection, percent disability, the need for reexamination, and the competency of veterans and dependents for self-support. The information from the DBQ is entered into the Veteran Benefits Management System evaluation builder, which populates all the information inputted by the rater. Then the RVSR assigns an effective date (the date the veteran will begin to receive benefits). Only RVSRs or decision review officers (DROs) may prepare complex medical opinion requests, including conflicting medical diagnoses and questions concerning the credibility of evidence presented to the examiner. Journey-level VSRs who have completed training specified by the central office may prepare basic medical opinion requests without RVSR or DRO review (VA, 2018b).

It should be noted that in determining a disability percentage for residuals of traumatic brain injury, an RVSR might consider information from more than one DBQ. The order in which DBQs are completed should be taken into consideration, given the likelihood that additional DBQs will be required and answers to questions on one might be required in another. For example, because the posttraumatic stress disorder (PTSD) DBQ requires information from the TBI DBQ, the TBI DBQ should be completed before the PTSD DBQ. A protocol should be implemented requiring the TBI DBQ to be conducted prior to the PTSD DBQ. (See Appendixes D and J for the TBI and PTSD DBQs, respectively.)

THE APPEALS PROCESS

Veterans have the right to appeal any benefits decision made by VBA. Once VBA has made a decision on the veteran's claim (whether the initial decision, a decision for an increased rating, or any other decision), the veteran has 1 year to appeal some or all of the decision, including, but not limited to, entitlement to service connection, the percentage of evaluation assigned, and the effective date (see Notice of Disagreement, Appendix K). The appeals process is a multistage, nonlinear process set in law that has evolved over decades, with a continuous

[4] Prior to leaving the military, all service members undergo a medical examination that is used by both the Department of Defense (DoD) and the VA called the separation health assessment (VA, 2018b). The examination documents and assesses the service member's medical history, medical concerns identified during his or her service career, and current health status.

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open record which allows the submission of new evidence at any time. Each submission of evidence requires a new cycle of review and decision making. The appeals process is described in Box 3-1 below.

BOX 3-1
Life Cycle of a VA Appeal

- Veteran submits claim
- VBA issues initial VA rating decision
- Veteran submits notice of disagreement informal appeal
- VBA issues statement of the case informal appeal decision
- Veteran submits VA Form 9 (Substantive Appeal) formal appeal
- VBA issues supplemental statement of the case 1st, 2nd, 3rd, etc. appeal decision(s). VBA certifies and transfers appeal to Board of Veterans' Appeals for a final decision. Board issues final decision
- By law, board must decide appeals in docket order

SOURCE: BVA, 2016.

There are two levels of appeals. The first level of appeal is heard by the Board of Veterans' Appeals (BVA). The BVA's mission is to conduct hearings and decide appeals in a timely manner.[5] To initiate an appeal, the veteran must submit a Notice of Disagreement (see Appendix K). Additionally, the veteran must submit VA Form 9, which is the official appeal (see Appendix L). If, after the decision is made, the veteran still disagrees with the BVA's decision, then the second level of appeal available to the veteran is the U.S. Court of Appeals for Veterans Claims. The veteran must submit a notice of appeal within 120 days of the BVA decision (VA, 2018b). Once the appeal has been docketed, the court clerk will send a notice of docketing to all parties advising them of the date the clerk received the notice of appeal. The clerk also notes what will be required of both the veteran and the VA secretary (VA, 2015b). The court is a national court of record and has exclusive jurisdiction to provide judicial review of final decisions by the BVA. The court provides the highest level of appeals within the VA.

The appeals process is complex and takes a considerable amount of time. In FY 2017, the BVA issued 52,661 decisions. For those appeals that were resolved by the BVA, veterans waited on average 7 years from the date that they initiated their appeal until resolution (BVA, 2017).[6]

THE DISABILITY BENEFITS QUESTIONNAIRE AND A SCHEDULE FOR RATING DISABILITIES FOR RESIDUALS OF TBI

The committee was tasked with making a determination of the adequacy of the tools and protocols used by the VA to provide TBI examinations and to make recommendations for

[5] 38 United States Code (U.S.C.) § 7101 (a)
[6] See figure 1 in GAO's 2017 report *Additional Planning Would Enhance Efforts to Improve the Timeliness of Appeals Decisions* for a detailed appeals timeline: https://www.gao.gov/assets/690/683637.pdf (accessed March 21, 2019).

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legislative or administrative action for improving the adjudication of veterans' claims for all impairments arising from TBI. While Chapter 2 described the protocols for diagnosing and assessing TBI, this section will describe the tools that VHA and VBA use for evaluating residuals of TBI (i.e., the DBQ and the VASRD). The clinician using the DBQ will evaluate the veteran's condition, and the RVSR will determine a rating using the VASRD.[7] The DBQs were developed to assist the VBA in addressing TBI rating criteria (correspondence with VHA, 2018); therefore, the criteria in the DBQ have been developed to mirror those in the VASRD.

As previously discussed, in order to assess the level of impairment resulting from residuals of TBI, VHA clinicians and VBA-contracted clinicians use the DBQ, a form that elicits the medical information needed to make claims. The DBQ provides a standardized report format for medical examinations and opinions to guide the documentation of C&P exams. The C&P examiners use DBQs to provide medical information that is directly relevant to determining a disability rating, which enables the VA's rating specialists, the RVSRs, to have the information they need to start processing a claim by using the VASRD.

The disability rating for residuals of TBI derives from the levels of impairment contained in the "assessment of cognitive impairment and other residuals of TBI" section of the DBQ for residuals of TBI. In the VASRD, the disability rating for residuals of TBI can only take on five values: 0 percent, 10 percent, 40 percent, 70 percent, or 100 percent. If the outcome of the DBQ indicates that the veteran is completely impaired in one or more of the 10 facets on the DBQ, VBA awards the veteran a 100 percent disability. If no facet is evaluated as total, the overall percentage is based on the highest facet as follows: 0 = 0 percent; 1 = 10 percent; 2 = 40 percent; and 3 = 70 percent. For example, a veteran might be awarded 70 percent disability if 3 is the highest level of evaluation among the facets evaluated (see Appendix E).[8]

Comments on the 10 Facets

The committee reviewed the "assessment of cognitive impairment and other residuals of TBI" section of the DBQ as well as comments on the 10 facets that are evaluated in that section (see Appendix D for the DBQ). In the following subsections the committee comments on those facets and on the difficulty that a rater may have with providing a rating on the VASRD because of the lack of flexibility in applying the rating.

Memory, Attention, Concentration, and Executive Functions

Section II of the DBQ, "assessment of cognitive impairment and other residuals of TBI," identifies deficits in memory, attention, concentration, and executive functions that are commonly observed following TBI (Rosenthal et al., 1999). The definition of executive function used in the rating schedule emphasizes the cognitively based functions, such as planning and organization, while the difficulties with the regulation of emotions and behavior often experienced following TBI are not evaluated in the VASRD under residuals of TBI. Difficulties with executive functions following TBI are wide ranging and include problems with information processing, reasoning and problem solving, planning and organization, goal setting, self-

[7] TBI is rated in the VASRD under 38 CFR 4.124a, Diagnostic Code 8045—residuals of TBI (see Appendix D).
[8] Overall disability ratings for multiple disabilities are not additive, but are calculated according to a combined ratings table and rounded to the nearest ten. As an example, for a veteran who is awarded a rating of 40 percent disability for residuals of TBI and 20 percent for a second condition (e.g., back pain), the combined rating according to the table is 52 percent, which the VA rounds down to 50 percent. The table can be found at VA (2018c).

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awareness, and mental flexibility. Executive function deficits can be observed in persons with TBI of any severity level and might be short-lived or chronic (Wood and Worthington, 2017).

The committee notes that the DBQ specifies that cognitive impairment includes memory, attention, concentration, *or* executive functioning. Ratings of impairment greater than the mild level rely on objective evidence in testing. Evaluators should be aware, however, that appropriate tests for evaluating a cognitive or executive function can take different forms (e.g., from an evaluation of functional problem solving in the kitchen by an occupational therapist to a full neuropsychologic test battery).

Furthermore, memory, attention, concentration, and executive function are grouped into one facet, leaving the VHA or VBA clinician to choose one level of functional status for those four areas (see Appendix D TBI DBQ). That assumes that each of these four functions has been affected to the same degree, which might not be the case. The DBQ does not provide guidance on how a clinician should address different levels of impairments for the four functions evaluated in this facet.

Judgment

Judgment, which includes decision making, is rated separately on the DBQ from the first facet of memory, attention, concentration, and executive functions. The committee found that to be appropriate, given the importance of judgment for independent functioning. The decision-making process includes identifying alternative choices, weighing the pros and cons of the choices, understanding the outcomes of decisions, and making reasonable choices. Judgment and decision making can remain impaired for years following TBI exposure and can have a substantial impact on an individual's successful return to community participation (Agoston and Kamnaksh, 2015; Wood and Worthington, 2017).

The DBQ requires an evaluation of judgment based on the complexity or novelty of decision making and the frequency of difficulty with decision making. However, the latter criterion can be problematic when a poor decision made infrequently has serious consequences. For example, an individual might decide to forego taking a medication to prevent seizures on a day that she or he wants to drink alcohol. While the individual is heeding a recommendation not to mix alcohol with the medication, the individual has inappropriately weighed the risk of a seizure against the perceived pros of drinking alcohol. On the continuum of complexity, the decision to take or forego the medication and to consume or not consume the alcohol falls in the moderate range; however, the consequences of making the wrong decision even once can be serious. The physician filling out the DBQ must check the box on the frequency of the occurrence, but a more refined DBQ (and the VASRD) might take into account both the complexity of the decision and the consequences of poor decision making, rather than the frequency with which a poor decision is observed.

Social Interaction

Social interactions might deteriorate following a TBI. For example, individuals might experience difficulties using the historic and current context to fully comprehend meaning in a conversation, might have difficulties with turn-taking and tending to dominate the interaction, or might have trouble with the violation of social norms and maintaining boundaries (Angeleri et al., 2008; Rowley et al., 2017). Many individuals have problems perceiving and reading affective cues in themselves and others (Bornhofen and McDonald, 2008; Neumann et al., 2014). Individuals with TBI might not be aware of how their behavior is affecting social interaction and,

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as a result, fail to modify their behavior (Prigatano, 2009; Sherer et al., 1998). Impaired social interaction can lead to negative outcomes, such as social isolation and job loss.

On the DBQ, social interaction is evaluated with regard to the frequency in which it is inappropriate. While frequency is an important consideration, the impact of the social interaction deficits should also be considered. For example, individuals who fail to take turns in conversations can quickly find themselves without a conversational partner after only a couple of interactions.

Orientation

Disorientation following TBI is normally considered within the context of posttraumatic amnesia. During the acute stage of recovery, individuals might not be fully aware of their location (place orientation), the passage of time (time orientation), or their situation, and in rare circumstances they cannot identify themselves (person orientation). The extent to which the individual is oriented to time, place, situation, and person is used an indicator of progress in recovery from posttraumatic amnesia (McKinlay and Watkins, 1999). However, it is also possible that individuals might become disoriented in certain circumstances, even months or years post-injury. While even persons without TBI might temporarily lose track of time during prolonged circumstances without scheduled activities (e.g., vacation), the difference is that an individual with TBI might have greater difficulty reorienting in those circumstances. Periods of disorientation might also be a signal of underlying deterioration due to aging, or they might be a function of multiple factors common to TBI, such as a disrupted sleep-wake cycle, medications and their interactions, or stress. Persons with comorbid PTSD may experience dissociation and its associated disorientation (McKinnon et al., 2016).

The DBQ assesses orientation with regard to person, time, place, and situation in accordance with the four areas that are impaired and how frequently they are impaired. However, while not being able to identify oneself or one's current circumstances is the least frequent outcome of the four, it is also potentially the most concerning, as it can have a catastrophic impact on overall function.

Motor Activity

The committee noted that the motor facet is limited to apraxia, the inability to execute skilled actions, which can result from multiple types of brain lesions and can affect multiple systems, including speech and limb movements (Worthington, 2016). The assessment of this facet is more specifically defined as slowed or decreased motor activity due to apraxia. Due to the nature of the impairments, individuals with apraxia may have functional limitations in day-to-day function that are difficult to assess on clinical exam (Worthington, 2016).

Visual–Spatial Orientation

Deficits in visual–spatial orientation can affect route finding and the ability to work with three-dimensional objects. Left neglect or inattention can cause an individual to run into doorways or not be aware of dangerous situations if they only occur on the person's left side. Veterans and other persons with mild TBI have been found to have deficits in spatial attention that have affected their ability to walk around in the community (Catena et al., 2009; Kearns et al., 2015). The TBI DBQ focuses primarily on a person's ability to find his or her way in familiar and unfamiliar surroundings and to use assistive devices such as GPS, a global positioning system. At the most severe level of impairment, an individual may not be able to identify his or

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her body parts (which can be affected by left neglect) or identify spatial relationships between two objects. The DBQ would more accurately reflect the full spectrum of deficits if each level under visual–spatial orientation also included additional visual–spatial problems, such as left inattention.

Subjective Symptoms

The DBQ provides examples of subjective symptoms that may be considered based on their impact on work, the instrumental activities of daily living, or family or other close relationships. Example symptoms include headaches, anxiety, dizziness, tinnitus, insomnia, hypersensitivity to light or sound, marked fatigability, and blurred or double vision. The physical and sensory sequelae of TBI, including concussion (Junn et al., 2015), depend on such factors as the brain region involved (e.g., olfactory tracts, motor cortex, visual association areas, cerebellum) and can affect many organ systems. There are conditions that may be subjective symptoms attributable to TBI that are not listed in the facets on the DBQ, such as olfactory changes (Bratt et al., 2018) or postural instability or gait disturbance (Meadows and Williams, 2009); however, they are addressed in Section III of the DBQ and require additional questionnaires to be completed.

Neurobehavioral Effects

After TBI, individuals can have numerous difficulties in behavioral regulation, including impulsivity, poor initiation, disinhibition, anosognosia (impaired self-awareness), irritability, aggression, inappropriate sexual behavior, apathy, and difficulties with emotional control (Wood and Worthington, 2017; Wortzel and Arciniegas, 2014). Difficulties with behavioral and emotional regulation are often poorly understood by others, and there is a tendency to attribute the maladaptive behavior to the person or their "personality" rather than recognizing the brain injury as the source (or, at a minimum, as an exacerbating factor). The misattribution creates a barrier to the development of accommodations and strategies in the environment designed to maximize more adaptive behavior. Individuals who have difficulties with activation and initiation may be viewed as "lazy," while those who are disinhibited may be perceived as "rude" and "obnoxious." Unfortunately, employers and the general public are often not informed about TBI and its effects and are thus likely to react quickly to single significant incidents by terminating employment, avoiding future interactions, or barring the individual from public places.

The DBQ acknowledges that some deficits in neurobehavioral regulation can have a more serious impact than others. However, the rating of the severity of this effect focuses on the frequency in which the behavior interferes with work or social interactions. Given that a single occurrence of some behaviors (e.g., physical aggression, inappropriate touching) could lead to immediate termination, basing the ratings on frequency does not adequately capture the severity of the neurobehavioral deficits. The criteria could be improved by focusing directly on the extent of the behavior's impact on work or social interactions. For example: Is the individual able to self-monitor and apply compensatory strategies to avoid affecting interactions? Does the behavior disrupt an interaction to the extent that the interaction ceases whenever the behavior occurs? Does the behavior result in formal or informal sanctions or restrictions?

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Communication

Communication impairments after TBI may be secondary to aphasia (primary language impairment) or manifest themselves through an interaction with other cognitive impairments that decrease the effectiveness of communication such as an inability to attend to conversation or difficulty with appropriate social interactions associated with communication (Togher et al., 2014). The DBQ groups together comprehension and expression under the communication facet and categorizes levels of difficulty based on the communication of complex ideas and basic needs and the frequency with which the veteran experiences communication limitations. However, an inability to communicate, even when infrequent, implies a more severe disabling effect. Thus, the DBQ should take into account functional impact in addition to frequency.

Consciousness

The committee notes that this facet is a dichotomous yes/no indication of whether the veteran manifests impaired arousal. While it is appropriate that a vegetative state, a minimally responsive state, or coma are equated with total disability, there are manifestations of impaired arousal between "normal" and "persistent altered state of consciousness," and those disorders of consciousness should be rated.

Cumulative Effects

As previously described, the facets diagnosed by a VHA clinician or VBA clinician contractor on the DBQ are translated by a non-clinician to provide a disability percentage of 0, 10 percent, 40 percent, 70 percent, or 100 percent, and the facet with the highest level of impairment is translated into the final rating. The committee found this approach to be problematic as it does not allow for cumulative effects of multiple residuals. For example, eight facets rated as mild might carry more consequences than a single facet rated moderate.

Other Comments

The TBI DBQ has a section for additional residuals, other findings, diagnostic testing, functional impacts, and remarks from the clinician. It is not clear how information from that section would be incorporated into the rating decision.

Since the DBQ mirrors the VASRD, the same issues described for facets of TBI on the DBQ hold for the VASRD.

The committee recommends that the Department of Veterans Affairs convene experts from both the Veterans Health Administration and the Veterans Benefits Administration, including clinicians who diagnose and assess residuals of traumatic brain injury (TBI), to regularly update the Veterans Affairs Schedule for Rating Disabilities and the Disability Benefits Questionnaire for residuals of TBI to better reflect the current state of medical knowledge.

Additional Aspects of TBI Not Adequately Addressed in the DBQ

In the committee's review of the residuals of the TBI DBQ, the committee found additional important residuals that were not included. In particular, injuries to cervical muscles, ligaments, nerve roots, vertebrae, and intervertebral discs are common contributors to post-TBI headache as well as to vestibular dysfunction (Morin et al., 2016). Thus, the committee believes

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that the VA should add the residuals in the Neck (Cervical Spine) Conditions DBQ to the list of residuals attributable to TBI in Section III of the DBQ Initial Evaluation of Residuals of Traumatic Brain Injury (see Appendix D for TBI DBQ and Appendix M for Neck DBQ).

In addition, there are three important residuals of TBI that are not adequately covered by any of the existing DBQs: insomnia, vestibular dysfunction, and near vision dysfunction (near point accommodative and convergence insufficiency).

Insomnia

Isolated questions related to insomnia and sleep disruption can be found on four DBQs (mental disorders, chronic fatigue syndrome, PTSD, and sleep apnea), but no single DBQ combines them all in a way that captures the full extent of disability associated with post-TBI sleep disruption. Sleep disruption occurs commonly after TBI, contributing to fatigue, cognitive dysfunction, and disrupted mood (Viola-Saltzman and Watson, 2012).

Vestibular Dysfunction

Isolated questions and physical exam elements related to vestibular dysfunction can be found on two DBQs (cranial nerves diseases and ear conditions), but no single DBQ combines them in a way that captures the full extent of disability associated with post-TBI vestibular dysfunction. Such dysfunction is typically a mix of both peripheral (ear and vestibulocochlear nerves) and central (vestibulo-spinal and vestibulo-ocular) vestibular structure disruption. Vestibular dysfunction occurs commonly after TBI, producing symptoms related to (1) altered postural stability (imbalance and abnormal gait), (2) altered oculomotor function (reduced dynamic visual acuity, dizziness with head movement, dizziness with movement of objects in visual field), and (3) reduced concentration or "fogginess" when in motion (Akin et al., 2017). Vestibular dysfunction may also contribute to altered mood, particularly anxiety (Franke et al., 2012).

Near-Vision Dysfunction

Although the eye conditions DBQ provides questions related to diplopia, no existing DBQ provides questions or physical exam elements intended to capture the full extent of disability associated with near-point accommodative and convergence insufficiency. These near-vision problems occur commonly after TBI and can result in not only diplopia but also blurred vision, headache, nausea, and an inability to maintain focus while reading and doing other close-range visual activities (Brahm et al., 2009; Thiagarajan et al., 2011).

The committee recommends that the Department of Veterans Affairs add insomnia, vestibular dysfunction, and near-vision dysfunction to the Disability Benefits Questionnaire for residuals of traumatic brain injury.

CREDENTIALS AND TRAINING REQUIRED IN EVALUATING RESIDUALS OF TBI FOR VA DISABILITY COMPENSATION

Examinations of disabling conditions of TBI, also referred to by the VA as residuals of TBI, may be completed by generalists or by specialists appropriate to the residual being examined—for example, by a psychiatrist or psychologist for mental illness or by an

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ophthalmologist for visual disorder—who have completed the Disability Examination Management Office (DEMO) TBI training module in the Talent Management System (VA, 2016a).

Training Required for Providers Diagnosing TBI

In addition to the requirement that a provider diagnosing TBI be board certified in one of four specialties noted above, providers must complete Web-based training through the VA's Talent Management System (VA, 2016b). The training includes the following modules (correspondence with VHA Office of Disability and Medical Assessment [DMA], April 30, 2018):

- **VHI Veterans Health Initiative Traumatic Brain Injury Independent Study (VA 8339)** This is a one-time mandatory training for all clinical providers treating TBI patients and highly encouraged for all VHA providers. The independent study presents an overview of TBI issues that primary care practitioners might encounter when providing care to veterans and active-duty personnel. It provides a review of the diagnostic criteria for TBI and of management principles.
- **Traumatic Brain Injury Module 1: Diagnosing Combat-Related Concussion (VA 27851)** This is the first module of a three-part video series on traumatic brain injury. The module is focused on diagnosing combat-related concussion. A pre- and post-test are provided to document knowledge transfer. The VA's stated purpose for this module is to provide education in the foundations of TBI and in the nuances of diagnosing combat-related TBI.
- **Traumatic Brain Injury Module 2: Expected Outcomes from Combat-Related Concussion (VA 27852)** The second module of a three-part video series on TBI is concentrated on expected outcomes from combat-related concussion. A pre- and post-test are provided to document knowledge transfer. The VA's stated purpose for the module is to provide education on the outcomes of combat-related TBI.
- **Traumatic Brain Injury Module 3: Treatment of Combat-Related Concussion (VA 27853)** The third module of the three-part series focuses on the treatment of combat-related concussions. A pre- and post-test are provided to document knowledge transfer. The VA's stated purpose for this module is to provide education on treatment recommendations for combat-related TBI.
- **VA/DoD CPG Management of Concussion–Mild Traumatic Brain Injury—Summary Guide (VA 5440)** This publication contains a summary of the Clinical Practice Guideline (CPG) for Management of Concussion/Mild Traumatic Brain Injury. The guideline was developed by a group of expert VA and Department of Defense (DoD) clinicians under the auspices of the VA/DoD Evidence-Based Clinical Practice Work Group.

Those training modules for C&P examiners are provided by VHA's Office of Disability and Medical Assessment (DMA). The committee is not aware of a schedule to review or update the DMA training. Updates are based on regulatory changes to the TBI exam or the C&P process. On average, the courses are updated every 5 years, but if there are significant changes that affect the examination process, updates may be undertaken sooner. Generally, VHA C&P

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disability examination courses are overview courses that assist clinicians with a basic understanding of how to conduct specific examinations based on the legal and administrative requirements for conducting the examination (correspondence with VHA DMA, April 30, 2018).

Thus, the VA provides additional, required training to the physicians who are currently allowed to diagnose TBI. And, as noted in Chapter 2, the committee recommends that the VA allow other health care professionals with TBI training and experience to make TBI diagnoses. The committee believes that it is the training and experience in diagnosing and treating TBI over time, not necessarily the medical specialty, that render a health care specialist capable of an accurate TBI diagnosis.

Training Required for Providers Assessing Residuals of TBI

The assessments for the residuals of the TBI (using the TBI DBQ) may be completed by a generalist clinician (e.g., a physician, physician assistant or nurse practitioner, psychologist) or a specialist appropriate to the residual being examined (e.g., a psychiatrist or psychologist for mental illness or an ophthalmologist for vision disorders) who has completed the DEMO TBI training module. The DEMO training module takes approximately 1 hour to complete (VA, 2016c). At the completion of the course, the clinician takes a 21 multiple-choice question examination.

The objectives of the DEMO course are to:

- Define the criteria to diagnose TBI;
- Describe best practices for activities performed prior to conducting a C&P TBI examination;
- Apply best practices for opening, conducting, and closing a C&P TBI examination, as well as for guiding the veteran through the interview and examination process;
- Identify signs and symptoms of TBI sequelae;
- Explain when additional testing is indicated;
- Incorporate the interpretation of diagnostic tests into the C&P report;
- Apply best practices for using the DBQ or other documentation protocol to document a C&P TBI examination; and
- Learn through case studies.

The DEMO module defines TBI as any of the following occurring after a traumatic event:

- Memory loss for events immediately before or after injury (posttraumatic amnesia)
- Altered mental state at the time of injury, such as confusion, disorientation, slow thinking
- Neurologic deficits, such as weakness, balance disturbance, praxis, paresis/plegia, change in vision, other sensory alterations, and aphasia
- Intracranial lesion

The committee found the information provided in the training materials for those who diagnose TBI and those who assess residuals of TBI to be outdated and inaccurate, given the current knowledge about TBI and its sequelae at all levels of severity. In addition to the previously raised concerns related to the facets in the DBQ, there was particular concern on the

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committee about the repeated assertion in the training materials that only symptoms that emerge soon after the injury can be confidently attributed to the TBI. The committee notes that TBI, including mild TBI, can be associated with later health consequences (see Chapter 2 and, for example, Aldag et al., 2017; Barnes et al., 2018; Corrigan and Hammond, 2013; Crane et al., 2016; Dams-O'Connor et al., 2013; Fann et al., 2018; Gardner et al., 2017, 2018; IOM, 2009; Masel and DeWitt, 2010; McKee et al., 2009). As described in Chapter 2, there are multiple reasons why the sequelae of TBI can manifest at any time following the injury. Thus, the VA should be aware that training materials should be updated frequently to reflect the current state of the science.

Exams Provided by VHA Clinicians Compared to Those Provided by VBA Contractors

One theme that recurred throughout the committee's deliberations about the adjudication process was the differences between C&P exams performed by VHA clinicians and those performed by VBA contractors.

In recent years there has been a substantial increase in the percentage of exams ordered for contractors. Table 3-2 shows a breakdown of C&P exams ordered for claims that included a diagnosis of TBI by VHA clinicians versus VBA contractors from 2016 through 2018. The percentage of exams performed by contractors for claims that include a diagnosis of TBI has increased from 26 percent in 2016 to 58 percent in 2017 to 71 percent to date in 2018, including claims that ordered both VHA- and VBA-contract exams.

TABLE 3-2 VHA- and VBA-Contract Exams Ordered for Claims That Included a Diagnosis of TBI

Fiscal Year	Number of Exams Ordered	VBA-Contract Exams Ordered	VHA Exams Ordered	Both*
2016	39,524	7,100 (18%)	29,340 (74%)	3,084 (8%)
2017	42,765	15,574 (36%)	17,855 (42%)	9,336 (22%)
2018 (through July 2018)	28,199	12,777 (45%)	7,999 (29%)	7,423 (26%)

NOTE: The number of exams ordered includes both those for service connection and those for increased benefits.
*Both VHA- and VBA-contract examinations were ordered for a single veteran during the pendency of a claim that included TBI. However, the examinations may or may not have been for the claimed condition of TBI.
SOURCE: Communication with VBA, July 2018.

The increase in the percentage of exams performed by contractors is notable because there are several differences in how VHA clinicians and VBA contractors conduct C&P exams. First, VBA contractors often do not have the same access to VHA medical records that VHA clinicians do. VHA clinicians have access to a veteran's full medical record, but contractors only have access to the information that VBA (or VHA) provides to them. If a veteran is receiving care at the VA, his or her thorough TBI assessment will be part of the medical record, and access to that information for the purposes of completing the DBQ might favor the veteran. A contractor would have access to the TBI assessment only if VHA/VBA supplies it (personal communication with VBA, June 18, 2018).

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Furthermore, the committee learned through its conversations with VBA that VHA clinicians and VBA contractors do not receive the same training. Hiring standards are different for VHA clinicians and VBA contractors. Contractors might not have the military cultural competence that VHA clinicians do. In addition, contractors might be more isolated geographically from VA medical centers, and might not have access to other examiners if questions arise regarding their ability to assess residuals (personal communication with VBA, June 18, 2018).

Another potential difference between VHA clinicians and VBA-contracted clinicians is that VHA clinicians typically work with a team of individuals with specific training related to the components included within the DBQ, while it is not clear if contracting clinicians have the same additional expertise available to them. That could be a problem for sections on the DBQ that might require a referral to a clinician with different expertise from the examining physician (personal communication with VBA, June 18, 2018). In cases where contracting clinicians in geographically isolated areas do not have access to additional expertise needed to complete a DBQ, it might be appropriate to consider telehealth as an alternative to an in-person examination. The VA provides standards for telehealth examinations in its M21 manual. Specifically, the examiner must be able to "see clearly, and fully appreciate all non-verbal cues, mannerisms, and manifestations displayed by the Veteran in a manner on par with an in-person examination" (VA, 2018b).

Finally, the committee learned from VBA that there might be a disparity between VHA clinicians and VBA contractors in the amount of time spent with veterans. Contractors are typically paid according to the number of exams completed. Thus, there might be an incentive to minimize the time spent with each patient and complete more exams. Additionally, the average VHA C&P provider is fully trained in 6–8 months and his or her work is reviewed by senior providers. Contractors generally do not spend as much time on training and oversight, which might lead to differing examination results (personal communication with VBA, June 18, 2018).

It is important to note that while differences exist in the way that VHA clinicians and VBA contractors perform C&P exams, the committee could find no evidence regarding whether there are differences in outcome between the two groups. VBA does not collect data relevant to that issue from its contractors. Nonetheless, given that differences exist, the committee provides a recommendation regarding the use of contractors to perform C&P exams.

The committee recommends that the Department of Veterans Affairs provide the Veterans Benefits Administration contractors with the same training and access to medical records as Veterans Health Administration clinicians to ensure equitable disability determinations for all veterans.

QUALITY ASSURANCE IN THE ADJUDICATION OF DISABILITY COMPENSATION CLAIMS FOR RESIDUALS OF TBI

Given its broader task of providing recommendations for legislative or administrative action for improving the adjudication of veterans' claims for impairments arising from TBI, the committee reviewed the protocols the VA has in place for assuring quality of its processes.

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The VA's Efforts to Ensure Consistency

The committee sent the VA questions about how the department ensures consistency in translating information from the DBQ into a disability percentage. The VA sent written responses to the committee's questions and answered that it promotes consistency through automating decision-making processes, by providing training and oversight of its raters, and conducting national reviews of rater compliance with the department's procedures (personal communication with VBA, July 6, 2018).

The VA explained that consistency in decision making is promoted by automating some of the decisions that would otherwise be left to the discretion of raters, using decision assistance tools, such as the evaluation builder within VBA's electronic claims processing system (i.e., the Veterans Benefits Management System). Using the evaluation builder, the rater inputs information from all DBQs related to the claim, and the evaluation builder translates the rater's selections into a disability evaluation percentage by applying the disability evaluation criteria from the VASRD. According to the VA, that automation allows for greater consistency between ratings.

The VA believes that the training and oversight of decision makers also promote consistency in the ratings process (personal communication with VBA, July 6, 2018). VBA's Adjudication Procedures Manual, M-21, requires that TBI raters complete training, which will be described in the next section.

Finally, the VA explained that it promotes consistency through national quality reviews and that these reviews are "designed to gauge the quality of the claims process to maintain and improve the consistency and compliance of all claims based on current policy and procedures" (personal communication with VBA, July 6, 2018).

The VA's training and oversight for raters and its quality reviews are described in detail in the following sections.

Training Required for Veterans Service Representatives

As described previously, RVSRs are the personnel within VBA who determine if a veteran's condition is service-connected and, if so, provide the veteran with a disability rating percentage using criteria in the VASRD. The committee spoke with a former RVSR to understand the training and oversight that the VA requires of RVSRs (personal communication with VBA, August 6, 2018).

RVSRs receive 3 months of training, including 1 at a regional office and 2 at a national location. During the first month of training at a regional office, new RVSRs are taught by a DRO various processes, rules, and regulations related to providing ratings. They are also taught how to use VBA rating tools and how to navigate the VA information technology (IT) system, and they are given an overview of diseases by body system. After this month of training, RVSRs attend challenge training at a national location, where they are divided into classrooms of 20 students with whom they spend the 2 months of training. Each group is provided with an initial set of three instructors from various regional offices across the nation for the first month of challenge training. Instructors are seasoned ratings specialists, including DROs.

RVSRs are taught the curriculum provided from the training department, including some of the same material provided in the regional training—IT systems, diseases by body systems, and protocols. For the second month of challenge training, the instructors are replaced by three different instructors who teach the same material. Thus, new RVSRs repeat the same lessons

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with different teachers who might have different teaching styles and perspectives. During challenge training, new RVSRs rate practice cases that are graded against a gold standard.

When the training is completed, the new RVSRs return to their regional offices, where they are assigned teams and official mentors, who are DROs or seasoned raters. Every case reviewed by a new RVSR goes to the DRO for review and then to quality review (QR) for more review. RVSRs can specialize in certain areas that require additional training, such as TBI, sexual trauma, cases with VA employees, or cases with veterans represented by an attorney.

When assigned specialty cases, such as TBI, the new RVSR must have 100 percent of their cases reviewed by a mentor until they "correctly" (as determined by the mentor) rate 10 consecutive cases. Then, they are released to "single signature" status, meaning they can determine a rating without mentor review (personal communication with VBA, August 6, 2018).

Quality Review in the VA

According to the VA's Adjudication Procedures Manual, M-21-4 (VA, 2018b), VBA assesses the quality of its rating process using two systems: a compensation service quality review team (QRT), which operates at each facility where claims are processed for disability, and the national level Systematic Technical Accuracy Review (STAR).

Compensation Service Quality Review Teams

The compensation service QRT places quality review specialists at each VBA facility that processes claims to assess the performance of individual raters' work. The QRT routinely reviews claims before a final determination is made in an effort to identify and avoid common errors (GAO, 2014; VA, 2018b). According to the VA, the QRT's purpose is to improve the quality and timeliness of claims processing and to decrease the amount of work performed on individual cases. The focus is on evaluating the quality of each facility that processes claims, identifying error trends (i.e., where a decision rises to the level of a clear and unmistakable error or a clear violation of current regulations or directives), and ensuring that employee reviews are performed monthly. The QRT's primary work is to provide feedback and training on error trends identified via individual quality reviews and in-process reviews.

Individual Quality Reviews

Individual quality reviews are randomly selected from the previous month based on national performance standards. Five randomly selected *completed* cases are reviewed per month per rater (RVSR, VSR, or DRO). The goal is to perform 60 individual quality reviews every fiscal year per rater in order to assess quality (VA, 2018b).

In-Process Review

Another process called in-process review (IPR) occurs *prior to finalization* of the rating in an effort to identify errors. Cases are again randomly reviewed. According to the VA, the focus of IPR is on identifying errors early in the claims process, identifying training opportunities, and improving employees' understanding of why errors occurred and how to prevent them in the future. Errors that are detected are provided to employees immediately so that prompt corrective action can be taken. These are non-punitive and not used for individual performance management purposes. The IPR process does not occur regularly (VA, 2018b).

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Systematic Technical Accuracy Review (STAR)

Quality review also occurs at the national level through VBA's national quality assurance program, using the STAR process. VBA began employing STAR in 2012 to measure the accuracy of decisions on individual medical conditions within each claim (GAO, 2014). STAR staff members randomly select completed claims and review them against specific aspects of the claim in the STAR checklist. These include the following critical items: (1) benefit entitlement (address all issues, proper development, grant or deny, and award actions); (2) decision documentation and notification; and (3) administrative (appropriate signatures, examination and medical opinion requests, and expedited favorable decision). The review focuses on the outcome of the claim, not the process by which the decision was reached. The stated purpose of the reviews is to gauge the quality of the claims process in order to maintain and improve the consistency and compliance of all claims based on current policy and procedures (VA, 2018b).

The STAR review has two main components, as noted in a 2014 Government Accountability Office (GAO) report:

- Benefit entitlement review: assesses whether the correct steps were followed in addressing all issues in the claim, collecting appropriate evidence, and whether the resulting decision was correct, including effective dates and payment rates.
- Accuracy performance measures: calculated based on the results of the benefit entitlement review.

The STAR system also assesses whether claims processors appropriately documented the decision and notified claimants. Data are produced on a monthly basis by each regional office. In 2018, claims-based and issue-level accuracy were reported for 3-month and 12-month periods. The claims-based accuracy rate is determined by dividing the total number of error-free cases by the total number of cases reviewed. Issue-level accuracy is a measure of individual medical issues contained within a compensation claim. For the 12-month period preceding September 15, 2018, the national claim-based accuracy ranged from 85 to 91 percent and the issue-based accuracy from 94 to 96.5 percent (VA, 2018d).

Progress on Institute of Medicine 2007 Recommendations for Improving the Disability Adjudication Process

In 2007 the Institute of Medicine (IOM), in a report titled *A 21st Century System for Evaluating Veterans for Disability Benefits*, offered a number of recommendations to the VA on updating the disability evaluation process. Two of the recommendations bear on the question of assuring and improving the quality of the system, and the current committee asked the VA to comment on progress related to these recommendations.

Recommendation 5-3 was:

> VA should establish a recurring assessment of the substantive quality and consistency, or inter-rater reliability, of examinations performed with the templates, and if the assessment finds problems, take steps to improved quality and consistency, for example, by revising the templates, changing the training, or adjusting the performance standards for examiners.

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In its written response, VHA replied that the VA Office of Disability and Medical Assessment conducts "focused ratability reviews of disability evaluation requests and reports" using an audit tool (communication with VHA, May 7, 2018). This process is designed for clinical evaluation. VHA reports that it draws a randomized stratified sample of Veterans Integrated Services Network disability evaluations, which are added to the VA Corporate Data Warehouse each month (although it is not clear who does the auditing). The results are shared with the facilities and might trigger additional training or suggestions for improvement to the DBQ.

Recommendation 5-4 was: "The rating process should have built-in checks or periodic evaluations to ensure inter-rater reliability as well as the accuracy and validity of rating across impairment categories, ratings, and regions." In its written response, VBA stated that it conducts quality reviews at both the local and national level to assess the accuracy of claims processing (personal communication with VBA, May 2018). As described earlier in this chapter, the reviews are conducted by QRTs at each of the VA's 57 regional offices and can result in individual employee feedback and training. At the national level, this process is conducted by the STAR staff. VBA also examines consistency and variance across certain disability categories and decision types. In 2017, VBA initiated a quality management system, which is a database that contains all the quality measurement processes in a single system.

The committee notes that VHA and VBA's responses did not address measures of inter-rater reliability, as recommended by the 2007 IOM report.

Inter-Rater Reliability

The committee asked the VA if it was aware of any studies that examine inter-rater reliability or the degree of agreement among independent raters. VBA responded by describing its consistency study program. VBA developed its consistency study program to assess nationwide consistency among raters and to identify regional offices that require further training. In this training exercise, raters from all regional offices are provided the same body of evidence. Working independently, raters must make disability determinations of granting versus denying, assigning percentages, and assigning effective dates (personal communication with VBA, July 6, 2018).

According to a 2014 GAO report, VBA relied on inter-rater reliability studies to assess consistency, but the studies were time-consuming and resource-intensive, so VBA limited the scope of the studies to about 25–30 percent of its raters. However, since 2009, VBA has expanded its consistency program to include questionnaires, which are less resource-intensive, resulting in the VA's ability to administer the questionnaire to all raters, and more frequently—about 3 to 24 questionnaires per year (GAO, 2014). GAO reported that VBA stopped conducting consistency studies in favor of the more efficient questionnaires for assessing decision-making consistency. GAO reports that VBA did not pretest the consistency questionnaires to ensure the clarity of the questions or the validity of the expected results. (Appendix N includes a summary table of GAO reports on improving the VA disability compensation process.)

Chapter 4 will expand on this issue and others related to the quality of the adjudication process and will discuss the characteristics of a high-quality process for determining disability resulting from TBI.

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SUMMARY AND RECOMMENDATIONS

The VA requested that the committee review the adjudication process by which the impairments that result from TBI are assessed for awarding disability compensation. The committee was asked in particular to assess the adequacy of the tools and protocols used by the VA to provide examinations and to review the credentials and training of the providers who perform examinations.

The adjudication process for VA disability compensation involves several stakeholders, including the veteran, VBA, VHA, and staff offices that work with veterans on appeals. First, the veteran—or a VSO acting as the veteran's proxy—submits a claim to VBA. If all necessary information is provided, VBA will process the claim. Once a service-connected TBI diagnosis has been established, the residuals of TBI must be assessed to assist VBA with determining the disability rating. VBA sometimes accepts a medical report from a private physician if the agency determines it is "adequate for rating purposes." In most cases, medical information submitted is not "adequate for rating purposes," and VBA orders a C&P exam. A VHA physician or VBA clinician contractor evaluates the degree of impairment, functional limitation, and disability of the resulting TBI residuals. The C&P examiner records information using the DBQ for residuals of TBI, which is then submitted to VBA. If there is enough evidence, an RVSR makes a percentage disability rating decision by comparing DBQ results and other evidence to criteria in the VASRD and assigns an effective date. The veteran begins receiving disability benefits and may appeal to have his case reviewed if he or she does not agree with the rating decision. The appeals process re-reviews the case.

The DBQ guides the documentation of C&P exams by providing a structure for the standardized reporting of results. The VA developed the DBQs to mirror the VASRD in order to simplify decision making for raters in determining a disability rating. Although the DBQ is completed by a clinician, the disability rating is made by a non-clinician VBA rater, who applies medical information from the DBQ and other information from the veteran's records, if available, to the criteria in the VASRD. The clinician essentially plays no role in applying the diagnosis and medical information to the VASRD.

The DBQ and the VASRD provide a list of common sequelae[9] of TBI that are used to rate the level of disability associated with TBI. For the most part, the identified residuals accurately reflect the problems that are most likely to disrupt quality of life following TBI. However, some of the characteristics of the sequelae used to rate the severity of the disability (e.g., the frequency at which the problem is observed) do not fully capture the sequela's potential impact. Furthermore, they fail to take into account some basic medical knowledge concerning how residuals of TBI might manifest and affect disability.

The committee recommends that the Department of Veterans Affairs convene experts from both Veterans Health Administration and Veterans Benefits Administration, including clinicians who diagnose and assess residuals of traumatic brain injury (TBI), to regularly update the Veterans Affairs Schedule for Rating Disabilities and Disability Benefits Questionnaire for residuals of TBI to better reflect the current state of medical knowledge.

[9] Referred to by the VA as residuals.

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In the committee's review of the residuals of TBI DBQ, it found that there are important residuals that were not included. In particular, three important residuals of TBI are not adequately covered by any of the existing DBQs: insomnia, vestibular dysfunction, and near-vision dysfunction (near-point accommodative and convergence insufficiency).

Isolated questions related to insomnia and sleep disruption can be found on four DBQs (mental disorders, chronic fatigue syndrome, PTSD, and sleep apnea), but no single DBQ combines them all in a way that captures the full extent of disability associated with post-TBI sleep disruption. Sleep disruption occurs commonly after TBI, contributing to fatigue, cognitive dysfunction, and disrupted mood.

Isolated questions and physical exam elements related to vestibular dysfunction can be found on two DBQs (cranial nerves diseases and ear conditions), but no single DBQ combines them in a way that captures the full extent of disability associated with post-TBI vestibular dysfunction. This dysfunction is typically a mix of both peripheral (ear and vestibulocochlear nerves) and central (vestibulo-spinal and vestibulo-ocular) vestibular structure disruption. Vestibular dysfunction occurs commonly after TBI, producing symptoms related to (1) altered postural stability (imbalance and abnormal gait); (2) altered oculomotor function (reduced dynamic visual acuity, dizziness with head movement, dizziness with movement of objects in visual field); and (3) reduced concentration or "fogginess" when in motion. Vestibular dysfunction may also contribute to altered mood, particularly anxiety.

Although the eye conditions DBQ includes questions related to diplopia, no existing DBQ includes questions or physical exam elements intended to capture the full extent of disability associated with near-point accommodative and convergence insufficiency. These near-vision problems occur commonly after TBI and can result in not only diplopia but also blurred vision, headache, nausea, and an inability to maintain focus while reading and doing other close-range visual activities.

The committee recommends that the Department of Veterans Affairs add insomnia, vestibular dysfunction, and near-vision dysfunction to the Disability Benefits Questionnaire for residuals of traumatic brain injury.

Additionally, through conversations with the VA, the committee learned that there are differences in training and access to medical records between VHA clinicians and VBA-contracting clinicians who conduct C&P evaluations. This is notable, given the recent increase in the percentage of C&P evaluations performed by contractors for TBI claims (from 26 percent in 2016 to 58 percent in 2017 and 71 percent to date in 2018).

The committee recommends that the Department of Veterans Affairs provide the Veterans Benefits Administration contractors with the same training and access to medical records as Veterans Health Administration clinicians to ensure equitable disability determinations for all veterans.

Finally, the committee was tasked with making recommendations for improving the overall adjudication process for disability claims for residuals of TBI. The committee examined the structures the VA has in place for assuring the quality of its adjudication process. Although VBA has systems in place to review the consistency of the rating process, the VA does not measure reliability or validity. Chapter 4 will expand on this issue and discuss characteristics of a high-quality process for determining disability resulting from TBI.

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REFERENCES

Agoston, D. V., and A. Kamnaksh. 2015. Modeling the neurobehavioral consequences of blast-induced traumatic brain injury spectrum disorder and identifying related biomarkers. In F. H. Kobeissy (ed.), *Brain neurotrauma: Molecular, neuropsychological, and rehabilitation aspects*. Boca Raton, FL: CRC Press. Pp. 309–328.

Akin, F. W., O. D. Murnane, C. D. Hall, and K. M. Riska. 2017. Vestibular consequences of mild traumatic brain injury and blast exposure: A review. *Brain Injury* 31(9):1188–1194.

Aldag, M., R. C. Armstrong, F. Bandak, P. S. F. Bellgowan, T. Bentley, S. Biggerstaff, K. Caravelli, J. Cmarik, A. Crowder, T. J. DeGraba, T. A. Dittmer, R. G. Ellenbogen, C. Greene, R. K. Gupta, R. Hicks, S. Hoffman, R. C. Latta, M. J. Leggieri, D. Marion, R. Mazzoli, M. McCrea, J. O'Donnell, M. Packer, J. B. Petro, T. E. Rasmussen, W. Sammons-Jackson, R. Shoge, V. Tepe, L. A. Tremaine, and J. Zheng. 2017. The biological basis of chronic traumatic encephalopathy following blast injury: A literature review. *Journal of Neurotrauma* 34(S1):S26–S43.

Angeleri, R., F. M. Bosco, M. Zettin, K. Sacco, L. Colle, and B. G. Bara. 2008. Communicative impairment in traumatic brain injury: A complete pragmatic assessment. *Brain and Language* 107(3):229–245.

Barnes, D. E., A. L. Byers, R. C. Gardner, K. H. Seal, W. J. Boscardin, and K. Yaffe. 2018. Association of mild traumatic brain injury with and without loss of consciousness with dementia in U.S. military veterans. *JAMA Neurology* 75(9):1055–1061.

Bornhofen, C., and S. McDonald. 2008. Emotion perception deficits following traumatic brain injury: A review of the evidence and rationale for intervention. *Journal of the International Neuropsychological Society* 14(4):511–525.

Brahm, K. D., H. M. Wilgenburg, J. Kirby, S. Ingalla, C. Y. Chang, and G. L. Goodrich. 2009. Visual impairment and dysfunction in combat-injured service members with traumatic brain injury. *Optometry and Vision Science* 86(7):817–825.

Bratt, M., T. Skandsen, T. Hummel, K. G. Moen, A. Vik, S. Nordgard, and A. S. Helvik. 2018. Frequency and prognostic factors of olfactory dysfunction after traumatic brain injury. *Brain Injury* 32(8):1021–1027.

BVA (Board of Veterans' Appeals). 2016. *Life cycle of a VA appeal*. https://www.bva.va.gov/docs/Life-Cycle-of-a-VA-Appeal-FY2016.pdf (accessed November 21, 2018).

BVA. 2017. *Department of Veterans Affairs Board of Veterans' Appeals—Annual report, fiscal year (FY) 2017.* https://www.bva.va.gov/docs/Chairmans_Annual_Rpts/BVA2017AR.pdf (accessed September 28, 2018).

Catena, R. D., P. Van Donkelaar, C. I. Halterman, and L. S. Chou. 2009. Spatial orientation of attention and obstacle avoidance following concussion. *Experimental Brain Research* 194(1):67–77.

Corrigan, J. D., and F. M. Hammond. 2013. Traumatic brain injury as a chronic health condition. *Archives of Physical Medicine and Rehabilitation* 94(6):1199–1201.

Crane, P. K., L. E. Gibbons, K. Dams-O'Connor, E. Trittschuh, J. B. Leverenz, C. Dirk Keene, J. Sonnen, T. J. Montine, D. A. Bennett, S. Leurgans, J. A. Schneider, and E. B. Larson. 2016. Association of traumatic brain injury with late-life neurodegenerative conditions and neuropathologic findings. *JAMA Neurology* 73(9):1062–1069.

Dams-O'Connor, K., L. E. Gibbons, J. D. Bowen, S. M. McCurry, E. B. Larson, and P. K. Crane. 2013. Risk for late-life re-injury, dementia and death among individuals with traumatic brain injury: A population-based study. *Journal of Neurology, Neurosurgery, and Psychiatry* 84(2):177–182.

Fann, J. R., A. R. Ribe, H. S. Pedersen, M. Fenger-Grøn, J. Christensen, M. E. Benros, and M. Vestergaard. 2018. Long-term risk of dementia among people with traumatic brain injury in Denmark: A population-based observational cohort study. *The Lancet Psychiatry* 5(5):424–431.

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Franke, L. M., W. C. Walker, D. X. Cifu, A. L. Ochs, and H. L. Lew. 2012. Sensorintegrative dysfunction underlying vestibular disorders after traumatic brain injury: A review. *Journal of Rehabilitation Research and Development* 49(7):985–994.

GAO (Government Accountability Office). 2014. *Improvements could further enhance quality assurance efforts*. https://www.gao.gov/assets/670/667027.pdf (accessed May 18, 2018).

Gardner, R. C., C. B. Peltz, K. Kenney, K. E. Covinsky, R. Diaz-Arrastia, and K. Yaffe. 2017. Remote traumatic brain injury is associated with motor dysfunction in older military veterans. *Journals of Gerontology, Series A: Biological Sciences and Medical Sciences* 72(9):1233–1238.

Gardner, R. C., A. L. Byers, D. E. Barnes, Y. Li, J. Boscardin, and K. Yaffe. 2018. Mild TBI and risk of Parkinson disease: A Chronic Effects of Neurotrauma Consortium study. *Neurology* 90(20):e1771–e1779.

Health.mil. 2018. *Medical evaluation board*. http://www.health.mil/Military-Health-Topics/Conditions-and-Treatments/Physical-Disability/Disability-Evaluation/Medical-Evaluation (accessed November 20, 2018).

IOM (Institute of Medicine). 2007. *A 21st century system for evaluating veterans for disability benefits.* Washington, DC: The National Academies Press.

IOM. 2009. *Gulf War and health: Volume 7: Long-term consequences of traumatic brain injury*. Washington, DC: The National Academies Press.

Junn, C., K. R. Bell, C. Shenouda, and J. M. Hoffman. 2015. Symptoms of concussion and comorbid disorders. *Current Pain and Headache Reports* 19(9):46.

Kearns, W. D., J. L. Fozard, L. Schonfeld, S. Scott, and K. Marshall. 2015. Elevated movement path tortuosity in voluntary outdoor ambulation in community-dwelling veterans with a history of traumatic brain injury. *Journal of Head Trauma Rehabilitation* 30(1):E8–E14.

Masel, B. E., and D. S. DeWitt. 2010. Traumatic brain injury: A disease process, not an event. *Journal of Neurotrauma* 27(8):1529–1540.

McKee, A. C., R. C. Cantu, C. J. Nowinski, E. T. Hedley-Whyte, B. E. Gavett, A. E. Budson, V. E. Santini, H. S. Lee, C. A. Kubilus, and R. A. Stern. 2009. Chronic traumatic encephalopathy in athletes: Progressive tauopathy after repetitive head injury. *Journal of Neuropathology and Experimental Neurology* 68(7):709–735.

McKinlay, W., and A. Watkins. 1999. Cognitive and behavioral effects of brain injury. In M. Rosenthal, E. R. Griffith, J. S. Kreutzer, and B. Pentland (eds.), *Rehabilitation of the adult and child with traumatic brain injury*, 3rd ed. Philadelphia, PA: Davis Company. Pp. 74–86.

McKinnon, A., R. Meiser-Stedman, P. Watson, C. Dixon, N. Kassam-Adams, A. Ehlers, F. Winston, P. Smith, W. Yule, and T. Dalgleish. 2016. The latent structure of acute stress disorder symptoms in trauma-exposed children and adolescents. *Journal of Child Psychology and Psychiatry and Allied Disciplines* 57(11):1308–1316.

Meadows, L., and J. Williams. 2009. An understanding of functional movement as a basis for clinical reasoning. In S. Raine, L. Meadows, and M. Lynch-Ellerington (eds.), *Bobath concept: Theory and clinical practice in neurological rehabilitation*. New York: Wiley. Pp. 23–42.

Morin, M., P. Langevin, and P. Fait. 2016. Cervical spine involvement in mild traumatic brain injury: A review. *Journal of Sports Medicine* 2016:1590161.

Neumann, D., B. Zupan, J. F. Malec, and F. Hammond. 2014. Relationships between alexithymia, affect recognition, and empathy after traumatic brain injury. *Journal of Head Trauma Rehabilitation* 29(1):E18–E27.

Prigatano, G. P. 2009. Anosognosia: Clinical and ethical considerations. *Current Opinion in Neurology* 22(6):606–611.

Rosenthal, M., J. S. Kreutzer, E. R. Griffith, and B. Pentland. 1999. *Rehabilitation of the adult and child with traumatic brain injury*. Philadelphia, PA: Davis Company.

Rowley, D. A., M. Rogish, T. Alexander, and K. J. Riggs. 2017. Cognitive correlates of pragmatic language comprehension in adult traumatic brain injury: A systematic review and meta-analyses. *Brain Injury* 31(12):1564–1574.

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Sherer, M., P. Bergloff, E. Levin, W. M. High Jr, K. E. Oden, and T. G. Nick. 1998. Impaired awareness and employment outcome after traumatic brain injury. *Journal of Head Trauma Rehabilitation* 13(5):52–61.

SSA (Social Security Administration). 2017. *Substantial gainful activity*. https://www.ssa.gov/oact/cola/sga.html (accessed May 27, 2018).

Thiagarajan, P., K. J. Ciuffreda, and D. P. Ludlam. 2011. Vergence dysfunction in mild traumatic brain injury (mTBI): A review. *Ophthalmic and Physiological Optics* 31(5):456–468.

Togher, L., C. Wiseman-Hakes, J. Douglas, M. Stergiou-Kita, J. Ponsford, R. Teasell, M. Bayley, and L. S. Turkstra. 2014. INCOG recommendations for management of cognition following traumatic brain injury, part IV: Cognitive communication. *Journal of Head Trauma Rehabilitation* 29(4):353–368.

VA (Department of Veterans Affairs). 2015a. *Chapter 2: Service-connected disabilities*. https://www.va.gov/opa/publications/benefits_book/benefits_chap02.asp (accessed May 11, 2018).

VA. 2015b. *Information and instructions for completing notice of disagreement (NOD)*. https://www.vba.va.gov/pubs/forms/VBA-21-0958-ARE.pdf (accessed August 24, 2018).

VA. 2016a. *VHA directive 1184: Screening and evaluation of traumatic brain injury*. https://www.va.gov/vhapublications/ViewPublication.asp?pub_ID=5376 (accessed May 11, 2018).

VA. 2016b. *VHA directive 1603: Training and certification of clinicians performing VA disability examinations*. https://www.va.gov/vhapublications/ViewPublication.asp?pub_ID=3295 (accessed May 11, 2018).

VA. 2016c. *DEMO traumatic brain injury examination course*. Department of Veterans Affairs. http://www.vesservices.com/VESWP/wp-content/uploads/2016/01/DEMO_TBI-course_0116.pdf (accessed May 11, 2018).

VA. 2018a. *Compensation*. https://www.benefits.va.gov/compensation (accessed August 24, 2018).

VA. 2018b. *M21-1 adjudication procedures manual*. Department of Veterans Affairs. https://www.knowva.ebenefits.va.gov/system/templates/selfservice/va_ssnew/help/customer/locale/en-US/portal/554400000001018/topic/554400000004049/M21-1-Adjudication-Procedures-Manual (accessed May 11, 2018).

VA. 2018c. *The VA claims process after you file your claim.* https://www.va.gov/disability/after-you-file-claim (accessed January 9, 2019).

VA. 2018d. *Veterans Benefits Administration reports: Detailed claims data*. https://www.benefits.va.gov/reports/detailed_claims_data.asp (accessed May 18, 2018).

VA Law (Veterans Law Group). 2018. *Frequently asked questions*. https://www.veteranslaw.com/faq (accessed August 28, 2018).

Veterans Aid Benefit. 2018. *VA 2018 compensation, SMC, and DIC rates*. https://www.benefits.va.gov/COMPENSATION/resources_comp01.asp (accessed August 28, 2018).

Viola-Saltzman, M., and N. F. Watson. 2012. Traumatic brain injury and sleep disorders. *Neurology Clinics* 30(4):1299–1312.

Wood, R. L., and A. Worthington. 2017. Neurobehavioral abnormalities associated with executive dysfunction after traumatic brain injury. *Frontiers in Behavioral Neuroscience* 11:195.

Worthington, A. 2016. Treatments and technologies in the rehabilitation of apraxia and action disorganisation syndrome: A review. *NeuroRehabilitation* 39(1):163–174.

Wortzel, H. S., and D. B. Arciniegas. 2014. The DSM-5 approach to the evaluation of traumatic brain injury and its neuropsychiatric sequelae. *NeuroRehabilitation* 34(4):613–623.

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4

Characteristics of a High-Quality Process for Determining Disability Resulting from Traumatic Brain Injury

This chapter discusses general issues related to the accuracy of the disability determination process; in particular, it examines the characteristics that define a high-quality process for determining disability resulting from traumatic brain injury (TBI), including the reliability and validity of the assessments themselves. It also discusses the characteristics of good process indicators and approaches to reducing variability in the disability determination of TBI residuals.

The chapter begins with a discussion of quality domains, including reliability, validity, burden, transparency, and credibility. It explains the importance of differentiating those domains in understanding process and outcome quality, and it comments on the many other factors that the Veterans Benefits Administration (VBA) must take into consideration when applying those concepts. Building on the descriptions in Chapter 3 of VBA's current adjudication process for residuals of TBI and the quality indicators that VBA currently measures, this chapter evaluates those and provides considerations for additional indicators that could be used to assess and improve the disability rating process.

The committee has included this chapter in its report because in discussions with VBA officials, there was great emphasis on the consistency of the rating process itself (as noted in Chapter 3), rather than on the outcome of the disability determinations. Consistency of process was presented as an end in and of itself, with less of a focus on ensuring the reliability and validity of the assessments, i.e., the characteristics of the process needed to ensure that the veteran had been given an accurate disability rating. VBA has taken great pains to train its raters so that they might accurately and reliably rate a disability; however, the emphasis on consistency of process does not actually ensure the reliability or the validly of the rating. Furthermore, and just as importantly, a lack of consistency in process does not necessarily mean there is a lack of reliability or validity. It is plausible that those factors are related to assessment performance, but is not guaranteed to be true.

DEFINITIONS OF QUALITY DOMAINS

The determination of disability can be conceptualized as an assessment or measurement process whose components include all the steps in the diagnosis, evaluation, and disability rating of the residuals of TBI, resulting in an overall disability assessment for the veteran. The overall

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quality of the disability determination process is multifactorial and includes aspects of process (e.g., the transparency of the process, the burden to the veteran) and outcome (e.g., the reliability and validity of disability determinations). Validity, in this context, is the degree to which the disability determination process results in the correct quantitative result for each veteran evaluated, over a wide range of injury severity, veteran characteristics, and geographic locations (Price, 2016).

The committee's review of the Department of Veterans Affairs' (VA's) quality assurance measures found that the VA's quality measures focus on consistency within the disability rating step of the process (see Chapter 3). The VA assesses the quality of its disability ratings through regional quality review teams (QRTs) and the national Systematic Technical Accuracy Review (STAR). The QRTs identify individual rater-level errors and facility-level error trends. A member of the QRT notes critical errors, such as an incorrect effective date or an application that was approved that should have been denied. The STAR review uses a checklist to measure how consistently claims comply with VBA's policies and procedures. Thus, the committee concluded that the VA defines quality primarily based on adherence to its policies and procedures.

The committee considered metrics of quality or quality domains that would be useful in determining the adequacy of the adjudication process for residuals of TBI. There is no single metric that captures the overall quality or performance of the disability determination process; instead, there are multiple domains that must be considered. These include the burden to the veteran associated with the evaluation, the transparency and credibility of the process, and the reliability and validity of the determinations (see Table 4-1).

TABLE 4-1 Examples of Domains of Quality Related to Disability Determinations After TBI

Domain or Metric	General Definition	Description Related to TBI Examinations
Burden	The effort required to complete a task or process.	The time, cost, and inconvenience to the veteran associated with completing the disability determination process.
Transparency	The degree to which rules and process are provided to the public in a comprehensible, accessible, and timely manner.	The degree to which the inner workings of the disability determination process are made known to the veteran, including details about the process and progress of the veteran's individual disability determination.
Credibility	The degree with which the process inspires believe or faith.	The degree with which the disability determination process is viewed as trustworthy and appropriate to key stakeholders, including veterans, and thus likely to yield a result that is trusted. High consistency of process can result in greater credibility.

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Domain or Metric	General Definition	Description Related to TBI Examinations
Reliability	The extent that an instrument or process yields the same results over multiple trials.	The degree to which repeated evaluations of the same service member would result in the same disability determination outcome. A high degree of reliability implies low variability from assessment to assessment. For example, inter-rater reliability measures the consistency of the result when a different rater completes a separate, independent assessment.
Validity	The extent that the instrument measures what it was designed to measure.	The degree to which the results of the disability determination process accurately reflect the disability resulting from service-connected TBI. There are multiple subtypes of validity, including content, construct, and criterion validity. A high degree of validity implies a lack of systematic bias.

SOURCES: OECD, 2018; Price, 2016.

Ideally the disability determination process should excel in each of those domains simultaneously. Many of the domains are related to each other. For example, a reliable and transparent process is more likely to be credible. A determination process cannot be valid without also being reliable. A valid disability evaluation process is one that would yield the "right answer," i.e., accurately identify and quantify the service-connected TBI-related disability for each veteran evaluated over a wide range of injury severity, veteran characteristics, and geographic locations. Validity requires reliability, but a highly reliable process does not promise validity, i.e., it might consistently yield the same incorrect results. The most highly valid processes are generally built on standardized procedures and use personnel with standardized training and qualifications; however, consistency of process is neither necessary nor sufficient to ensure validity (Sajdak et al., 2013; Wilbur et al., 2018).

The reliability of the evaluation process is defined by the consistency of outcome, i.e., the disability determinations themselves. Reliability can be measured for the entire evaluation process or separately for each stage or component, including the diagnosis of TBI, the determination of service connection, and the disability rating. Estimating the reliability of the evaluation process might require a subset of veterans to be evaluated more than once, for example, by different practitioners or at different geographic locations. In estimating the reliability of each stage in the evaluation process and the degree with which each stage of the process supports or compromises overall reliability, it might be informative to replicate each step in the evaluation independently and compare results.

The concept of validity can be further divided into three subtypes: content validity, construct validity, and criterion validity (Price, 2016). In the context of a TBI disability evaluation, *content validity* is the degree with which the determination process appears to measure or incorporate all characteristics of the veteran, the injury and its sequelae, or other factors that would reasonably influence the disability arising from TBI. For example, the Disability Benefits Questionnaire (DBQ) for residuals of TBI requires the examiner to assess 10

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facets of TBI-attributed cognitive impairment and subjective symptoms and select one answer for each facet that best represents the veteran's functional status. Do those criteria incorporate all characteristics of the veteran's injury-related functional status? A process that fails to assess key neurologic functions, such as memory or motor skills, for instance, would lack content validity.

Construct validity is the degree to which the results of the disability determination process are consistent with accepted theoretical constructs regarding TBI, its sequelae, and resulting disability (Price, 2016). For example, a process that yields disparate results for veterans with different sequelae of TBI but a similar overall impact on their lives would lack construct validity, as the construct of disability is closely related to the impact that symptoms and deficits have on the lives of affected service members. Another example of poor construct validity would be if the rating process assumed that all sequelae of TBI were immediately apparent, when current knowledge of TBI indicates that manifestations are often delayed.

Finally, *criterion validity*, a subset of construct validity, is the degree with which the results of the disability determination process match a criterion or "gold standard" that is assumed to define the degree of disability incurred by the veteran (Price, 2016). As there is no clear criterion standard available for disability, the criterion validity of the disability determination process cannot be assessed directly. However, enhanced assessment methods (e.g., by particularly well trained or experienced evaluators, incorporating additional evaluation modalities such as formal neuropsychiatric testing) might yield disability determinations that could serve as criterion standards for evaluating the usual assessment process.

A variety of approaches can be used to ensure quality. In considering the different approaches, it is useful to separate approaches that focus on consistency in the process of evaluation (e.g., in the qualifications of personnel, standardized training, defined and consistent workflows) and those that focus on the outcome of evaluation. An example of the latter would be an approach based on assessments of the accuracy of disability determination outcomes against a criterion standard, with feedback to evaluating personnel and other stakeholders, with the goal of reducing variability or the frequency of errors. The appeals process, allowing service members to request a re-evaluation of their disability, might be considered to be a feedback-based system for enhancing quality.

In seeking to obtain the same outcome each time a veteran with a stable disability is evaluated, it is important to keep in mind that perfect reliability is an unrealistic goal. Given the nature of the human condition, applicants can vary in their responses to an assessment from day to day or even from minute to minute, depending on internal factors (e.g., having a headache) or external factors (multiple distractions while the evaluation is being performed). Thus, the results of even the most reliable test or evaluation process can vary in response to internal or external factors affecting the applicant. In addition, the examiners and raters may themselves add variability to the process due to internal or external factors to which they may be subject. To address those limitations, the process should be made as independent of subjective judgement as possible in order to reduce variability and allow for the most reliable outcome possible.

Different approaches to completing assessments may be taken to get the same result and achieve reliability. While requiring all examiners from all specialties to follow the same standardized process for TBI diagnosis (or identifying residuals of TBI) may not be necessary to ensure reliability of the process, there needs to be a sufficient foundation of accurate information to support the accuracy of the assessments and therefore their quality, i.e., the ability to measure all relevant symptoms and deficits related to TBI. Similarly, it is important that the examiner follow the most recent evidence-based assessment procedures and be aware of areas that are

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mostly likely to be challenging. Nonetheless, if the outcomes of assessments are consistent, regardless of the standardization (or not) of the process, then reliability has been achieved.

Still, as previously mentioned, a reliable process is not necessarily a valid one. Even if each clinician making a TBI diagnosis, each examiner completing a DBQ, and each rater making a disability determination follows the same processes in their respective spheres with reliable and reproducible results each time, it will not guarantee that the results of those determinations represent the "truth" and are thus valid. It is important to acknowledge the overarching challenge that there is presently no clear consensus as to what accuracy means with respect to the diagnosis of TBI, the set of all possible sequelae, or the best way to quantify the effect of each on disability. Further work is needed to develop and improve criterion standards that can be used to evaluate the validity of each step in the TBI disability evaluation process.

Careful consideration should be given to the methods used to evaluate the processes of diagnosis and disability assessment with regard to content, construct, and criterion validity. These processes include the diagnosis of TBI, the determination of service connection, the detection and characterization of sequelae of the TBI (e.g., as documented in the DBQ), and the assessment and quantification of the resulting disability by raters. The goal of the overall process is to yield an evaluation that accurately captures the effects of service-related TBI on disability in veterans.

APPROACHES FOR ENSURING QUALITY

Broadly speaking, systems have two areas in which quality can be measured: the quality of the systems' processes and the quality of their outcomes. Process quality includes the domains of burden, transparency, and credibility, whereas outcome quality includes reliability and validity in its various forms. The variables or metrics that are used to measure quality in each of those domains are called indicators or quality indicators. The indicators of process quality and the indicators of outcome quality are distinct from each other (Mant, 2001).

Process quality includes how efficiently the system functions and how well it obeys its own rules. For instance, in the veterans' benefit determination system, process quality can be measured by ease of access, timeliness of examinations, qualifications of reviewers, and timeliness of appeals. Outcome quality, on the other hand, includes both reliability (e.g., how frequently different examiners reach the same conclusions) and validity (i.e., how accurately the system arrives at the correct answer). A system can be timely, easily accessed, adhere to its own rules, and have few errors detected but consistently fail to produce the right outcome; process quality does not guarantee outcome quality. To ensure and maintain high outcome quality, systems need to measure the quality of outcomes, incorporate feedback, correct themselves, and measure the outcomes after such a correction.

Approaches Based on Consistency of Process: Process Quality

There are two steps in the rating of service-connected TBI disability, which should be explicitly structured and continually reassessed to assure quality. The first step is the examination by a clinician whose results populate the DBQ, and the second is the rating process that produces the final disability rating from the DBQ and other supporting information. Each of the steps should have distinct process quality indicators. For the examination stage, process indicators could include the qualification of examiners, the ease and timeliness of access, the

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completeness of the DBQ (e.g., no missing data), the timeliness of DBQ filing, and the transparency and credibility of this step in the evaluation. For the rating process, indicators could include time to initial disability determination, the accuracy of the rating as determined by higher-level review, the credibility and transparency of the rating system, and the timeliness of the appeals process. Ideally, process quality indicators should represent characteristics inherently valuable to veterans and to the process owner (the Department of Veterans Affairs). In contrast with determinations of outcome quality, which require judgments against external or internal assessment standards and focus on deviations from those results, the use of process indicators is relatively straightforward.

VBA already measures a number of process quality indicators, as detailed in Chapter 3 and summarized in Table 4-2.

TABLE 4-2 Examples of VA Quality Indicators and Measurements

VA Quality Indicator	Measurement	Quality Domain(s) Addressed
Adherence to VA claim rating policies (described by the VA as "accuracy")	The STAR review compares the documentation and outcomes of randomly selected completed claims to a checklist to determine the "accuracy" of the claims, meaning their adherence to the VA policies (M-21, Chapter 3). Data are produced on a monthly basis by each regional office and published on a public-facing website. Claims-based and issue-level accuracy is reported for 3-month and 12-month periods. The claims-based accuracy rate is determined by dividing the total number of error-free cases by the total number of cases reviewed. Issue-level accuracy is a measure of individual medical issues contained within a compensation claim.	Credibility, via consistency of process, reliability
Consistency in rater decision making	Questionnaires are administered to all raters 3–24 times per year (GAO, 2014). The questionnaires include a brief scenario on a specific medical condition for which raters must answer several multiple-choice questions. These tools are not validated.	Credibility, via consistency of process
Consistency in qualifications for examiners	Percentage of TBI diagnoses made by clinicians with the appropriate specialty and proper certification (VA OIG, 2018).	Credibility, via consistency of process
Access to VA facilities and information about disability benefits	Proportion of veterans who submit a disability claim who are seen, measured from administrative databases. The question of how difficult it is for the veterans to arrange an appointment might require additional investigation, for instance, from client satisfaction surveys.	Burden, transparency
Timeliness	Measures of timeliness between any points in the process of disability determination, from initial filing to initial disability examination, from initial disability examination to initial disability determination, and, if appealed, from initial appeal filing to final determination (GAO, 2002, 2018).	Burden

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The first of these are the qualifications for the examiners. Under the M21-1 Adjudication Procedures Manual (see Appendix I), if the original diagnosis of TBI is made within the Veterans Health Administration (VHA) or by a VBA contractor, it needs to be made by a physician who is board certified in one of four specialties: neurology, neurosurgery, physical medicine and rehabilitation, or psychiatry. One measure of quality is what percentage of TBI diagnoses have been made by physicians with those qualifications. Another measure of process quality is the percentage of examiners completing the DBQ who have the specialized training required for this role. It is important to note that there is often little or no evidence linking common process indicators (e.g., qualifications of personnel) to outcome quality (e.g., accuracy of disability determination against an accepted criterion standard).

A second process quality indicator is access to VA facilities and information about disability benefits. The proportion of veterans who submit a disability claim and who are then seen at a VA facility can be measured from administrative databases. The question of how difficult it is for them to arrange an appointment might require additional investigation, for instance, from client satisfaction surveys. Furthermore, there may be injured veterans who fail to submit a disability claim due to the perceived difficulty of the process or to a belief that a favorable disability assessment is unlikely. The improvement goal here should be to remove barriers to access, whether real or perceived.

A third process indicator is timeliness. Timeliness can be measured between any points in the process of disability determination, from initial filing to initial disability examination, from initial disability examination to initial disability determination, or, if the rating is appealed, from initial appeal filing to final determination. Measures of timeliness should be possible with data from administrative databases, but they could also be assessed from client satisfaction surveys and standard patient encounters.

The transparency of the adjudication process is a key quality characteristic that does not appear to be explicitly addressed by existing VA quality indicators. Transparency is often a requirement for credibility and should be considered from the points of view of both the individual veteran and the system. Transparency from the point of view of the individual veteran would include, for example, access to the details of his or her individual application (e.g., results of the veteran's examination as documented on the DBQ, details regarding additional materials that have been requested by VBA). Transparency from a system-wide point of view would include easy access to and widespread distribution of data on the system performance, including performance with respect to both process quality measures (e.g., timeliness of and access to VHA examinations, percent of examinations conducted by contracted examiners) and outcome quality measures (e.g., the consistency of outcomes across geographic regions, the accuracy of disability determinations evaluated using standardized patients, the inter-rater reliability of determinations as assessed through independent examinations and ratings of random cases). The committee found that transparency was inadequately appreciated as a goal by both VHA and VBA personnel.

The committee recommends that the Veterans Health Administration (VHA) and Veterans Benefits Administration take specific actions to increase transparency at both individual and system-wide levels, including but not limited to providing full access to veterans of the details of their examinations and ratings and providing public access to detailed system-wide data, with separation by geographic location and examination type (e.g., VHA versus contracting examiner), on the outcomes of evaluations and outcome quality.

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Concerning who can make the diagnosis of TBI, it might seem reassuring to restrict this role to physicians who are board certified in neurology, neurosurgery, physical medicine and rehabilitation or psychiatry, as their training in brain pathophysiology and clinical care implies that they should have a good understanding of TBI. However, having had the basic training in the recent or remote past does not necessarily mean that those clinicians are currently capable of making the TBI determination accurately or that they have the time and motivation required to accurately make or rule out the diagnosis. Those clinicians might have chosen to focus on another aspect of their vast fields and subspecialized in an area of greater interest to them, whereas practitioners who are board certified in another specialist area may have a keen interest in TBI and thus be more likely to be abreast of the current controversies and the latest evidence-based diagnostic and treatment practices and be in a better position to make such a determination. Additionally, that requirement for board certification increases the burden on veterans by limiting the supply of individuals qualified to perform their assessment.

The specialty of a practitioner does not necessarily ensure the accuracy of the assessment. Not just specialization but also knowledge, training, experience, and interest should be taken into account. A well-outlined and detailed process in the hands of an inexperienced examiner might result in less reliable determinations than a less detailed process executed by an experienced physician who has diagnosed and treated a large number of TBI cases in his or her professional career. On the other hand, an inexperienced examiner with an intense interest in the topic may provide more reliable determinations than an experienced examiner with less interest and less time in which to complete the evaluation. A basic understanding of the pathophysiology of TBI and of the proximal and distal signs and symptoms associated with this diagnosis is necessary for an accurate diagnosis. However, the committee is unaware of any data supporting the current emphasis placed on the specialty of the examiner or on using the same consistent process among all examiners within the same discipline or among disciplines. Thus, the committee recommended in Chapter 2 that the VA should reconsider its decision and allow any clinician with specialized training in TBI to be able to make the diagnosis.

Approaches Based on Repetition or Comparison to Other Standards: Outcome Quality

Validity and reliability must be defined in terms of the outcome of the assessment rather than just by the consistency of the process; consistency of process is neither necessary nor sufficient to ensure reliability or validity. In other words, the key question is if the approaches, whether all the same or different, lead to an assessment that is repeatable and that accurately reflects the disability associated with TBI. Emphasizing consistency of process and qualifications of practitioners does not ensure the reliability or the validity of the assessments, and, just as important, a lack of consistency of process and qualifications of practitioners does not mean there was a lack of validity. It is likely that those factors are indeed related to assessment performance, but it is not guaranteed to be true.

If different assessment paths (providers, tools, locations) all lead to the same final disability assessments, then the fact that the processes are different should be of little concern. Admittedly, variability in assessments processes may negatively affect the credibility of the process; however, if the validity of the outcome is consistently high, then the process is of lesser importance. The biggest challenge is determining what “accuracy” means within this context and providing a practical and widely accepted criterion standard assessment against which the disability rating system can be judged.

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Conceptually, measurement or assessment error can be separated into two types: random variability and systematic error or bias (Bhattacherjee, 2012). Random variability that leads to a reduction in measurement reliability is generally addressed through ensuring that the process is consistent, assessing the sources of random variability, and emphasizing process modification and improvement activities. Systematic error or bias refers to consistent differences between individual disability determinations and the corresponding criterion standard for each determination, i.e., a general under- or over-estimate of the TBI-associated disability. Bias can be quantified in terms of an average or as a median difference from the criterion standard assessment. The presence of consistent bias—e.g., substantively lower disability scores than the national median from one examiner or in one center—suggests a target for quality improvement; this presumes, however, that the national median is consistent between locations. Finally, the committee notes that the VA's approach is designed to favor veterans if "a reasonable doubt arises regarding service origin, the degree of disability, or any other point" (VA, 2001).[1]

Random assessment error will always exist to some extent in the disability determination system. Sources of this variability can include examiners, instruments, record availability, raters, and veterans' understanding of what is being asked of them and why. One way to think of random assessment error is to consider the hypothetical distribution of disability scores obtained if the same veteran presented 100 times with the same underlying disability, undergoing evaluation by 100 different unbiased examiners with evaluations that were then rated by 100 different raters. That process would yield 100 completely independent evaluations of the same underlying disability. Different examiners are likely to have slightly different findings, and certain raters might rate the disability below the median and others above the median. Reducing this random variability—that is, narrowing the distribution—is one goal of quality improvement. Practical assessments of random measurement error can be made with many fewer assessments (e.g., duplicate evaluations).

The committee noted that existing quality indicators and processes for ensuring quality within both VHA and VBA do not address the quality of outcomes as defined by either the reliability of the outcomes, as assessed by independent evaluations, or the validity of outcomes.

The committee recommends that the Department of Veterans Affairs institute processes and programs to measure the reliability and validity of the adjudication process, identify opportunities for improvement in the quality of outcomes, and implement modifications of the adjudication process as needed to optimize the quality of both the adjudication process and the reliability and validity of the outcomes.

The committee further recommends that the VA take the following initial, specific actions to evaluate the reliability and validity of disability determinations:

1. The VA should implement a program using "standard patients" to evaluate the existing examination system and the completion of the DBQ. Specifically, standard patients would be professional actors or people portraying veterans with disability claims who have a history of injury and subsequent disability and who are coached to give standard answers and to present with a specific history and physical findings. The purpose of using standard patients is to determine how much variability there is

[1] For that reason, the committee did not address the issue of malingering or falsely or grossly exaggerated patient reporting of symptoms, which could affect the validity of the assessment.

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between the correct, criterion standard outcome that has been determined a priori and what an examiner records on the DBQ. That could be accomplished by a taped interview and examination, which could be viewed and rated by physicians who perform disability exams. Standard patient examinations may be used to identify random variability or systematic errors associated with individual examiners or offices, to measure the overall quality of the system, and to determine the settings in which the rating system is most likely to yield invalid disability ratings (Beullens et al., 1997). The committee most strongly endorses the use of this method.

2. The committee believes the VA should have experienced second-level reviewers independently repeat a random sample of disability determinations and provide disability determinations to be used as criterion standards. The repeat evaluations should include both the disability examination and the rating step. The differences between what an individual examiner and rater, or a group of examiners and raters, determined and the criterion standard then represent variation from the assumed accurate answer. This approach is fundamentally different from and extends existing VBA programs, both at the regional office level through the quality review teams and at the national level through the STAR system (VA, 2018). In both of those review systems, the evaluation is an audit rather than an independent repetition of the entire process, and, even for the rating step, the second rater knows what the first rater found and that rater's reasons for assigning the rating that he or she assigned. Because the second-level reviewer is aware of the initial reviewer's findings, this has the potential to introduce confirmation bias into the second determination (Karanicolas et al., 2010). To provide the least biased estimates of outcome quality, the second examiner and rater providing the criterion standard should replicate the entire process independently and be *unaware* of the first determination and reasoning. In short, there is a need for blind examinations and ratings that can be compared with the initial results, rather than having the second examinations and ratings be biased by those results.
3. The committee believes the VA should institute a system through which the veterans themselves rate the quality of the outcome. Are they satisfied or dissatisfied, and, if dissatisfied, how would they suggest the system be improved? This method is used extensively in a variety of customer-service industries, from medicine to travel, but it requires high rates of reporting to assure that system problems are not overestimated by dissatisfied clients with bad experiences or unrealistic expectations (Crow et al., 2002). A variant on this approach could be to examine the rate of applications for appeals, an administrative mechanism that represents extreme dissatisfaction. Examining appeals by time (to note improvements) and by geographic area (to identify clusters of dissatisfaction with the outcome) might be able to provide some insight into the quality of the disability determinations, that is, the quality of the system.
4. Finally, the VA should collect data on and examine the consistency of outcome determinations across the population of veterans filing claims in a certain year. As service members are drawn from the nation as a whole, one might assume those who have service-related disabilities should be evenly distributed throughout the population. Alternatively, however, more severely disabled veterans may be geographically clustered (e.g., near military bases), and variation by geographic

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> location should be carefully considered. The proportion of claims received each percentage disability can be examined as a whole to understand the variability in the process and then examined for subpopulations of examining centers to see where disability ratings may be less likely to be granted or systematically given lower scores.

SUMMARY AND RECOMMENDATIONS

The committee was tasked to evaluate the "adequacy" or quality of the adjudication process for impairments resulting from TBI. Building on the descriptions in Chapter 3 of the VA's adjudication process for the residuals of TBI and its quality assurance measures, this chapter described desirable characteristics of quality indicators that would be beneficial for the VA to monitor and to use to drive improvements in the adjudication process.

In Chapter 3 the committee examined the structures that the VA has in place for assuring the quality of its adjudication process and found that although VBA has systems in place to review the consistency of the process, the VA does not measure reliability or validity. The committee noted that in 2007 the Institute of Medicine provided recommendations for VHA to

> establish a recurring assessment of the substantive quality and consistency, or inter-rater reliability, of examinations performed with the templates, and if the assessment finds problems, take steps to improve quality and consistency, for example, by revising the templates, changing the training, or adjusting the performance standards for examiners

and also for VBA to establish "built-in checks or periodic evaluations to ensure inter-rater reliability as well as the accuracy and validity of rating across impairment categories, ratings, and regions" (IOM, 2007). The committee supports those recommendations and believes that they were not adequately addressed.

The committee discussed several major domains of quality and how they are related to the adjudication process for veteran disability claims, including reliability and validity. A process with high reliability is one in which repeated evaluations of the same service member would result in the same disability rating. An adjudication process with high validity would be one in which the disability rating reflects the true degree of service-connected disability. Ideally, a high-quality adjudication process would excel in both of these quality domains while also being transparent, timely, and credible and minimizing the burden to the veteran. To ensure and maintain high quality, systems need to measure both process and outcome quality, incorporate feedback, correct themselves, and measure outcomes after such a correction.

The committee's review of the VA's quality assurance measures found that the VA's quality measures focus on consistency in the disability rating step of the process. As described in Chapter 3, VBA has implemented measures to ensure the consistency of the rating process.

One example of a VA quality measure that focuses on consistency of process but with unclear effect on reliability or validity is the measurement of the fraction of diagnoses of TBI that are made by a physician who is board certified in one of four specialties: neurology, neurosurgery, physical medicine and rehabilitation, or psychiatry. As noted in Chapter 2, while the committee appreciates that an understanding of the pathophysiology of TBI and of the proximal and distal signs and symptoms associated with this diagnosis is necessary for an accurate diagnosis, there need not be an inordinate amount of emphasis placed on the specialty of

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the examiner or on adherence to this policy if there is no evidence that this will lead to more accurate evaluations of disability.

The transparency of the adjudication process is another key quality characteristic. Transparency should be considered from the points of view of both the individual veteran and the system. Transparency from the point of view of the individual veteran would include, for example, access to the details of his or her individual application (e.g., results of the examination as documented on the DBQ, details regarding additional materials that have been requested by VBA). Transparency from a system-wide point of view would include easy access to and widespread distribution of data on the system performance, including both performance with respect to process quality measures (e.g., timeliness of and access to VHA examinations, the percent of examinations conducted by contracted examiners) and outcome quality measures (e.g., the consistency of outcomes across geographic regions, the accuracy of disability determinations evaluated using standardized patients, the inter-rater reliability of determinations as assessed through independent examinations and ratings of random cases). The committee found that transparency was inadequately appreciated as a goal by both VHA and VBA personnel.

The committee recommends that the Veterans Health Administration (VHA) and Veterans Benefits Administration take specific actions to increase transparency, at both individual and system-wide levels, including but not limited to providing full access to veterans of the details of their examinations and ratings and providing public access to detailed system-wide data, with separation by geographic location and examination type (e.g., VHA versus contracting examiner), on the outcomes of evaluations and outcome quality.

Careful consideration should be given to the methods that the VA uses to evaluate the processes of diagnosis and disability assessment, to include not only the disability rating step, but also the diagnosis of TBI, the determination of service connection, and the detection and characterization of sequelae of the TBI, e.g., as documented in the DBQ. The overall goal of the evaluation is to ensure that the approaches taken by the examiner result in an evaluation that accurately captures the effects of TBI on disability in veterans.

The committee recommends that the Department of Veterans Affairs institute processes and programs to measure the reliability and validity of the adjudication process, identify opportunities for improvement in the quality of outcomes, and implement modifications of the adjudication process as needed to optimize the quality of both the adjudication process and the reliability and validity of the outcomes.

Four specific recommendations for initial steps to be taken are (1) instituting a program of standard patients to directly measure the reliability and validity of the examination and rating processes for such patients; (2) using experienced, second-level reviewers to conduct fully independent evaluations to evaluate the criterion validity of actual veterans' evaluations; (3) creating a system by which veterans may rate the quality of their own evaluations; and (4) instituting the systematic and transparent collection and comparison of disability outcome data across geographic regions.

Implementing the recommendations contained within this chapter will produce a fundamental enhancement in the methods used by the VA to ensure the quality of disability

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evaluations for TBI. This shift, from a focus on the consistency of the process (e.g., for the rating step in disability determination) and on practitioner qualifications to a focus on the accuracy of the outcome of the evaluation is intended and expected to identify steps or components in the disability evaluation process that warrant improvement. In fact, the identification of such opportunities for improvement will be a key indicator of the success and positive impact of these recommendations in improving the system, rather than a criticism of the current system or the personnel who work within it. Furthermore, by adopting an explicit learning structure in which the reliability and validity of disability determinations are directly assessed, the VA will be able to devote its resources to the modifications and enhancements of the disability evaluation system that will have the greatest impact in improving the service provided to injured veterans.

REFERENCES

Beullens, J., J. J. Rethans, J. Goedhuys, and F. Buntinx. 1997. The use of standardized patients in research in general practice. *Family Practice* 14(1):58–62.

Bhattacherjee, A. 2012. *Social science research: Principles, methods, and practices.* Tampa, FL: University of South Florida Tampa.

Crow, R., H. Gage, S. Hampson, J. Hart, A. Kimber, L. Storey, and H. Thomas. 2002. The measurement of satisfaction with healthcare: Implications for practice from a systematic review of the literature. *Health Technology Assessment* 6(32):1–244.

GAO (Government Accountability Office). 2002. *Claims processing timeliness performance measures could be improved*. Washington, DC. https://www.gao.gov/assets/240/236589.pdf (accessed December 7, 2018).

GAO. 2014. *Improvements could further enhance quality assurance efforts*. Washington, DC. https://www.gao.gov/assets/670/667027.pdf (accessed May 18, 2018).

GAO. 2018. *Improved perfomance analysis and training oversight needed for contracted exams*. Washington, DC. https://www.gao.gov/assets/700/694986.pdf (accessed December 7, 2018).

Karanicolas, P. J., F. Farrokhyar, and M. Bhandari. 2010. Blinding: Who, what, when, why, how? *Canadian Journal of Surgery* 53(5):345–348.

Mant, J. 2001. Process versus outcome indicators in the assessment of quality of health care. *International Journal for Quality in Health Care* 13(6):475–480.

OECD (Organisation for Economic Co-operation and Development) Statistics Directorate. 2018. *OECD glossary of statistical terms—transparency definition*. https://stats.oecd.org/glossary/detail.asp?ID=4474 (accessed November 2, 2018).

Price, L. R. 2016. *Psychometric methods: Theory into practice.* New York: Guilford Publications.

Sajdak, R., L. A. Trembath, and K. S. Thomas. 2013. The importance of standard operating procedures in clinical trials. *Journal of Nuclear Medicine Technology* 41(3):231–233.

VA (Department of Veterans Affairs). 2001. *38 CFR 3.102—reasonable doubt*. https://www.gpo.gov/fdsys/granule/CFR-2009-title38-vol1/CFR-2009-title38-vol1-sec3-102

VA. 2018. *M21-1 adjudication procedures manual, Chapter 6: Quality review team*. https://www.knowva.ebenefits.va.gov/system/templates/selfservice/va_ssnew/help/customer/locale/en-US/portal/554400000001018/topic/554400000004049/M21-1-Adjudication-Procedures-Manual (accessed May 11, 2018).

VA OIG (Department of Veterans Affairs Office of Inspector General). 2018. *Review of Montana board of psychologists complaint and assessment of VA protocols for traumatic brain injury compensation and pension examinations*. Washington, DC. https://www.va.gov/oig/pubs/VAOIG-15-01580-108.pdf (accessed December 7, 2018).

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Wilbur, K., A. Elmubark, and S. Shabana. 2018. Systematic review of standardized patient use in continuing medical education. *Journal of Continuing Education in the Health Professions* 38(1):3–10.

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5

Summary and Recommendations

The Department of Veterans Affairs (VA) requested a comprehensive review of the examinations conducted by the VA of individuals who submit claims to the VA secretary for compensation for traumatic brain injury (TBI). The process is a complex one, which has been detailed in the previous chapters. Veterans who submit claims for TBI-related sequelae first have to demonstrate that they had sustained a TBI. Once the diagnosis of TBI has been proven, then the veteran may seek compensation for sequelae (i.e., residuals) of TBI. The administrations within the VA that are involved in this process are the Veterans Health Administration (VHA) and the Veterans Benefits Administration (VBA); each administration has distinct requirements and responsibilities for the health of the veteran and compensation decisions.

The specific statement of task is provided in Box 5-1 below.

BOX 5-1
Statement of Task

The National Academies of Sciences, Engineering, and Medicine will convene a committee to make:

(A) A determination of the adequacy of the tools and protocols used by the Department of Veterans Affairs to provide examinations; and

(B) A determination of which credentials are necessary for health care specialists and providers to perform such portions of such examinations that relate to an assessment of all disabling effects.

Additionally, the committee shall include in its final report:

(1) Findings with respect to the comprehensive review noted in (A) and (B) above; and

(2) Recommendations for legislative or administrative action for improving the adjudication of veterans' claims seeking entitlement to compensation for all impairments arising from a traumatic brain injury.

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DIAGNOSING TBI

Damage to the brain caused by trauma is referred to as TBI. TBI may be blunt, non-penetrating, penetrating, or due to blast. According to the Centers for Disease Control and Prevention, mild TBI (mTBI) (often referred to as a concussion) manifests initially as a brief change in mental status or unconsciousness, whereas severe TBI results in an extended period of unconsciousness or amnesia. The first step in the compensation process for residuals of TBI is to be able to prove the diagnosis of a TBI.

TBI severity is typically defined at the time of initial injury; the Glasgow Coma Scale (GCS) has been the gold standard of neurologic assessment of trauma patients since its development. Other TBI severity-classification systems rely on single indicators, such as a loss of consciousness or the duration of posttraumatic amnesia. The predictive value of those measures has been demonstrated, but each may be influenced by factors unrelated or indirectly related to the severity of TBI (e.g., intoxication). Ultimately, the severity of injury as it is defined initially does not necessarily predict the trajectory or natural history of TBI, as individuals diagnosed with mTBI can experience ongoing impairment.

In the absence of clear biomarkers, self-report based on a validated screening method is currently considered the gold standard for obtaining a comprehensive lifetime history of exposure to TBI. Reliance on medical records is often insufficient because many injuries are not treated, including, occasionally, even more severe injuries. Screening instruments vary in the extent to which their psychometrics have been established, with single-item screens tending to be the least reliable and to be unlikely to capture all TBIs. Many mTBIs incurred during deployment are not evaluated at the time of injury and must be evaluated retrospectively, typically with the Brief Traumatic Brain Injury Screen, a four-item measure that is typically completed upon return from deployment as part of a comprehensive health screening. A positive screen is followed by a more comprehensive evaluation, the VA Comprehensive TBI Evaluation.

The current method of TBI diagnosis after initial injury relies on a report of certain symptoms at the time of injury from the person who was injured or from a witness. However, not all individuals who have sustained a TBI are identified at the time of initial injury (e.g., in the case of complex polytrauma); for instance, other injuries might appear to be more severe so that the head injury is not assessed, or, in the case of mTBI, the individual might not present for medical care. Furthermore, there are no current tests to help make, and perhaps document, the diagnosis more than 24 hours after injury, although new tests have been approved by the Food and Drug Administration for use early after injury.

Thus, when considering the diagnosis of TBI in the clinical setting, it is important to understand the role that patient and family self-report have in providing evidence of injury. While prospective evaluation is often able to document an initial injury, prior injuries are typically undocumented or elicited via informal methods. Furthermore, TBI is often confused with a variety of other conditions, including aging, depression, and emotional problems such as posttraumatic stress disorder (PTSD). Even when medical records are available, a large percentage of prior injuries often do not receive recognition or medical attention. Therefore, patient self-report of previous head trauma is often used in both clinical practice and research as a screening method to identify TBI.

TBI has been associated with behavioral outcomes such as depression, anxiety, aggression, and impulse control and overlaps with the symptoms of PTSD. Thus, a TBI evaluation might be incomplete unless the diagnostician is familiar with the symptoms of PTSD

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and other common comorbidities. PTSD and other psychiatric conditions are often diagnosed concurrent with or following a brain injury. PTSD and TBI share some pathophysiologic characteristics, and both are associated with cognitive impairment and sleep disruption. It is important to recognize that mental health symptoms might have causes other than TBI, among which are pain, the use of medications, alcohol or drug use or intoxication, and PTSD, which can be present either in isolation or in addition to a brain injury and, as noted, can confound or complicate the diagnosis.

Given the complexities in diagnosing TBI and the time that might have elapsed since the original injury, a diagnostician needs to have experience with TBI and to be trained in and familiar with the state of the science for making a determination of brain injury and its severity. In addition, there is enough ongoing research and new theoretical views on the trajectory of recovery after TBI that new developments are likely forthcoming that would assist providers who have training and experience with TBI to more accurately diagnose TBI. Currently the VA requires one of four medical specialties to diagnose TBI: neurology, neurosurgery, physiatry, and psychiatry. There are many specialties and subspecialties involved in making the diagnosis of a brain injury, particularly if the diagnosis occurs months to years following the injury. Universities and medical schools offer special training in brain injury to train physicians and other health care professionals with an interest in the field to assist in the diagnosis, treatment, and rehabilitation of individuals diagnosed with brain injury. Thus, the VA should consider allowing other health care professionals with experience and pertinent ongoing training in brain injury to make TBI diagnoses. The committee believes that it is the training and experience and not necessarily the specialty that renders a health care professional capable of an accurate diagnosis.

The committee recommends that the Department of Veterans Affairs allow health care professionals who have specific traumatic brain injury (TBI) training and experience, in addition to the current required specialists, to make a TBI diagnosis. Furthermore, the committee recommends pertinent and ongoing clinical training that is up to date with the state of current knowledge regarding TBI.

THE ADJUDICATION PROCESS

The VA requested that the committee review the adjudication process by which residuals of TBI are assessed for awarding disability compensation. Thus the committee examined the adequacy of the tools and protocols used by the VA in providing examinations to veterans and reviewed the credentials and training of the providers who perform such examinations.

The adjudication process for VA disability compensation involves several stakeholders, including the veteran, VBA, VHA, and staff offices that work with veterans on appeals. As a first step, the veteran or the veteran service organization representative submits a claim to VBA. If all necessary information is provided, VBA will process the claim, but the residuals of TBI must be assessed to enable VBA to determine a disability rating.

In most cases, VBA orders a compensation and pension (C&P) exam. A VHA physician or VBA clinician contractor evaluates the degree of impairment, functional limitation, and disability resulting from the residuals of TBI. The C&P examiner records information using the Disability Benefits Questionnaire (DBQ) for residuals of TBI, which is then submitted to VBA. A rating veterans service representative makes a percentage disability rating decision by

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comparing DBQ results and other evidence to criteria in the VA Schedule for Rating (VASRD), and an effective start date is assigned. The veteran may file an appeal to have the case reviewed if he or she does not agree with the rating decision.

The DBQ guides the documentation of C&P exams by providing a structure for the standardized reporting of results. The VA developed the DBQs to mirror the VASRD, which consists of the criteria encoded in federal regulation for assigning disability ratings, in order to simplify decision making for raters in determining a disability rating. Although the DBQ is completed by a clinician, the disability rating is made by a non-clinician VBA contractor. The clinician essentially plays no role in applying the diagnosis and medical information to the VASRD.

The DBQ and the VASRD provide a list of common sequelae (i.e., residuals) of TBI that are used to rate the level of disability associated with TBI. For the most part, the identified residuals accurately reflect the problems that are most likely to disrupt an individual's quality of life following TBI. However, some of the characteristics of the sequelae used to rate severity of disability (e.g., the frequency at which the problem is observed) do not fully capture the sequela's potential impact. Furthermore, they fail to take into account some basic medical knowledge concerning how residuals of TBI might manifest and affect disability.

The committee recommends that the Department of Veterans Affairs (VA) convene experts from both the Veterans Health Administration and the Veterans Benefits Administration, including clinicians who diagnose and assess residuals of traumatic brain injury (TBI), to regularly update the VA Schedule for Rating Disabilities and disability benefits questionnaire for residuals of TBI to better reflect the current state of medical knowledge.

In the committee's review of the residuals of the TBI DBQ, it found that there are important residuals that were not included. In particular, three important residuals of TBI are not adequately covered by any of the existing DBQs: insomnia, vestibular dysfunction, and near-vision dysfunction (near-point accommodative and convergence insufficiency).

Isolated questions related to insomnia and sleep disruption can be found on four DBQs (mental disorders, chronic fatigue syndrome, PTSD, and sleep apnea), but no single DBQ combines them all in a way that captures the full extent of disability associated with post-TBI sleep disruption. Sleep disruption occurs commonly after TBI, contributing to fatigue, cognitive dysfunction, and disrupted mood.

Isolated questions and physical exam elements related to vestibular dysfunction can be found on two DBQs (cranial nerves diseases and ear conditions), but no single DBQ combines them in a way that captures the full extent of disability associated with post-TBI vestibular dysfunction. This dysfunction is typically a mix of both peripheral (ear and vestibulocochlear nerves) and central (vestibulo-spinal and vestibulo-ocular) vestibular structure disruption. Vestibular dysfunction occurs commonly after TBI, producing symptoms related to altered postural stability (imbalance and abnormal gait), altered oculomotor function (reduced dynamic visual acuity, dizziness with head movement, dizziness with movement of objects in visual field), and reduced concentration or "fogginess" when in motion. Vestibular dysfunction may also contribute to altered mood, particularly anxiety.

Although the eye conditions DBQ provides questions related to diplopia, no existing DBQ provides questions or physical exam elements intended to capture the full extent of disability associated with near-point accommodative and convergence insufficiency. These near-

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vision problems occur commonly after TBI and can result in not only diplopia but also blurred vision, headache, nausea, and an inability to maintain focus while reading and doing other close-range visual activities.

The committee recommends that the Department of Veterans Affairs add insomnia, vestibular dysfunction, and near-vision dysfunction to the disability benefits questionnaire for residuals of traumatic brain injury.

With regard to the clinicians who conduct C&P exams, the committee learned that there are differences in training and access to medical records between VHA clinicians and VBA-contracting clinicians. That is notable, given the recent increase in the percentage of C&P evaluations performed by contractors for TBI claims (from 26 percent in 2016 to 58 percent in 2017 and 71 percent to date in 2018).

VBA contractors often do not have the same access to VHA medical records as VHA clinicians. While VHA clinicians have access to the veteran's full medical record, contractors have access only to the information that VBA (or VHA) provides to them. VHA clinicians and VBA contractors do not receive the same training. Hiring standards are different for VHA clinicians and VBA contractors. Contractors might not have the military cultural competence that VHA clinicians do. Furthermore, contracting clinicians might not have the same additional expertise available to them as VA clinicians, which could affect sections on the DBQ that might require a referral to a clinician with different expertise from the examining physician.

The committee recommends that the Department of Veterans Affairs provide Veterans Benefits Administration contractors with the same training and access to medical records as Veterans Health Administration clinicians in order to ensure equitable disability determinations for all veterans.

ADEQUACY OF THE ADJUDICATION PROCESS

The committee was tasked with evaluating the "adequacy" or quality of the adjudication process for impairments resulting from TBI. Thus, the committee examined desirable characteristics of quality indicators that would be beneficial for the VA to monitor and to use to drive improvements in the adjudication process. The committee notes that although VBA has systems in place to review the consistency of its process, it does not appear to measure reliability or validity. Thus, the committee discussed several major domains of quality and how they are related to the adjudication process for veteran disability claims.

A process with high reliability is one in which repeated evaluations of the same service member would result in the same disability rating. An adjudication process with high validity would be one in which the disability rating reflects the true degree of service-connected disability. A high-quality adjudication process would ideally excel in both of these quality domains (reliability and validity) while also being transparent, timely, and credible and minimizing burden to the veteran. To ensure and maintain high quality, systems need to measure both process and outcome quality, incorporate feedback, correct themselves, and measure outcomes after such a correction.

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In the committee's review of the VA's quality assurance measures, it found that the VA's quality measures focus on consistency in the disability rating step of the process. As described in Chapter 3, VBA has implemented measures to ensure the consistency of the rating process.

One example of a VA quality measure that focuses on the consistency of the process but with unclear effect on reliability or validity is the measurement of the fraction of diagnoses of TBI that are made by a physician who is board certified in one of four specialties: neurology, neurosurgery, physical medicine and rehabilitation, or psychiatry. As noted in Chapter 2, while the committee appreciates that an understanding of the pathophysiology of TBI and of the proximal and distal signs and symptoms associated with this diagnosis is necessary for an accurate diagnosis, there need not be an inordinate amount of emphasis placed on the specialty of the examiner or on adherence to this policy if there is no evidence that this will lead to more accurate evaluations of disability.

The transparency of the adjudication process is another key quality characteristic. Transparency should be considered from the points of view of both the individual veteran and the system. Transparency from the point of view of the individual veteran would include, for example, access to the details of his or her individual application (e.g., the results of the examination as documented on the DBQ, details regarding additional materials that have been requested by VBA). Transparency from a system-wide point of view would include easy access to and widespread distribution of data on the system performance, including performance with respect to both process quality measures (e.g., timeliness of and access to VHA examinations, percent of examinations conducted by contracted examiners) and outcome quality measures (e.g., the consistency of outcomes across geographic regions, the accuracy of disability determinations evaluated using standardized patients, the inter-rater reliability of determinations as assessed through independent examinations and ratings of random cases). The committee found that transparency was inadequately appreciated as a goal by both VHA and VBA personnel.

The committee recommends that the Veterans Health Administration (VHA) and Veterans Benefits Administration (VBA) take specific actions to increase transparency, at both individual and system-wide levels, including but not limited to providing full access to veterans of the details of their examinations and ratings and providing public access to detailed system-wide data, with separation by geographic location and examination type (e.g., VHA versus VBA contracting physician), on the outcomes of evaluations and outcome quality.

Careful consideration should be given to the methods that the VA uses to evaluate the processes of diagnosis and disability assessment, including not only the disability rating step, but also the diagnosis of TBI, the determination of service connection, and the detection and characterization of the sequelae of the TBI, e.g., as documented in the DBQ. The overall goal of the evaluation is to ensure that the approaches taken by the examiner result in an evaluation that accurately captures the effects of TBI on disability in veterans.

The committee recommends that the Department of Veterans Affairs institute processes and programs to measure the reliability and validity of the adjudication process, identify opportunities for improvement in the quality of outcomes, and implement modifications of the adjudication process as needed to optimize the quality of both the adjudication process and the reliability and validity of the outcomes.

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Four specific recommendations for the initial steps to be taken are (1) instituting a program of standard patients to directly measure the reliability and validity of the examination and rating processes for such patients; (2) the use of experienced, second-level reviewers to conduct fully independent evaluations to evaluate the criterion validity of actual veterans' evaluations; (3) creating a system by which veterans may rate the quality of their own evaluations; and (4) the systematic and transparent collection and comparison of disability outcome data across geographic regions.

The implementation of the recommendations will represent a fundamental enhancement in the methods used by the VA to ensure the quality of disability evaluations for TBI. Shifting from a focus on the consistency of the process (e.g., for the rating step in disability determination) and on practitioner qualifications to a focus on the accuracy of the outcome of the evaluation is intended and expected to identify steps or components in the disability evaluation process that warrant improvement. In fact, the identification of such opportunities for improvement will be a key indicator of the success and positive impact of those recommendations in improving the system, rather than a criticism of the current system or the personnel who work within it.

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A

Legislation Directing the Study

Enacted — Signed by the President on December 16, 2016

H.R. 6416 - Jeff Miller and Richard Blumenthal Veterans Health Care and Benefits Improvement Act of 2016
114th Congress (2015–2016)

SEC. 110. INDEPENDENT REVIEW OF PROCESS BY WHICH DEPARTMENT OF VETERANS AFFAIRS ASSESSES IMPAIRMENTS THAT RESULT FROM TRAUMATIC BRAIN INJURY FOR PURPOSES OF AWARDING DISABILITY COMPENSATION.

(a) AGREEMENT.—
(1) IN GENERAL.—The Secretary of Veterans Affairs shall seek to enter into an agreement with the National Academies of Sciences, Engineering, and Medicine to perform the services covered by this section.
(2) TIMING.—The Secretary shall seek to enter into the agreement described in paragraph (1) not later than 9 months after the date of the enactment of this Act.
(b) COMPREHENSIVE REVIEW.—
(1) IN GENERAL.—Under an agreement between the Secretary and the National Academies of Sciences, Engineering, and Medicine under this section, the National Academies of Sciences, Engineering, and Medicine shall conduct a comprehensive review of examinations furnished by the Department of Veterans Affairs to individuals who submit claims to the Secretary for compensation under chapter 11 of title 38, United States Code, for traumatic brain injury to assess the impairments of such individuals relating to such injury.
(2) ELEMENTS.—The comprehensive review carried out pursuant to paragraph (1) shall include the following:
(A) A determination of the adequacy of the tools and protocols used by the Department to provide examinations described in paragraph (1).
(B) A determination of which credentials are necessary for health care specialists and providers to perform such portions of such examinations that relate to an assessment of all disabling effects.
(3) GROUP OF EXPERIENCED HEALTH CARE PROVIDERS.—In carrying out the comprehensive review pursuant to paragraph (1), the National Academies of Sciences, Engineering, and Medicine shall convene a group of relevant experts, including experts in clinical neuropsychology, psychiatry, physiatry, neurosurgery, and neurology.
(c) REPORT.—

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(1) IN GENERAL.—Not later than 540 days after the date on which the Secretary enters into an agreement under subsection (a)(1), the Secretary shall submit to the Committees on Veterans' Affairs of the Senate and House of Representatives a report on the comprehensive review conducted under this section.
(2) ELEMENTS.—The report submitted under paragraph (1) shall include the following:
(A) The findings of the National Academies of Sciences, Engineering, and Medicine with respect to the comprehensive review conducted under this section.
(B) Such recommendations for legislative or administrative action as the National Academies of Sciences, Engineering, and Medicine may have for the improvement of the adjudication of claims described in subsection (b)(1).
H.R. 6416—11
(d) ALTERNATE CONTRACT ORGANIZATION.—
(1) IN GENERAL.—If the Secretary is unable within the period prescribed in subsection (a)(2) to enter into an agreement described in subsection (a)(1) with the National Academies of Sciences, Engineering, and Medicine on terms acceptable to the Secretary, the Secretary shall seek to enter into such an agreement with another appropriate organization that—
(A) is not part of the Government;
(B) operates as a not-for-profit entity; and
(C) has expertise and objectivity comparable to that of the Health and Medicine Division of the National Academies of Sciences, Engineering, and Medicine.
(2) TREATMENT.—If the Secretary enters into an agreement with another organization as described in paragraph (1), any reference in this section to the National Academies of Sciences, Engineering, and Medicine shall be treated as a reference to the other organization.

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B

Definitions of Traumatic Brain Injury

TABLE B-1 Case Definitions of Traumatic Brain Injury

Organization	Definition	Reference/Year
National Institute of Neurological Disorders and Stroke	Traumatic brain injury (TBI), a form of acquired brain injury, occurs when a sudden trauma causes damage to the brain. TBI can result when the head suddenly and violently hits an object or when an object pierces the skull and enters brain tissue. Symptoms of a TBI can be mild, moderate, or severe, depending on the extent of the damage to the brain. A person with a mild TBI may remain conscious or may experience a loss of consciousness for a few seconds or minutes. Other symptoms of mild TBI include headache, confusion, lightheadedness, dizziness, blurred vision or tired eyes, ringing in the ears, bad taste in the mouth, fatigue or lethargy, a change in sleep patterns, behavioral or mood changes, and trouble with memory, concentration, attention, or thinking. A person with a moderate or severe TBI may show these same symptoms, but may also have a headache that gets worse or does not go away, repeated vomiting or nausea, convulsions or seizures, an inability to awaken from sleep, dilation of one or both pupils of the eyes, slurred speech, weakness or numbness in the extremities, loss of coordination, and increased confusion, restlessness, or agitation.	NIH, 2018
Centers for Disease Control and Prevention	CDC defines a traumatic brain injury as a disruption in the normal function of the brain that can be caused by a bump, blow, or jolt to the head, or penetrating head injury.	CDC, 2017
Concussion in Sport Group (Berlin)	Sport-related concussion (SRC) is a traumatic brain injury induced by biomechanical forces. Several common features that may be utilized in clinically defining the nature of a concussive head injury include • SRC may be caused either by a direct blow to the head, face, neck, or elsewhere on the body with an impulsive force transmitted to the head.	McCrory et al., 2017

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Organization	Definition	Reference/Year
	• SRC typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. However, in some cases, signs and symptoms evolve over a number of minutes to hours. • SRC may result in neuropathological changes, but the acute clinical signs and symptoms largely reflect a functional disturbance rather than a structural injury and, as such, no abnormality is seen on standard structural neuroimaging studies. • SRC results in a range of clinical signs and symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive features typically follows a sequential course. However, in some cases symptoms may be prolonged. • The clinical signs and symptoms cannot be explained by drug, alcohol, or medication use, other injuries (such as cervical injuries, peripheral vestibular dysfunction, etc.), or other comorbidities (e.g., psychological factors or coexisting medical conditions).	
Department of Veterans Affairs	Traumatic brain injury (TBI) can occur from direct contact to the head or when the brain is shaken within the skull, such as from a blast or whiplash during a car accident. The person may also have a loss of memory for the time immediately before or after the event that caused the injury. Not all injuries to the head result in a TBI, however. The severity of the TBI is determined at the time of the injury and is based on the length of the loss of consciousness, the length of either memory loss or disorientation, and how responsive the individual was after the injury.	VA, 2017
International Classification of Diseases, Tenth Revision, Clinical Modification	The Department of Veterans Affairs (VA) provides instructions for coding traumatic brain injury (TBI) using ICD-10. ICD-10 codes based on loss of consciousness (LOC) time after the injury. In order to ensure the most accurate and appropriate level of coding, documentation for initial encounters must clearly state if there was an LOC due to the injury and the duration of the LOC. If documentation does not clearly define the LOC then unspecified state of consciousness must be coded. Follow-up care should be coded for sequelae of TBI using the symptom code(s) best representing the patient's chief symptoms.	VA, 2015
American Academy of Neurology	Concussion is recognized as a clinical syndrome of biomechanically induced alteration of brain function, typically affecting memory and orientation, which may involve loss of consciousness (LOC). Symptoms are discussed as risk factors for severe or prolonged early impairments include headache, fatigue/fogginess, and dizziness. Signs include headache, fatigue/fogginess, early amnesia, alteration in mental status, and disorientation. A multidisciplinary approach to assessment and management is advocated in diagnosing concussion. Computerized tomography (CT) imaging should not be used to diagnose sports-related concussion, but might be obtained to	AAN, 2013

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Organization	Definition	Reference/Year
	rule out more serious traumatic brain injury (TBI) such as an intracranial hemorrhage in athletes with a suspected concussion who have LOC, post-traumatic amnesia, persistently altered mental status (Glasgow Coma Scale score 15), focal neurologic deficit, evidence of skull fracture on examination, or signs of clinical deterioration.	
Diagnostic and Statistical Manual of Mental Disorders (DSM-5)	Traumatic brain injury (TBI) is defined as brain trauma with specific characteristics that include at least one of the following: loss of consciousness, posttraumatic amnesia, disorientation and confusion, or, in more severe cases, neurological signs (e.g., positive neuroimaging, a new onset of seizures or a marked worsening of a pre-existing seizure disorder, visual field cuts, anosmia, hemiparesis). To be attributable to TBI, a neurocognitive disorder must present either immediately after the injury or immediately after the individual recovers consciousness after the injury and persist past the acute post-injury period. The cognitive presentation is variable. Difficulties in the domains of complex attention, executive ability, learning, and memory are common as well as slowing in speed of information processing and disturbances in social cognition. In more severe TBI in which there is brain contusion, intracranial hemorrhage, or penetrating injury, there may be additional neurocognitive deficits, such as aphasia, neglect, and constructional dyspraxia. Severity rating criteria include loss of consciousness, posttraumatic amnesia, and disorientation and confusion at initial assessment (Glasgow Coma Scale Score).	APA, 2013
Military Acute Concussion Evaluation	The Military Acute Concussion Evaluation, or MACE, is a standardized mental status exam that is used to evaluate mild TBI, or concussion, in a combat or other deployed setting. This screening tool was developed to evaluate a person with a suspected concussion, and is used to identify symptoms of mild TBI. The MACE form consists of four sections: 1. Concussion screening—includes a description of the injury event and screening questions about loss of consciousness (LOC), alteration of consciousness (AOC), and posttraumatic amnesia (PTA). If any of the screening questions are answered "yes," the evaluator continues with the other portions of MACE. 2. Cognitive exam—assigns scores for orientation, immediate memory, concentration, and delayed recall. The scores are totaled out of 30 possible points and reported at the end of the MACE form. 3. Neurological exam—tests for normal or abnormal pupil response to light, speech fluency and word finding, grip strength and pronator drift (an indicator of muscle weakness and compensation), and balance. Normal results are reported as "Green" and abnormal results are reported as "Red" at the end of the MACE form.	DVBIC, 2012

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Organization	Definition	Reference/Year
	4. Symptom screening—screens for symptoms including headache, dizziness, memory problems, balance problems, nausea/vomiting, difficulty concentrating, irritability, visual disturbances, and ringing in the ears. It also asks about concussion history in the past 12 months. Having no symptoms is reported as "A" and having one or more symptoms is reported as "B" at the end of the MACE form. MACE results are reported using the score from the cognitive exam, the color from the neurological exam, and the letter from the symptom screening. For example, a result of 24/Red/B would mean a cognitive score of 24 out of 30, an abnormal neurological response, and the presence of one or more symptoms. Future MACE scores can be used to determine whether the patient's cognitive function has improved or worsened over time.	
Brain Injury Association of America (BIAA)	TBI is defined as an alteration in brain function or other evidence of brain pathology caused by an external force.	BIAA, 2011
The Brief Traumatic Brain Injury Screen	The Brief Traumatic Brain Injury Screen screens for traumatic brain injury (TBI) using the following three questions: 1. Did you have any injury(ies) during your deployment from any of the following? (check all that apply) • Fragment • Bullet • Vehicular • Fall • Blast • Other (specify) 2. Did any injury received while you were deployed result in any of the following? (check all that apply) • Being dazed, confused, or "seeing stars" • Not remembering the injury • Losing consciousness (knocked out) for less than a minute • Losing consciousness for 1–20 minutes • Losing consciousness for longer than 20 minutes • Having any symptoms of concussion afterward (such as headache, dizziness, irritability, etc.) • Head injury	DVBIC, 2007

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Organization	Definition	Reference/Year
	• None of the above 3. Are you currently experiencing any of the following problems that you think might be related to a possible head injury or concussion? (check all that apply) • Headaches • Dizziness • Memory problems • Balance problems • Ringing in the ears • Irritability • Sleep problems • Other (specify)	
Mayo Classification System	According to the Mayo System there are three main classifications: Definite Moderate-Severe TBI, Probable Mild TBI (mTBI), and Possible TBI. A classification of a Definite Moderate-Severe TBI would be made if one of the following was present: death due to this TBI, loss of consciousness of 30 minutes or more, posttraumatic amnesia (PTA) of 24 hours or more, worst Glasgow Coma Scale score in the first 24 hours <13 (unless invalidated by factors such as intoxication, sedation, systemic shock). In addition if there was evidence of hematoma, contusion, penetrating TBI, hemorrhage, or brain stem injury, the TBI would be classified as Definite Moderate-Severe TBI. A classification of Probable mTBI is made if one or more of the following criteria apply: loss of consciousness is momentary to 30 minutes and PTA does not extend beyond 24 hours. If the individual sustains a depressed, basilar, or linear skull fracture (dura intact), then the TBI is still a probable mTBI. A classification of Possible TBI is made if one or more of the following symptoms are present: blurred vision, confusion, dazed, dizziness, focal neurological symptoms, headache or nausea.	Malec, 2007
World Health Organization Collaborating Center Task Force on Mild Traumatic Brain Injury	Mild traumatic brain injury (mTBI) is an acute brain injury resulting from mechanical energy to the head from external physical forces. Operational criteria for clinical identification include (i) one or more of the following: confusion or disorientation, loss of consciousness for 30 minutes or less, posttraumatic amnesia for less than 24 hours, and/or other transient neurological abnormalities such as focal signs, seizure, and intracranial lesion not requiring surgery; (ii) Glasgow Coma Scale score of 13–15 after 30 minutes post-injury or later upon presentation for health care. These manifestations of mTBI must not be due to drugs, alcohol, or medications; caused by other injuries or treatment for other injuries (e.g., systemic injuries, facial injuries, or	Holm, 2005

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Organization	Definition	Reference/Year
	intubation); caused by other problems (e.g. psychological trauma, language barrier, or coexisting medical conditions); or caused by penetrating cranio-cerebral injury	
American Congress of Rehabilitation Medicine (ACRM)	A patient with mild traumatic brain injury is a person who has had a traumatically induced physiological disruption of brain function, as manifested by at least one of the following: 1. any period of loss of consciousness; 2. any loss of memory for events immediately before or after the accident; 3. any alteration in mental state at the time of the accident (e.g., feeling dazed, disoriented, or confused); and 4. focal neurological deficits that may or may not be transient; but where the severity of the injury does not exceed the following: loss of conscientiousness for approximately 30 minutes or less; after 30 minutes an initial Glasgow Coma Scale (GCS) of 13–15; posttraumatic amnesia not greater than 24 hours.	Kay et al., 1993

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REFERENCES

American Academy of Neurology. 2013. *Summary of evidence-based guideline update: Evaluation and management of concussion in sports*. https://www.aan.com/Guidelines/home/GuidelineDetail/582 (accessed August 12, 2018).

APA (American Psychiatric Association). 2013. *Diagnostic and statistical manual of mental disorders, fifth edition (DSM-5).* Arlington, VA: American Psychiatric Association.

BIAA (Brain Injury Association of America). 2011. *BIAA adopts new TBI definition*. https://www.biausa.org/public-affairs/public-awareness/news/biaa-adopts-new-tbi-definition (accessed August 12, 2018).

CDC (Centers for Disease Control and Prevention). 2017. *Traumatic brain injury & concussion*. https://www.cdc.gov/traumaticbraininjury/index.html (accessed August 12, 2018).

DVBIC (Defense and Veterans Brain Injury Center). 2007. *Screening for traumatic brain injury in troops returning from deployment in Afghanistan and Iraq: Initial investigation of the usefulness of a short screening tool for traumatic brain injury*. https://dvbic.dcoe.mil/research/screening-traumatic-brain-injury-troops-returning-deployment-afghanistan-and-iraq-initial (accessed August 24, 2018).

DVBIC. 2012. *Military acute concussion evaluation form*. https://health.mil/Reference-Center/Forms/2015/04/30/MACE-2012 (accessed August 28, 2018).

Holm, L., J. D. Cassidy, L. J. Carroll, and J. Borg. 2005. Summary of the WHO collaborating centre for neurotrauma task force on mild traumatic brain injury. *Journal of Rehabilitation Medicine* 37(3):137–141.

Kay, T., D. E. Harrington, R. Adams, T. Anderson, S. Berrol, K. Cicerone, C. Dahlberg, D. Gerber, R. Goka, P. Harley, J. Hilt, L. Horn, D. Lehmkuhl, and J. Malec. 1993. Definition of mild traumatic brain injury. *Journal of Head Trauma Rehabilitation* 8(3):86–87.

Malec, J. F., A. W. Brown, C. L. Leibson, J. T. Flaada, J. N. Mandrekar, N. N. Diehl, and P. K. Perkins. 2007. The Mayo classification system for traumatic brain injury severity. *Journal of Neurotrauma* 24(9):1417–1424.

McCrory, P., W. Meeuwisse, J. Dvorak, M. Aubry, J. Bailes, S. Broglio, R. C. Cantu, D. Cassidy, R. J. Echemendia, R. J. Castellani, G. A. Davis, R. Ellenbogen, C. Emery, L. Engebretsen, N. Feddermann-Demont, C. C. Giza, K. M. Guskiewicz, S. Herring, G. L. Iverson, K. M. Johnston, J. Kissick, J. Kutcher, J. J. Leddy, D. Maddocks, M. Makdissi, G. T. Manley, M. McCrea, W. P. Meehan, S. Nagahiro, J. Patricios, M. Putukian, K. J. Schneider, A. Sills, C. H. Tator, M. Turner, and P. E. Vos. 2017. Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016. *British Journal of Sports Medicine* 51(11):838–847.

NIH (National Institutes of Health). 2018. *Traumatic brain injury information*. https://www.ncbi.nlm.nih.gov/pubmed (accessed August 12, 2018).

VA (Department of Veterans Affairs). 2015. *Fact sheet: Coding guidance for traumatic brain injury (TBI)*. http://www.rstce.pitt.edu/va_tbi/documents/11192015/11192015_03.pdf (accessed August 11, 2018).

VA. 2017. *VA research on traumatic brain injury*. https://www.research.va.gov/topics/tbi.cfm (accessed August 12, 2018).

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C

Timeline of Disability and Veterans Compensation Policy

1636 To encourage service in the Pequot War, the Plymouth colony provides for the maintenance of disabled soldiers; the first veterans' benefits in an English-speaking colony.

1776 The Continental Congress promises pensions to officers and soldiers disabled in the course of service; land grants ranging from 100 to 1,100 acres based on rank were considered part of the contract of enlistment.

1778 The Continental Congress promises half-pay for 7 years to officers who serve until the end of the war.

1780 The Continental Congress promises half-pay for life to officers and for 7 years to the widows and orphans of officers who die in service; this is the first national provision for widows and orphans.

1783 Washington addresses his officers at Newburgh, New York, counseling patience in pursuing demands for past pay and pensions; the Commutation Act is passed; the Society of Cincinnati, the nation's first veterans' organization, is founded.

1808 Control of military pensions transferred from the states to the federal government.

1818 Service Pension Law passed; means-based; disability not a requirement.

1828 Full pay for life is granted to surviving officers, noncommissioned officers, and soldiers who had served until the end of the war.

1862 General Law Pension System implemented; Arrears Act passed.

1865 National Home for Disabled Volunteer Soldiers established (not just a single facility—various branches were constructed nationwide); veterans' preference for civil service legally established.

1866 The Grand Army of the Republic formed.

1879 The Arrears of Pension Act passed.

1885 Act of March 3, presumption of soundness at time of enlistment for all pension applicants, although soundness could be rebutted.

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1890 Dependent Pension Act is passed.

1913 The Veterans of Foreign Wars is formed from the merger of smaller organizations of veterans of the Spanish–American War and the Philippine Insurrection.

1917 War Risk Insurance Act authorizes the issuance of life insurance policies to members of the armed services; a standard schedule for rating service-connected disabilities is created based on average impairment.

1918 A vocational rehabilitation program is established for veterans.

1919 American Legion founded in Paris by American Expeditionary Force members.

1920 Disabled American Veterans formed.

1921 The Veterans Bureau is established to consolidate veterans' services into one agency.

1924 Pre-service occupation is considered in the determination of disability rating.

1930 Creation of the Veterans Administration.

1933 Repeal of the pre-service consideration in rating determination; valuation of ratings correlated with the consumer price index.

1936 Congress passes legislation (over President Roosevelt's veto) providing for immediate payment of the World War I bonus.

1937 The category "totally disabled" is established for veterans with certain disabilities.

1938 Service members injured in the line of duty are guaranteed disability benefits in light of a potential draft.

1939 Rating schedule is revised.

1940s President Roosevelt signs the Servicemen's Readjustment Act of 1944, commonly known as the G.I. Bill of Rights (Public Law 346); it provides home loans, education assistance, and other readjustment services to veterans.
Rehabilitation efforts for brain injury also grew out of treatment of war injuries during World War II with the efforts of Dr. Howard Kessler, a strong advocate of rehabilitation of veterans, and Dr. Howard Rusk, an Air Force colonel who demonstrated the effectiveness of physical medicine with injured pilots.
Howard Rusk and Omar Bradley work to reorganize the Veterans Administration. Rusk and Frank Krusen work to develop the Department of Veterans Affairs (VA) rehabilitation.

1952 American Psychiatric Association publishes the first edition of the *Diagnostic and Statistical Manual for Mental Disorders* (*DSM-I*); the volume includes an entry for the combat-related disorder "gross stress reaction."

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1956	Report of the President's Commission on Veterans' Benefits released.
1956	Social Security Disability Insurance is established to cover disability-related "involuntary retirement."
1957	Veterans Benefits Act of 1957.
1958	All laws concerning veterans' benefits updated.
1973	The United States institutes an all-volunteer armed forces; veteran's benefits become an important incentive for recruitment.
1989	The cabinet-level VA is established.
1990–2000s	A period of cost reduction, accountability, managed care, and the closing or merging of many programs in traumatic brain injury (TBI) rehabilitation, as well as a period of growth of research and push to develop evidence-based practice guidelines for treatment and rehabilitation. The large number of injuries associated with the wars in Iraq and Afghanistan after 2001 has been a catalyst to expand efforts in research, prevention, assessment, and treatment in rehabilitation of persons with TBI in military and civilian settings.
2008	DSM-5 TBI and its neuropsychiatric sequelae are considered in detail. Criteria for diagnosing an injury event as TBI and attributing neurocognitive problems to it are offered.
2010	Veterans' Benefits Act of 2010. Authorizes special monthly compensation for veterans with TBI who are in need of aid and attendance. Final rule effective June 7, 2018.
2016	December 21, 2016. Rule published in the *Federal Register* to add special monthly compensation for veterans with residuals of TBI.
2018	December 8, 2017, Rule published effective January 8, 2018, to amend VA's adjudication regulation pertaining to extra-schedular consideration of a service-connected disability in exceptional compensation cases. This rule clarifies that an extra-schedular evaluation is to be applied to an individual service-connected disability when the disability is so exceptional or unusual that it makes application of the regular rating schedule impractical.

REFERENCES

Adler, J. 2013. Paying the price of war: United States soldiers, veterans, and health policy, 1917–1924, New York: Columbia University.

IOM (Institute of Medicine). 2007. *PTSD compensation and military service*. Washington, DC: The National Academies Press.

SpringBoard. 2015. *The history of traumatic brain injury treatment*. https://www.springerpub.com/w/nursing/blog-the-history-of-traumatic-brain-injury-treatment (accessed February 2, 2019).

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Evaluation of the Disability Determination Process for Traumatic Brain Injury in Veterans

VA (Department of Veterans Affairs). 2018. *Title 38, part 3, adjudication, supplement 116*. https://www.benefits.va.gov/WARMS/docs/regs/38cfr/bookb/B116.pdf (accessed February 2, 2019).

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D

DBQ Initial Evaluation of Residuals of Traumatic Brain Injury (I-TBI) Disability[1]

Name of Patient/Veteran: _____SSN: _____

Your patient is applying to the U.S. Department of Veterans Affairs (VA) for disability benefits.

VA will consider the information you provide on this questionnaire as part of their evaluation in processing the Veteran's claim.

SECTION I

1. Diagnosis

Does the Veteran now have or has he/she ever had a traumatic brain injury (TBI) or any residuals of a TBI?

☐ Yes ☐ No

If yes, select the Veteran's condition (check all that apply):

☐ Traumatic brain injury (TBI) ICD code: _____ Date of diagnosis: _____

☐ Other diagnosed residuals attributable to TBI, specify: _____

Other diagnosis #1: _____
ICD code: _____
Date of diagnosis: _____

Other diagnosis #2: _____
ICD code: _____
Date of diagnosis: _____

Other diagnosis #3: _____
ICD code: _____
Date of diagnosis: _____

Other diagnosis #4: _____
ICD code: _____
Date of diagnosis: _____

[1] Published by the Department of Veterans Affairs. See https://www.dcms.uscg.mil/Portals/10/CG-1/PSC/PSD/docs/VBA%20-%20Initial%20evaluation%20of%20TBI%20residuals.pdf?ver=2017-03-28-105323-973 (accessed December 28, 2018).

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If there are additional diagnoses that pertain to the residuals of a TBI, list using above format: _____

2. Medical history

a. Describe the history (including onset and course) of the Veteran's TBI and residuals attributable to TBI (brief summary): _____

b. Was the Veteran exposed to any blasts?

☐ Yes ☐ No
If yes, indicate number of blasts:
☐ 1 ☐ 2 ☐ 3 ☐ More than 3
Date of first blast exposure: _____
Date of last blast exposure: _____
How many blasts were severe enough to knock Veteran down or cause injury?
☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ More than 3

c. Does the Veteran's treatment plan include taking continuous medication for the diagnosed condition?

☐ Yes ☐ No
If yes, list only those medications used for the diagnosed condition: _____

3. Evidence review

Was medical evidence available for review as part of this examination?

☐ Yes ☐ No
If yes, indicate evidence reviewed as part of this examination (check all that apply):

☐ VA claims file (C-file)
If checked, documents listed separately below that are included in a C-file do not need to be additionally indicated.
☐ Veterans Health Administration medical records (CPRS treatment records)
☐ Civilian medical records
☐ Military service treatment records
☐ Military service personnel records
☐ Military enlistment examination
☐ Military separation examination
☐ Military post-deployment questionnaire
☐ Department of Defense Form 214 separation document
☐ Previous disability decision letters
☐ Correspondence and non-medical documents related to condition
☐ Interviews with collateral witnesses (family and others who have known the Veteran before and after military service)
☐ Medical evidence brought to exam by Veteran
If checked, describe: _____
☐ Other, describe: _____

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SECTION II. Assessment of cognitive impairment and other residuals of TBI

NOTE: For each of the following 10 facets of TBI-related cognitive impairment and subjective symptoms (facets 1–10 below), select the ONE answer that best represents the Veteran's current functional status.

Neuropsychological testing may need to be performed in order to be able to accurately complete this section. If neuropsychological testing has been performed and accurately reflects the Veteran's current functional status, repeat testing is not required.

1. Memory, attention, concentration, executive functions

- ☐ No complaints of impairment of memory, attention, concentration, or executive functions.
- ☐ A complaint of mild memory loss (such as having difficulty following a conversation, recalling recent conversations, remembering names of new acquaintances, or finding words, or often misplacing items), attention, concentration, or executive functions, but without objective evidence on testing.
- ☐ Objective evidence on testing of mild impairment of memory, attention, concentration, or executive functions resulting in mild functional impairment.
- ☐ Objective evidence on testing of moderate impairment of memory, attention, concentration, or executive functions resulting in moderate functional impairment.
- ☐ Objective evidence on testing of severe impairment of memory, attention, concentration, or executive functions resulting in severe functional impairment.

If the Veteran has complaints of impairment of memory, attention, concentration or executive functions, describe (brief summary):

_____

2. Judgment

- ☐ Normal
- ☐ Mildly impaired judgment. For complex or unfamiliar decisions, occasionally unable to identify, understand, and weigh the alternatives, understand the consequences of choices, and make a reasonable decision.
- ☐ Moderately impaired judgment. For complex or unfamiliar decisions, usually unable to identify, understand, and weigh the alternatives, understand the consequences of choices, and make a reasonable decision, although has little difficulty with simple decisions.
- ☐ Moderately severely impaired judgment. For even routine and familiar decisions, occasionally unable to identify, understand, and weigh the alternatives, understand the consequences of choices, and make a reasonable decision.
- ☐ Severely impaired judgment. For even routine and familiar decisions, usually unable to identify, understand, and weigh the alternatives, understand the consequences of choices, and make a reasonable decision. For example, unable to determine appropriate clothing for current weather conditions or judge when to avoid dangerous situations or activities.

If the Veteran has impaired judgment, describe (brief summary): _____

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3. Social interaction

☐ Social interaction is routinely appropriate.
☐ Social interaction is occasionally inappropriate.
☐ Social interaction is frequently inappropriate.
☐ Social interaction is inappropriate most or all of the time.

If the Veteran's social interaction is not routinely appropriate, describe (brief summary):

4. Orientation

☐ Always oriented to person, time, place, and situation.
☐ Occasionally disoriented to one of the four aspects (person, time, place, situation) of orientation.
☐ Occasionally disoriented to two of the four aspects (person, time, place, situation) of orientation or often disoriented to one aspect of orientation.
☐ Often disoriented to two or more of the four aspects (person, time, place, situation) of orientation.
☐ Consistently disoriented to two or more of the four aspects (person, time, place, situation) of orientation.

If the Veteran is not always oriented to person, time, place, and situation, describe (brief summary): _____

5. Motor activity (with intact motor and sensory system)

☐ Motor activity normal.
☐ Motor activity is normal most of the time, but mildly slowed at times due to apraxia (inability to perform previously learned motor activities, despite normal motor function).
☐ Motor activity is mildly decreased or with moderate slowing due to apraxia.
☐ Motor activity moderately decreased due to apraxia.
☐ Motor activity severely decreased due to apraxia.

If the Veteran has any abnormal motor activity, describe (brief summary): _____

6. Visual spatial orientation

☐ Normal
☐ Mildly impaired. Occasionally gets lost in unfamiliar surroundings, has difficulty reading maps or following directions. Is able to use assistive devices such as GPS (global positioning system).
☐ Moderately impaired. Usually gets lost in unfamiliar surroundings, has difficulty reading maps, following directions, and judging distance. Has difficulty using assistive devices such as GPS (global positioning system).
☐ Moderately severely impaired. Gets lost even in familiar surroundings, unable to use assistive devices such as GPS (global positioning system).
☐ Severely impaired. May be unable to touch or name own body parts when asked by the examiner, identify the relative position in space of two different objects, or find the way from one room to another in a familiar environment.

If the Veteran has impaired visual spatial orientation, describe (brief summary): _____

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7. Subjective symptoms

- ☐ No subjective symptoms.
- ☐ Subjective symptoms that do not interfere with work; instrumental activities of daily living; or work, family or other close relationships. Examples are: mild or occasional headaches, mild anxiety.
- ☐ Three or more subjective symptoms that mildly interfere with work; instrumental activities of daily living; or work, family or other close relationships. Examples of findings that might be seen at this level of impairment are: intermittent dizziness, daily mild to moderate headaches, tinnitus, frequent insomnia, hypersensitivity to sound, hypersensitivity to light.
- ☐ Three or more subjective symptoms that moderately interfere with work; instrumental activities of daily living; or work, family or other close relationships. Examples of findings that might be seen at this level of impairment are: marked fatigability, blurred or double vision, headaches requiring rest periods during most days.

If the Veteran has subjective symptoms, describe (brief summary): _____

8. Neurobehavioral effects

NOTE: Examples of neurobehavioral effects of TBI include: irritability, impulsivity, unpredictability, lack of motivation, verbal aggression, physical aggression, belligerence, apathy, lack of empathy, moodiness, and lack of cooperation, inflexibility, and impaired awareness of disability. Any of these effects may range from slight to severe, although verbal and physical aggression are likely to have a more serious impact on workplace interaction and social interaction than some of the other effects.

- ☐ No neurobehavioral effects.
- ☐ One or more neurobehavioral effects that do not interfere with workplace interaction or social interaction.
- ☐ One or more neurobehavioral effects that occasionally interfere with workplace interaction, social interaction, or both but do not preclude them.
- ☐ One or more neurobehavioral effects that frequently interfere with workplace interaction, social interaction, or both but do not preclude them.
- ☐ One or more neurobehavioral effects that interfere with or preclude workplace interaction, social interaction, or both on most days or that occasionally require supervision for safety of self or others.

If the Veteran has any neurobehavioral effects, describe (brief summary): _____

9. Communication

- ☐ Able to communicate by spoken and written language (expressive communication) and to comprehend spoken and written language.
- ☐ Comprehension or expression, or both, of either spoken language or written language is only occasionally impaired. Can communicate complex ideas.
- ☐ Inability to communicate either by spoken language, written language, or both, more than occasionally but less than half of the time, or to comprehend spoken language, written language, or both, more than occasionally but less than half of the time. Can generally communicate complex ideas.

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☐ Inability to communicate either by spoken language, written language, or both, at least half of the time but not all of the time, or to comprehend spoken language, written language, or both, at least half of the time but not all of the time. May rely on gestures or other alternative modes of communication. Able to communicate basic needs.

☐ Complete inability to communicate either by spoken language, written language, or both, or to comprehend spoken language, written language, or both. Unable to communicate basic needs.

If the Veteran is not able to communicate by or comprehend spoken or written language, describe (brief summary): _____

10. Consciousness

☐ Normal

☐ Persistent altered state of consciousness, such as vegetative state, minimally responsive state, coma.

If checked, describe altered state of consciousness (brief summary):

SECTION III

1. Residuals

Does the Veteran have any subjective symptoms or any mental, physical, or neurological conditions or residuals attributable to a TBI (such as migraine headaches or Meniere's disease)?

☐ Yes ☐ No

If yes, check all that apply:

☐ Motor dysfunction

If checked, ALSO complete specific Joint or Spine Questionnaire for the affected joint or spinal area.

☐ Sensory dysfunction

If checked, ALSO complete appropriate Cranial or Peripheral Nerve Questionnaire.

☐ Hearing loss and/or tinnitus

If checked, ALSO complete a Hearing Loss and Tinnitus Questionnaire.

☐ Visual impairment

If checked, ALSO complete an Eye Questionnaire.

☐ Alteration of sense of smell or taste

If checked, ALSO complete a Loss of Sense of Smell and Taste Questionnaire.

☐ Seizures

If checked, ALSO complete a Seizure Disorder Questionnaire.

☐ Gait, coordination, and balance

If checked, ALSO complete appropriate Questionnaire for underlying cause of gait and balance disturbance, such as Ear Questionnaire.

☐ Speech (including aphasia and dysarthria)

If checked, ALSO complete appropriate Questionnaire.

☐ Neurogenic bladder

If checked, ALSO complete appropriate Genitourinary Questionnaire.

☐ Neurogenic bowel

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If checked, ALSO complete appropriate Intestines Questionnaire.
☐ Cranial nerve dysfunction
If checked, ALSO complete a Cranial Nerves Questionnaire.
☐ Skin disorders
If checked, ALSO complete a Skin and/or Scars Questionnaire.
☐ Endocrine dysfunction
If checked, ALSO complete an Endocrine Conditions Questionnaire.
☐ Erectile dysfunction
If checked, ALSO complete Male Reproductive Conditions Questionnaire.
☐ Headaches, including Migraine headaches
If checked, ALSO complete a Headache Questionnaire.
☐ Meniere's disease
If checked, ALSO complete an Ear Conditions Questionnaire.
☐ Mental disorder (including emotional, behavioral, or cognitive)
If checked, ALSO complete Mental Disorders or PTSD Questionnaire.
☐ Other, describe: _____
If checked, ALSO complete appropriate Questionnaire.

2. Other pertinent physical findings, scars, complications, conditions, signs and/or symptoms

a. Does the Veteran have any scars (surgical or otherwise) related to any conditions or to the treatment of any conditions listed in the Diagnosis section above?
☐ Yes ☐ No
If yes, are any of the scars painful and/or unstable, or is the total area of all related scars greater than 39 square cm (6 square inches)?
☐ Yes ☐ No
If yes, also complete a Scars Questionnaire.
b. Does the Veteran have any other pertinent physical findings, complications, conditions, signs and/or symptoms?
☐ Yes ☐ No
If yes, describe (brief summary): _____

3. Diagnostic testing

NOTE: If diagnostic test results are in the medical record and reflect the Veteran's current TBI residuals, repeat testing is not required.

a. Has neuropsychological testing been performed?
☐ Yes ☐ No
If yes, provide date: _____
Results: _____
b. Have diagnostic imaging studies or other diagnostic procedures been performed?
☐ Yes ☐ No
If yes, check all that apply:

☐ Magnetic resonance imaging (MRI)
Date: _____ Results: _____

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☐ Computed tomography (CT)
Date: _____ Results: _____
☐ EEG
Date: _____ Results: _____
☐ Other, describe:
Date: _____ Results: _____

c. Has laboratory testing been performed?
☐ Yes ☐ No
If yes, specify tests: Date: _____ Results: _____

d. Are there any other significant diagnostic test findings and/or results?
☐ Yes ☐ No
If yes, provide type of test or procedure, date and results (brief summary): _____

4. Functional impact

Do any of the Veteran's residual conditions attributable to a traumatic brain injury impact his or her ability to work?
☐ Yes ☐ No
If yes, describe impact of each of the Veteran's residual conditions attributable to a traumatic brain injury, providing one or more examples: _____

5. Remarks, if any:
_____

Physician signature: _____ Date: _____
Physician printed name: _____
Medical license #: _____ Physician address: _____
Phone: _____ Fax: _____

NOTE: The VA may request additional medical information, including additional examinations if necessary to complete the VA's review of the veteran's application.

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E

§ 4.124a Schedule of Ratings—Neurological Conditions and Convulsive Disorders[1]

With the exceptions noted, disability from the following diseases and their residuals may be rated from 10 percent to 100 percent in proportion to the impairment of motor, sensory, or mental function. Consider especially psychotic manifestations, complete or partial loss of use of one or more extremities, speech disturbances, impairment of vision, disturbances of gait, tremors, visceral manifestations, etc., referring to the appropriate bodily system of the schedule. With partial loss of use of one or more extremities from neurological lesions, rate by comparison with the mild, moderate, severe, or complete paralysis of peripheral nerves.

Note: It is required for the minimum ratings for residuals under diagnostic codes 8000–8025 that there be ascertainable residuals. Determinations as to the presence of residuals not capable of objective verification, i.e., headaches, dizziness, fatigability, must be approached on the basis of the diagnosis recorded; subjective residuals will be accepted when consistent with the disease and not more likely attributable to other disease or no disease. It is of exceptional importance that when ratings in excess of the prescribed minimum ratings are assigned, the diagnostic codes utilized as bases of evaluation be cited, in addition to the codes identifying the diagnoses.

8045 Residuals of Traumatic Brain Injury (TBI)

There are three main areas of dysfunction that may result from TBI and have profound effects on functioning: cognitive (which is common in varying degrees after TBI), emotional/behavioral, and physical. Each of these areas of dysfunction may require evaluation.

Cognitive impairment is defined as decreased memory, concentration, attention, and executive functions of the brain. Executive functions are goal setting, speed of information processing, planning, organizing, prioritizing, self-monitoring, problem solving, judgment, decision making, spontaneity, and flexibility in changing actions when they are not productive. Not all of these brain functions may be affected in a given individual with cognitive impairment, and some functions may be affected more severely than others. In a given individual, symptoms may fluctuate in severity from day to day. Evaluate cognitive impairment under the table titled "Evaluation of Cognitive Impairment and Other Residuals of TBI Not Otherwise Classified."

[1] Published by the Department of Veterans Affairs. See https://www.benefits.va.gov/warms/bookc.asp (accessed December 28, 2018).

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Subjective symptoms may be the only residual of TBI or may be associated with cognitive impairment or other areas of dysfunction. Evaluate subjective symptoms that are residuals of TBI, whether or not they are part of cognitive impairment, under the subjective symptoms facet in the table titled "Evaluation of Cognitive Impairment and Other Residuals of TBI Not Otherwise Classified." However, separately evaluate any residual with a distinct diagnosis that may be evaluated under another diagnostic code, such as migraine headache or Meniere's disease, even if that diagnosis is based on subjective symptoms, rather than under the "Evaluation of Cognitive Impairment and Other Residuals of TBI Not Otherwise Classified" table.

Evaluate emotional/behavioral dysfunction under § 4.130 (Schedule of ratings—mental disorders) when there is a diagnosis of a mental disorder. When there is no diagnosis of a mental disorder, evaluate emotional/behavioral symptoms under the criteria in the table titled "Evaluation of Cognitive Impairment and Other Residuals of TBI Not Otherwise Classified."

Evaluate physical (including neurological) dysfunction based on the following list, under an appropriate diagnostic code: motor and sensory dysfunction, including pain, of the extremities and face; visual impairment; hearing loss and tinnitus; loss of sense of smell and taste; seizures; gait, coordination, and balance problems; speech and other communication difficulties, including aphasia and related disorders, and dysarthria; neurogenic bladder; neurogenic bowel; cranial nerve dysfunctions; autonomic nerve dysfunctions; and endocrine dysfunctions.

The preceding list of types of physical dysfunction does not encompass all possible residuals of TBI. For residuals not listed here that are reported on an examination, evaluate under the most appropriate diagnostic code. Evaluate each condition separately, as long as the same signs and symptoms are not used to support more than one evaluation, and combine under § 4.25 the evaluations for each separately rated condition. The evaluation assigned based on the "Evaluation of Cognitive Impairment and Other Residuals of TBI Not Otherwise Classified" table will be considered the evaluation for a single condition for purposes of combining with other disability evaluations.

Consider the need for special monthly compensation for such problems as loss of use of an extremity, certain sensory impairments, erectile dysfunction, the need for aid and attendance (including for protection from hazards or dangers incident to the daily environment due to cognitive impairment), being housebound, etc.

Evaluation of Cognitive Impairment and Subjective Symptoms

The table titled "Evaluation of Cognitive Impairment and Other Residuals of TBI Not Otherwise Classified" contains 10 important facets of TBI related to cognitive impairment and subjective symptoms. It provides criteria for levels of impairment for each facet, as appropriate, ranging from 0 to 3, and a fifth level, the highest level of impairment, labeled "total." However, not every facet has every level of severity. The Consciousness facet, for example, does not provide for an impairment level other than "total," since any level of impaired consciousness would be totally disabling. Assign a 100 percent evaluation if "total" is the level of evaluation for one or more facets. If no facet is evaluated as "total," assign the overall percentage evaluation based on the level of the highest facet as follows: 0 = 0 percent; 1 = 10 percent; 2 = 40 percent; and 3 = 70 percent. For example, assign a 70 percent evaluation if 3 is the highest level of evaluation for any facet.

Note (1): There may be an overlap of manifestations of conditions evaluated under the table titled "Evaluation of Cognitive Impairment and Other Residuals of TBI Not Otherwise

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Classified" with manifestations of a comorbid mental or neurologic or other physical disorder that can be separately evaluated under another diagnostic code. In such cases, do not assign more than one evaluation based on the same manifestations. If the manifestations of two or more conditions cannot be clearly separated, assign a single evaluation under whichever set of diagnostic criteria allows the better assessment of overall impaired functioning due to both conditions. However, if the manifestations are clearly separable, assign a separate evaluation for each condition.

Note (2): Symptoms listed as examples at certain evaluation levels in the table are only examples and are not symptoms that must be present in order to assign a particular evaluation.

Note (3): "Instrumental activities of daily living" refers to activities other than self-care that are needed for independent living, such as meal preparation, doing housework and other chores, shopping, traveling, doing laundry, being responsible for one's own medications, and using a telephone. These activities are distinguished from "Activities of daily living," which refers to basic self-care and includes bathing or showering, dressing, eating, getting in or out of bed or a chair, and using the toilet.

Note (4): The terms "mild," "moderate," and "severe" TBI, which may appear in medical records, refer to a classification of TBI made at, or close to, the time of injury rather than to the current level of functioning. This classification does not affect the rating assigned under diagnostic code 8045.

Note (5): A veteran whose residuals of TBI are rated under a version of § 4.124a, diagnostic code 8045, in effect before October 23, 2008, may request review under diagnostic code 8045, irrespective of whether his or her disability has worsened since the last review. VA will review that veteran's disability rating to determine whether the veteran may be entitled to a higher disability rating under diagnostic code 8045. A request for review pursuant to this note will be treated as a claim for an increased rating for purposes of determining the effective date of an increased rating awarded as a result of such review; however, in no case will the award be effective before October 23, 2008. For the purposes of determining the effective date of an increased rating awarded as a result of such review, VA will apply 38 CFR 3.114, if applicable.

TABLE E-1 Evaluation of Cognitive Impairment and Other Residuals of TBI Not Otherwise Classified

Facets of Cognitive Impairment and Other Residuals of TBI Not Otherwise Classified	Level of Impairment	Criteria
Memory, attention, concentration, executive functions	0	No complaints of impairment of memory, attention, concentration, or executive functions.
	1	A complaint of mild loss of memory (such as having difficult following a conversation, recalling recent conversations, remembering names of new acquaintances, or finding words, or often misplacing items), attention, concentration, or executive functions, but without objective evidence on testing.
	2	Objective evidence on testing of mild impairment of memory, attention, concentration, or executive functions resulting in mild functional impairment.

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Facets of Cognitive Impairment and Other Residuals of TBI Not Otherwise Classified	Level of Impairment	Criteria
	3	Objective evidence on testing of moderate impairment of memory, attention, concentration, or executive functions resulting in moderate functional impairment.
	Total	Objective evidence on testing of severe impairment of memory, attention, concentration, or executive functions resulting in severe functional impairment.
Judgment	0	Normal.
	1	Mildly impaired judgment. For complex or unfamiliar decisions, occasionally unable to identify, understand, and weigh the alternatives, understand the consequences of choices, and make a reasonable decision.
	2	Moderately impaired judgment. For complex or unfamiliar decisions, usually unable to identify, understand, and weigh the alternatives, understand the consequences of choices, and make a reasonable decision, although has little difficulty with simple decisions.
	3	Moderately impaired judgment. For complex or unfamiliar decisions, usually unable to identify, understand, and weigh the alternatives, understand the consequences of choices, and make a reasonable decision, although has little difficulty with simple decisions.
	Total	Severely impaired judgment. For even routine and familiar decisions, usually unable to identify, understand, and weigh the alternatives, understand the consequences of choices, and make a reasonable decision. For example, unable to determine appropriate clothing for current weather conditions or judge when to avoid dangerous situations or activities.
Social interaction	0	Social interaction is routinely appropriate.
	1	Social interaction is occasionally inappropriate.
	2	Social interaction is frequently inappropriate.
	3	Social interaction is inappropriate most or all of the time.
Orientation	0	Always oriented to person, time, place, and situation.
	1	Occasionally disoriented to one of the four aspects (person, time, place, situation) of orientation.
	2	Occasionally disoriented to two of the four aspects (person, time, place, situation) of orientation or often disoriented to one aspect of orientation.
	3	Often disoriented to two or more of the four aspects (person, time, place, situation) of orientation.

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	Total	Consistently disoriented to two or more of the four aspects (person, time, place, situation) of orientation.
Motor activity (with intact motor and sensory system)	0	Motor activity normal.
	1	Motor activity normal most of the time, but mildly slowed at times due to apraxia (inability to perform previously learned motor activities, despite normal motor function).
	2	Motor activity mildly decreased or with moderate slowing due to apraxia.
	3	Motor activity moderately decreased due to apraxia.
	Total	Motor activity severely decreased due to apraxia.
Visual spatial orientation	0	Normal.
	1	Mildly impaired. Occasionally gets lost in unfamiliar surroundings, has difficulty reading maps or following directions. Is able to use assistive devices such as GPS (global positioning system).
	2	Moderately impaired. Usually gets lost in unfamiliar surroundings, has difficulty reading maps, following directions, and judging distance. Has difficulty using assistive devices such as GPS (global positioning system).
	3	Moderately severely impaired. Gets lost even in familiar surroundings, unable to use assistive devices such as GPS (global positioning system).
	Total	Severely impaired. May be unable to touch or name own body parts when asked by the examiner, identify the relative position in space of two different objects, or find the way from one room to another in a familiar environment.
Subjective symptoms	0	Subjective symptoms that do not interfere with work; instrumental activities of daily living; or work, family, or other close relationships. Examples are: mild or occasional headaches, mild anxiety.
	1	Three or more subjective symptoms that mildly interfere with work; instrumental activities of daily living; or work, family, or other close relationships. Examples of findings that might be seen at this level of impairment are: intermittent dizziness, daily mild to moderate headaches, tinnitus, frequent insomnia, hypersensitivity to sound, hypersensitivity to light.
	2	Three or more subjective symptoms that moderately interfere with work; instrumental activities of daily living; or work, family, or other close relationships. Examples of findings that might be seen at this level of impairment are: marked fatigability, blurred or double vision, headaches requiring rest periods during most days.

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Facets of Cognitive Impairment and Other Residuals of TBI Not Otherwise Classified	Level of Impairment	Criteria
Neurobehavioral effects	0	One or more neurobehavioral effects that do not interfere with workplace interaction or social interaction. Examples of neurobehavioral effects are: irritability, impulsivity, unpredictability, lack of motivation, verbal aggression, physical aggression, belligerence, apathy, lack of empathy, moodiness, lack of cooperation, inflexibility, and impaired awareness of disability. Any of these effects may range from slight to severe, although verbal and physical aggression are likely to have a more serious impact on workplace interaction and social interaction than some of the other effects.
	1	One or more neurobehavioral effects that occasionally interfere with workplace interaction, social interaction, or both but do not preclude them.
	2	One or more neurobehavioral effects that frequently interfere with workplace interaction, social interaction, or both but do not preclude them.
	3	One or more neurobehavioral effects that interfere with or preclude workplace interaction, social interaction, or both on most days or that occasionally require supervision for safety of self or others.
Communication	0	Able to communicate by spoken and written language (expressive communication), and to comprehend spoken and written language.
	1	Comprehension or expression, or both, of either spoken language or written language is only occasionally impaired. Can communicate complex ideas.
	2	Inability to communicate either by spoken language, written language, or both, more than occasionally but less than half of the time, or to comprehend spoken language, written language, or both, more than occasionally but less than half of the time. Can generally communicate complex ideas.
	3	Inability to communicate either by spoken language, written language, or both, at least half of the time but not all of the time, or to comprehend spoken language, written language, or both, at least half of the time but not all of the time. May rely on gestures or other alternative modes of communication. Able to communicate basic needs.
	Total	Complete inability to communicate either by spoken language, written language, or both, or to comprehend spoken language, written language, or both. Unable to communicate basic needs.
Consciousness	Total	Persistently altered state of consciousness, such as vegetative state minimally responsive state, coma.

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F

Case Definitions of Traumatic Brain Injury

Organization	Year	Mild	Moderate	Severe
American Congress of Rehabilitation Medicine	1993	GCS 13–15 and a minimum of 1 of the following: (1) any LOC; (2) any amnesia; (3) alteration in mental status (e.g., dazed, disoriented, or confused); or (4) focal neurologic deficits (may or may not be transient)	NA	NA
American Academy of Neurology	1997	Grade 1: no LOC, transient confusion, symptoms (e.g., headaches and dizziness) and mental status changes (e.g., befuddlement, inability to focus attention, or post-traumatic amnesia) resolve in less than 15 minutes Grade 2: no LOC, transient confusion, symptoms or mental status changes last more than 15 minutes Grade 3: LOC (seconds or minutes)	NA	NA
American Medical Society for Sports Medicine	2013	Diagnosis guided by standardized symptoms checklist, cognitive tools, balance tests, and further neurologic physical examination and previous medical history	NA	NA
Centers for Disease Control and Prevention	2012	Normal imaging, LOC <30 minutes, PTA <24 hours, GCS (best score within 24 hours) 13–15, AIS: head 1–2	Normal or abnormal imaging, LOC 30 min to 24 hours, PTA >1 day, <7 days; GCS (best score within 24 hours) 9–12, AIS: head 3	Normal or abnormal, LOC >24 hours, PTA >7 days, GCS (best score

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Organization	Year	Mild	Moderate	Severe
				within 24 hours) 3–8, AIS: head 4–6
Department of Defense/ Department of Veterans Affairs	2009	GCS (best available score in first 24 hours) 13–15 and one or more of the following: (1) LOC ≤30 minutes; (2) PTA ≤24 hours; or (3) alteration in mental status ≤24 hours	GCS (best available score in first 24 hours) 9–12 and one or more of the following: (1) LOC 30 minutes–24 hours; (2) PTA 24 hours–7 days; or (3) alteration in mental status >24 hours	GCS (best available score in first 24 hours) 3–8 and one or more of the following: (1) LOC ≥24 hours; (2) PTA ≥7 days; or (3) alteration in mental status >24 hours
Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition	2013	Severity rating criteria include loss of consciousness, PTA, and disorientation and confusion at initial assessment (GCS score)	In more severe TBI in which there is brain contusion, intracranial hemorrhage, or penetrating injury, there may be additional neurocognitive deficits, such as aphasia, neglect, and constructional dyspraxia	[See previous column]
International Conference on Concussion in Sport	2017	Sport-related concussion is a traumatic brain injury induced by biomechanical forces. Clinical definition can include (1) caused either by a direct blow to the head, face, neck or elsewhere on the body with an impulsive force transmitted to the head (2) typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. However, in some cases, signs and symptoms evolve over a number of minutes to hours (3) may result in neuropathological changes, but the acute clinical signs	NA	NA

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Organization	Year	Mild	Moderate	Severe
		and symptoms largely reflect a functional disturbance rather than a structural injury and, as such, no abnormality is seen on standard structural neuroimaging studies (4) results in a range of clinical signs and symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive features typically follows a sequential course. However, in some cases symptoms may be prolonged		
Mayo Classification System	2007	Probable mTBI if one or more of the following criteria apply: loss of consciousness is momentary to 30 minutes and PTA does not extend beyond 24 hours. If the individual sustains a depressed, basilar, or linear skull fracture (dura intact), then the TBI is still a probable mTBI. Possible TBI if one or more of the following symptoms are present: blurred vision, confusion, dazed, dizziness, focal neurological symptoms, headache, or nausea	Definite moderate–severe TBI if one of the following was present: death due to this TBI, loss of consciousness of 30 minutes or more, post-traumatic amnesia of 24 hours or more, worst Glasgow Coma Scale score in the first 24 hours <13 (unless invalidated by factors such as intoxication, sedation, systemic shock). Or, evidence of hematoma, contusion, penetrating TBI, hemorrhage, brain stem injury	[See previous column]
National Institute of Neurological Disorders and Stroke	2018	A person with an mTBI may remain conscious or may experience a loss of consciousness for a few seconds or minutes. Other symptoms of mTBI include headache, confusion, lightheadedness, dizziness, blurred vision or tired eyes, ringing in the ears, bad taste in the mouth, fatigue or lethargy, a change in sleep patterns, behavioral or mood changes, and trouble with	A person with a moderate or severe TBI may show these same symptoms, but may also have a headache that gets worse or does not go away, repeated vomiting or nausea, convulsions or seizures, an inability to awaken from sleep, dilation of one or both pupils of the eyes, slurred speech, weakness or numbness in the extremities, loss of coordination, and increased	[See previous column]

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Organization	Year	Mild	Moderate	Severe
		memory, concentration, attention, or thinking	confusion, restlessness, or agitation	
World Health Organization	2004	GCS 13–15 after 30 minutes postinjury or later and one or more of the following: (1) confusion or disorientation; (2) LOC ≤30 minutes; (3) PTA <24 hours; (4) transient neurologic abnormalities (focal signs or seizure); or (5) intracranial lesion not requiring surgery	NA	NA

NOTE: AIS = Abbreviated Injury Scale/Score; GSC = Glasgow Coma Score; LOC = loss of consciousness; mTBI = mild traumatic brain injury; NA = not applicable/available; PTA = posttraumatic amnesia; TBI = traumatic brain injury.

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G

MACE 2: Military Acute Concussion Evaluation

MACE 2
Military Acute Concussion Evaluation

Use MACE 2 as close to time of injury as possible.

Service Member Name: _____

DoDI/EDIPI/SSN:_____Branch of Service & Unit:_____

Date of Injury:_____Time of Injury: _____

Examiner: _____

Date of Evaluation:_____Time of Evaluation: _____

Purpose: MACE 2 is a multimodal tool that assists providers in the assessment and diagnosis of concussion. The scoring, coding and steps to take after completion are found at the end of the MACE 2.

Timing: MACE 2 is most effective when used as close to the time of injury as possible. The MACE 2 may be repeated to evaluate recovery.

RED FLAGS

Evaluate for red flags in patients with Glasgow Coma Scale (GCS) 13-15.

- Deteriorating level of consciousness
- Double vision
- Increased restlessness, combative or agitated behavior
- Repeat vomiting
- Results from a structural brain injury detection device (if available)
- Seizures
- Weakness or tingling in arms or legs
- Severe or worsening headache

Defer MACE 2 if any red flags are present. Immediately consult higher level of care and consider urgent evacuation according to evacuation precedence/Tactical Combat Casualty Care (TCCC).

- **Negative for all red flags**
  Continue MACE 2, and observe for red flags throughout evaluation.

Revised 10/2018 dvbic.dcoe.mil Page 1 of 14

MILITARY ACUTE CONCUSSION SCREENING

Complete this section to determine if there was an injury event AND an alteration of consciousness or memory.

1. Description of Incident

A. Record the event as described by the service member or witness.
Use open-ended questions to get as much detail as possible.

_____
_____
_____
_____

Key questions:
- Can you tell me what you remember?
- What happened?
- Who were you last with?

B. Observable Signs

At the time of injury were any of these observable signs witnessed?
Visual clues that suggest a possible concussion include:

- Lying motionless on the ground
- Slow to get up after a direct or indirect blow to the head
- Disorientation, confusion, or an inability to respond appropriately to questions
- Blank or vacant look
- Balance difficulties, stumbling, or slow labored movements
- Facial injury after head trauma
- Negative for all observable signs

C. Record the type of event.
Check all that apply:

- ☐ Blunt object
- ☐ Sports injury
- ☐ Gunshot wound
- ☐ Fall
- ☐ Assault
- ☐ Explosion/blast Estimated distance ____
- ☐ Fragment
- ☐ Motor vehicle crash
- ☐ Other _____

D. Was there a blow or jolt to the head?

- Did your head hit any objects?
- Did any objects strike your head?
- Did you feel a blast wave? (A blast wave that is felt striking the body or head is considered a blow to the head.)
- Did you have a head acceleration or deceleration?

☐ YES ☐ NO ☐ UNKNOWN

Revised 10/2018 dvbic.dcoe.mil Page 2 of 14

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2. Alteration of Consciousness or Memory

A. Was there alteration of consciousness (AOC)?
AOC is temporary confusion or "having your bell rung."
☐ YES ☐ NO
If yes, for how long?_____seconds ____minutes
☐ UNKNOWN

Key questions:
- Were you dazed, confused, or did you "see stars" immediately after the event?
- Did you feel like you were in a fog, slowed down, or "something was not right"?

B. Was there loss of consciousness (LOC)?
LOC is temporarily passing out or blacking out.
☐ YES ☐ NO
If yes, for how long?_____seconds ____minutes
☐ UNKNOWN

Key questions:
- Did you pass out or black out?
- Is there a period of time you cannot account for?

C. Was there any post traumatic amnesia (PTA)?
PTA is a problem remembering part or all of the injury events.
☐ YES ☐ NO
If yes, for how long?_____seconds ____minutes
☐ UNKNOWN

Key questions:
- Is there a period of time you cannot account for?
- What is the last thing you remember before the event?
- What is the first thing you remember after the event?

D. Was the AOC, LOC or PTA witnessed?
☐ YES ☐ NO
If yes, for how long?_____seconds ____minutes
☐ UNKNOWN

Tips for assessment:
- Ask witness to verify AOC, LOC or PTA and estimate duration.

3. Symptoms

Common symptoms after a concussion are listed below. For this event, check all that apply.

- Headache
- Dizziness
- Memory problems
- Balance problems
- Nausea/vomiting
- Difficulty concentrating
- Irritability
- Visual disturbances
- Ringing in the ears
- Other _____
- **Negative for all symptoms**

Revised 10/2018 dvbic.dcoe.mil Page 3 of 14

4. History

A. During the past 12 months, were you diagnosed with a concussion, not counting this event?
☐ YES ☐ NO
If yes, how many? ____
☐ UNKNOWN

B. History of diagnosed/treated headache disorder or migraine.
☐ YES ☐ NO

C. History of depression, anxiety, or other behavioral health concerns.
☐ YES ☐ NO

CONCUSSION SCREENING RESULTS (Possible Concussion?)

Was there a blow or jolt to the head (1D)
AND
ANY alteration of consciousness or memory? (2A,2B,2C,or 2D)

YES (to both) ⬇ | **NO** (to either or both) ⬇

POSITIVE CONCUSSION SCREEN:
1. **Continue** MACE 2.
2. Complete evaluation before prescribing rest.
3. Communicate findings to line leadership.
4. Document and code findings in electronic health record (EHR).

NEGATIVE CONCUSSION SCREEN:
1. **Stop** MACE 2.
2. Initiate 24 hour-rest period, if deployed. During rest, avoid activities that worsen symptoms. Follow up with the service member after rest period per concussion management tool (CMT).
3. Communicate findings to line leadership.
4. Document and code findings in electronic health record (EHR).

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COGNITIVE EXAM

5. Orientation

Score one point for each correct response.

Ask This Question	Incorrect	Correct
"What month is this?"	0	1
"What is the date or day of the month?"	0	1
"What day of the week is it?"	0	1
"What year is it?"	0	1
"What time do you think it is?"	0	1
Correct response must be within one hour of actual time.		

ORIENTATION TOTAL SCORE ____/5

6. Immediate Memory

Choose one list (A-F below) and use that list for the remainder of the MACE 2.

Read the script for each trial and then read all five words. Circle the response for each word for each trial. Repeat the trial three times, even if the service member scores perfectly on any of the trials.

Trial 1 script: Read the script exactly as written.

- *"I am going to test your memory. I will read you a list of words and when I am done, repeat back to me as many words as you can remember, in any order."*

Trials 2 and 3 script: Read the script exactly as written.

- *"I am going to repeat that list again. Repeat back to me as many words as you can remember, in any order, even if you said them before."*

	Trial 1		Trial 2		Trial 3	
List A	Incorrect	Correct	In	correct	Correct	Incorrect
Jacket	0	1		0	1	0
Arrow	0	1		0	1	0
Pepper	0	1		0	1	0
Cotton	0	1		0	1	0
Movie	0	1		0	1	0

IMMEDIATE MEMORY TOTAL SCORE ____/15

Immediate Memory Alternate Word Lists

List B	List C	List D	List E	List F
Dollar	Finger	Baby	Candle	Elbow
Honey	Penny	Monkey	Paper	Apple
Mirror	Blanket	Perfume	Sugar	Carpet
Saddle	Lemon	Sunset	Sandwich	Saddle
Anchor	Insect	Iron	Wagon	Bubble

NEUROLOGICAL EXAM

7. Speech Fluency

☐ Normal
☐ Abnormal

- Speech should be fluid and effortless
  - no pauses or unnatural breaks.
  - Stuttering or struggling to speak is abnormal.

8. Word Finding

☐ Normal
☐ Abnormal

- Assess difficulties with word finding:
  - Difficulty in coming up with the name of an object or grasping to find words is abnormal.

9. Grip Strength

☐ Normal
☐ Abnormal

- Assess grip strength. Grip strength should be strong and equal bilaterally.
  - Unequal or weak grip strength is abnormal.

10. Pronator Drift

☐ Normal
☐ Abnormal

- Direct service member to stand with eyes closed and arms extended forward, parallel to the ground with palms up. Assess for five to 10 seconds:
  - Any arm or palm drift is abnormal.

11. Single Leg Stance

☐ Normal
☐ Abnormal

- Remove shoes if possible. Have service member stand on one leg, arms across chest, hands touching shoulders, eyes open initially. Once service member is balanced, have them close their eyes and time for 15 seconds how long they can maintain their balance. Repeat test with opposite leg.
  - Loss of balance on either leg before eight seconds is abnormal.

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NEUROLOGICAL EXAM - Continued

12. Tandem Gait

☐ Normal
☐ Abnormal

- Remove shoes if possible. Have service member take six steps one foot in front of the other, heel-to-toe, with arms at side
  - Stumbling or shifting feet is abnormal.

13. Pupil Response

☐ Normal
☐ Abnormal

- Pupils should be round, equal in size and briskly constrict to a direct, bright light.
  - Unequal pupil size, dilation or constriction delay is abnormal.

14. Eye Tracking

☐ Normal
☐ Abnormal

- Both eyes should smoothly track your finger side-to-side and up and down.
  - Unequal, irregular or delayed eye tracking is abnormal.

NEUROLOGICAL EXAM RESULTS (Questions 7-14)

☐ All Normal ☐ Any Abnormal

COGNITIVE EXAM

15. Concentration

A. Reverse Digits

Read the script and begin the trial by reading the first string of numbers in Trial 1.

Circle the response for each string.

- If correct on string length of Trial 1, proceed to the next longer string length in the same column.
- If incorrect on string length of Trial 1, move to the same string length of Trial 2.
- If incorrect on both string lengths in Trials 1 and 2, **STOP** and record score as zero for that string length. Record total score as sum of previous correct trials.

COGNITIVE EXAM - Continued

15. Concentration - Continued

A. Reverse Digits

Script: Read the script exactly as written.

- *"I am going to read you a string of numbers. When I am finished, repeat them back to me backward. That is, in reverse order of how I read them to you. For example, if I said 7 - 1 - 9, then you would say 9 - 1 - 7."*

List A			
Trial 1	Trial 2 (if Trial 1 is incorrect)	Incorrect	Correct
4-9-3	6-2-9	0	1
3-8-1-4	3-2-7-9	0	1
6-2-9-7-1	1-5-2-8-5	0	1
7-1-8-4-6-3	5-3-9-1-4-8	0	1

REVERSE DIGITS SCORE (16A) ____/4

Concentration Alternate Number Lists

Note: Use the same list (A-F) that was used in Question 6.

List B		List C	
Trial 1	Trial 2	Trial 1	Trial 2
5-2-6	4-1-5	1-4-2	6-5-8
1-7-9-5	4-9-6-8	6-8-3-1	3-4-8-1
4-8-5-2-7	6-1-8-4-3	4-9-1-5-3	6-8-2-5-1
8-3-1-9-6-4	7-2-7-8-5-6	3-7-6-5-1-9	9-2-6-5-1-4

List D		List E		List F	
Trial 1	Trial 2	Trial 1	Trial 2	Trial 1	Trial 2
7-8-2	9-2-6	3-8-2	5-1-8	2-7-1	4-7-9
4-1-8-3	9-7-2-3	2-7-9-3	2-1-6-9	1-6-8-3	3-9-2-4
1-7-9-2-6	4-1-7-5-2	4-1-8-6-9	9-4-1-7-5	2-4-7-5-8	8-3-9-6-4
2-6-4-8-1-7	8-4-1-9-3-5	6-9-7-3-8-2	4-2-7-9-3-8	5-8-6-2-4-9	3-1-7-8-2-6

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COGNITIVE EXAM - Continued

15. Concentration - Continued

B. Months in Reverse Order

Script: Read the script exactly as written.

- *"Now tell me the months of the year in reverse order. Start with the last month and go backward. So you'll say: December, November…Go ahead."*

Correct Response:
Dec – Nov – Oct – Sep – Aug – Jul – Jun – May – Apr – Mar – Feb – Jan

	Incorrect	Correct
ALL months in reverse order	0	1

MONTHS IN REVERSE ORDER (16B) ___/1

CONCENTRATION TOTAL SCORE ___/5
Sum of scores:
15A (0-4 points) and 15B (0 or 1 point)

16. Delayed Recall

Read the script and circle the response for each word.
Do NOT repeat the word list.
Note: Use the same list (A-F) that was used in Question 6.

Script: Read the script exactly as written.

- *"Do you remember that list of words I read a few minutes earlier? I want you to tell me as many words from that list as you can remember. You can say them in any order."*

List A	Incorrect	Correct
Jacket	0	1
Arrow	0	1
Pepper	0	1
Cotton	0	1
Movie	0	1

DELAYED RECALL TOTAL SCORE ___/5

Delayed Recall Alternate Word Lists

List B	List C	List D	List E	List F
Dollar	Finger	Baby	Candle	Elbow
Honey	Penny	Monkey	Paper	Apple
Mirror	Blanket	Perfume	Sugar	Carpet
Saddle	Lemon	Sunset	Sandwich	Saddle
Anchor	Insect	Iron	Wagon	Bubble

17. Vestibular/Ocular-Motor Screening (VOMS) for Concussion Instructions

VOMS Contraindication: Unstable Cervical Spine.

Consider defering VOMS if patient is overtly symptomatic or a trained provider unavailable. VOMS should be completed before return to duty. Use comment section for any provider-observed difficulty with specific VOMS tasks.

A. Baseline symptoms. Record headache, dizziness, nausea and fogginess (HDNF), on zero to 10 scale prior to screening.

B. Smooth pursuits. Service member and examiner are seated. Hold fingertip three feet from patient. Service member focuses on fingertip target as examiner moves fingertip smoothly horizontally one and a half feet right and left of midline at rate requiring two seconds to go fully from left to right and right to left. Perform twice. Repeat in vertical direction one and a half feet above and one and a half feet below midline up and down, moving eyes two seconds fully up and two seconds down. Perform twice. Record HDNF on a zero to 10 scale.

C. Saccades. Service member and examiner are seated.

1) **Horizontal saccades:** Hold two fingertips horizontally at a distance of three feet from service member, and one and a half feet left and right of midline so service member gazes 30 degrees left and right. Service member moves eyes as quickly as possible from point to point. Perform 10 times. Record HDNF on a zero to 10 scale.
2) **Vertical saccades:** Repeat with two fingertips vertically three feet from service member, and one and a half feet above and below midline so service member gazes 30 degrees upward and downward. Service member moves eyes as quickly as possible from point to point. Perform 10 times. Record HDNF on a zero to 10 scale.

D. Convergence. Service member and provider are seated facing each other. Service member focuses on font target (page 14) at arm's length and slowly brings toward tip of nose. Service member stops target when two distinct images seen or when outward deviation of eye observed. Repeat and measure three times. Record centimeters between target and tip of nose for each trial. A near point of convergence ≥ five centimeters from the tip of the nose is considered abnormal. Record HDNF on a zero to 10 scale.

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17. Vestibular/Ocular-Motor Screening (VOMS) for Concussion Instructions (Continued)

E. **Vestibular-ocular reflex (VOR) test**. Service member and examiner are seated. Examiner holds font target (page 14) in front of service member in midline at three feet, rotation speed set with metronome.

1) **Horizontal VOR test**: Service member rotates head horizontally focusing on target at 20 degrees to each side. Rotation = 180 beats per minute (bpm). Perform 10 times. Record: HDNF 10 seconds after test.

2) **Vertical VOR test**: Repeat test moving head vertically 20 degrees up and down at 180 bpm. Perform 10 times. Record HDNF 10 seconds after test.

F. **Visual motion sensitivity (VMS) test**. Service member stands with feet shoulder width apart, facing a busy area. Examiner stands next to and slightly behind service member. Service member outstretches arm. Focusing on their thumb, the service member rotates head,eyes and trunk as unit 80 degrees right and left. Rotation = 50 bpm. Perform five times. Record HDNF on a zero to 10 scale.

Revised 10/2018 dvbic.dcoe.mil Page 11 of 14

MACE 2 - Military Acute Concussion Evaluation

17. VOMS Score Card

Vestibular/Ocular Motor Test:	Not Tested	Headache 0-10	Dizziness 0-10	Nausea 0-10	Fogginess 0-10	Comments
BASELINE SYMPTOMS:	N/A					
Smooth Pursuits						
Saccades – Horizontal						
Saccades – Vertical						
Convergence (Near Point)						(Near Point in cm): Measure 1: ___ Measure 2: ___ Measure 3: ___
VOR – Horizontal						
VOR – Vertical						
Visual Motion Sensitivity Test						
Total						

Any score above baseline is considered abnormal

VOMS RESULTS

☐ All Normal ☐ Any Abnormal

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EXAM SUMMARY

Record the data for correct MACE 2 documentation.

Cognitive Summary

Orientation Total Score - Q5	/5
Immediate Memory Total Score (all 3 trials) - **Q6**	/15
Concentration Total Score (Sections A and B) - **Q15**	/5
Delayed Recall Total Score - Q16	/5
COGNITIVE RESULTS ≤ 25 is abnormal	/30

NEUROLOGICAL RESULTS (Q 7-14) ☐ Abnormal (+) ☐ Normal (-)

SYMPTOM RESULTS (Q 3) ☐ 1 or more symptoms (+) ☐ No symptoms (-)

HISTORY RESULTS (Q 4A-4C) ☐ Positive (+) ☐ Negative (-)

VOMS RESULTS (Q 17) ☐ Abnormal (+) ☐ Normal (-) ☐ Deferred

MACE 2 RESULTS ☐ Positive (+) ☐ Negative (-)

AFTER COMPLETING MACE 2:

- ☐ Document MACE 2 results in the EHR with coding instructions.
- ☐ Initiate 24-hour rest.
- ☐ ☐ Refer to concussion management tool for the management recommendations based on MACE 2 results.
- ☐ ☐ After 24-hour rest period, evaluate for initiation into the Progressive Return to Activity (PRA) following the guidance of the PRA Clinical Recommendation.

Refer to Progressive Return to Activity Clinical Tool at dvbic.dcoe.mil/files/resources/2013_PRA_PCM_CST_FINAL.pdf

VOMS Equipment Sample 14 point font: **A**

Centimeter Ruler 0 cm 5 cm 15 cm

TBI CODING INSTRUCTIONS

Initial TBI screening code*: Z13.850

TBI coding sequence:

1. **Primary TBI diagnostic code: S06. E L S E****
2. **Primary symptom code**, if applicable: (e.g., H53.2 - diplopia)
3. **Deployment status code**, if applicable:*** (e.g., Z56.82 for deployed or Z91.82 for history of military deployment)
4. **TBI external cause of morbidity code**: (For example, Y36.290A (A- use for initial visit) for war operations involving other explosions and fragments, military personnel, initial encounter)
5. Place of occurrence code, if applicable
6. **Activity code**, if applicable
7. **Personal History of TBI code**: if applicable Z87.820

* MACE 2
** Etiology, Location, Severity, Encounter
*** Deployment code must fall within the first four codes when applicable

For more information, see DVBIC ICD-10 Coding Guidance Tool.

References available at https://dvbic.dcoe.mil/material/military-acute-concussion-evaluation-2-mace-2-reference-list.

We are authorized to collect the information on this form and any supporting documentation, including social security numbers, under the Patient Protection and Affordable Care Act (Public Law No. 111-148), as amended by the Health Care and Education Reconciliation Act of 2010 (Public Law No. 111-152), and the Social Security Act.

THIS TOOL MAY BE COPIED FOR CLINICAL USE.

PUID 4901
Released: February 2012 | Revised October 2018
by Defense and Veterans Brain Injury Center.
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H

Fact Sheet: Coding Guidance for Traumatic Brain Injury

Health Information Management Office of Informatics and Analytics

IMPORTANT NOTE: This Fact Sheet denotes use of *International Classification of Diseases, Tenth Revision* (ICD-10) codes effective October 1, 2015. ALL PREVIOUS VERSIONS OF THIS FACT SHEET ARE RESCINDED.

BACKGROUND: The Veterans Health Administration (VHA) has a need, to the best of its ability, to uniquely identify and report on Traumatic Brain Injury (TBI), its conditions, syndrome, and symptoms resulting from such injuries. VHA in conjunction with Department of Defense (DOD) have championed the development of TBI codes to more accurately capture and reflect TBI and its effects.

CODING THE INITIAL ENCOUNTER: The ICD-10-CM codes will now provide the specificity of initial, subsequent, and/or sequela to describe the injury; however the seventh character of A will be used to identify the first time the patient is seen for the injury, regardless of when the injury took place. If an injury occurred in the past several months or even years prior but the patient has never sought treatment for the injury previously, the first time the patient is SEEN for the injury is considered the initial treatment.

An initial encounter does not refer to the first time the patient is seen by each clinician for that particular TBI. Rather, an initial encounter is defined as the first time the patient is seen by any medical professional for the TBI, regardless of when the injury took place even if it occurred several weeks, months or years prior to the encounter, and for additional encounters where the patient is receiving “active treatment” as defined in the ICD-10-CM Official Guidelines for Coding and Reporting. Clinical documentation must clearly indicate that the encounter coded is the initial encounter for that particular injury.

For ICD-10-CM the appropriate 7th character will be added to the code to indicate the type of encounter:

- A initial encounter will be used while the patient is receiving active treatment for the condition

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- D subsequent encounter will be used for encounters after the patient has received active treatment of the condition and receiving routine care for the condition during the healing or recovery phase
- S sequela will be used for complications that arise as a direct result of the condition

Initial Encounter: Veteran is seen for the *first time* at a VA facility for memory problems, as well as any additional encounters where the patient is receiving "active treatment". During the history the practitioner determines, on the basis of Veteran's self-report, that there was brief loss of consciousness less than 30 minutes due to an Improvised Explosive Device (IED) blast. There is no evidence in the record of skull fracture. The Veteran reports that he has never sought treatment for the condition which is now causing significant problems at work. The practitioner selects the codes TBI Not Otherwise Specified (NOS) with loss of consciousness of 30 minutes or less, initial encounter (S06.9X1A) and the codes the for memory loss NOS (R41.3), and war operations involving explosion of improvised explosive device (IED), military personnel (Y36.230A).

ICD-10 now codes based on loss of consciousness (LOC) time after the injury. In order to ensure the most accurate and appropriate level of coding, documentation must clearly state if there was an LOC due to the injury and the duration of the LOC. If documentation does not clearly define the LOC then unspecified state of consciousness must be coded. Please refer to your Health Information Management Coding Department for further guidance.

FOLLOW UP CARE (Subsequent/Sequela Encounter): Subsequent encounter designation will be used for encounters after the patient has received active treatment of the condition and is receiving routine care for the condition during the healing or recovery phase, and sequela (late effect) designation will be used for complications that arise as a direct result of the condition. For follow up visits for late effects directly related to a previous TBI, the symptom code(s) that best represents the patient's chief complaint or symptom(s) (e.g., headache, insomnia, vertigo) are coded, followed by the appropriate late effect code or sequela code. This will be the initial TBI injury code with the seventh character of S for sequela. Late effects include any symptom or sequelae of the injury specified as such, which may occur at any time after the onset of the injury. The External Causes of Morbidity (V01-Y99) code will also need to be added with a seventh character of S.

The pairing of the symptom code and the late effect code is the ONLY WAY that symptoms can be causally and uniquely associated with TBI and is essential to the accurate classification of TBI.

REHABILITATION: For TBI patients who receive inpatient or outpatient rehabilitation, the first-entered diagnosis is the purpose of the appropriate condition for which the rehabilitation service is being performed (e.g. neurological deficits, hemiparesis, etc.) and then the appropriate TBI code with the seventh character of D for subsequent encounter or S for sequela (S06.2, S06.3, or S06.9). The External Causes of Morbidity (V01-Y99) code will also need to be added with a seventh character of S.

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USE of Z87.820 CODE: Z87.820 Personal history of traumatic brain injury was developed to indicate that previous TBI occurred and may impact current care. The Z87.820 code is not used in conjunction with the late effect codes; rather the Z code is used when no other code is available to reflect a previous TBI. Normally, the Z87.820 code is used to identify a personal history of injury with or without a confirmed diagnosis. A history of an illness, even if no longer present, is important information that may alter the type of treatment ordered.

TBI SCREENING: Code Z13.850 should be used if TBI screening occurs at a visit, whether or not the screening is positive. A TBI diagnosis code should not be entered for a positive screen since a positive TBI screen does not indicate a TBI diagnosis. A TBI diagnosis code can only be entered for the encounter at which the diagnosis is made.

Examples of ICD-10-CM Codes Typically Associated with TBI

Acute Injuries

Series Code	Description
S02.0xx	Fractures of vault of skull—requires a seventh character for type of encounter and healing
S02.1	Fractures of base of skull—requires two digits and a seventh character
S06.0	Concussion—requires two digits and a seventh character
S06.1	Traumatic cerebral edema—requires two digits and a seventh character
S06.2	Diffuse traumatic brain injury—requires two digits and a seventh character
S06.30	Focal traumatic brain injury—requires an additional digit and a seventh character
S06.31	Contusion and laceration of right cerebrum—requires an additional digit and a seventh character
S06.32	Contusion and laceration of left cerebrum—requires an additional digit and a seventh character
S06.33	Contusion and laceration of cerebrum, unspecified—requires an additional digit and a seventh character
S09.x	Unspecified intracranial injury (TBI NOS)—requires an additional digit and a seventh character

Late Effect Codes or Sequela

Series Code	Description
S06.2	Diffuse traumatic brain injury—requires two digits and a seventh character of S
S06.30	Focal traumatic nrain injury—requires an additional digit and a seventh character of S
S09.x	Unspecified intracranial injury (TBI NOS)—requires an additional digit and a seventh character of S

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Symptoms Involving Emotional State

ICD-10 Code	Symptom
R45.0	Nervousness
R45.4	Irritability and anger
R45.87	Impulsiveness
R45.86	Emotional lability
R45.3	Demoralization and apathy
R45.89	Other signs and symptoms involving emotional state

Symptoms Involving Cognitive Function and Awareness

ICD-10 Code	Symptom
R41.840	Attention and concentration deficit
R41.841	Cognitive communication deficit
R41.842	Visuospatial deficit
R41.843	Psychomotor deficit
R41.844	Frontal lobe and executive function deficit
R41.89	Other signs and symptoms involving cognitive functions and awareness

Note: Memory deficits will be coded as R41.3.

Physical Effects of TBI

ICD-10 Code	Description
G44.301	Posttraumatic headache, unspecified, intractable
G44309	Posttraumatic headache, unspecified, not intractable
G44.321	Chronic posttraumatic headache, unspecified, intractable
G44.329	Chronic posttraumatic headache, unspecified, not intractable
R42.	Dizziness
R43.0	Loss of smell (anosmia)
R43.8	Other disturbance of smell and taste
R47.82	Fluency disorder conditions classified elsewhere
R47.81	Slurred speech
R56.1	Posttraumatic seizures

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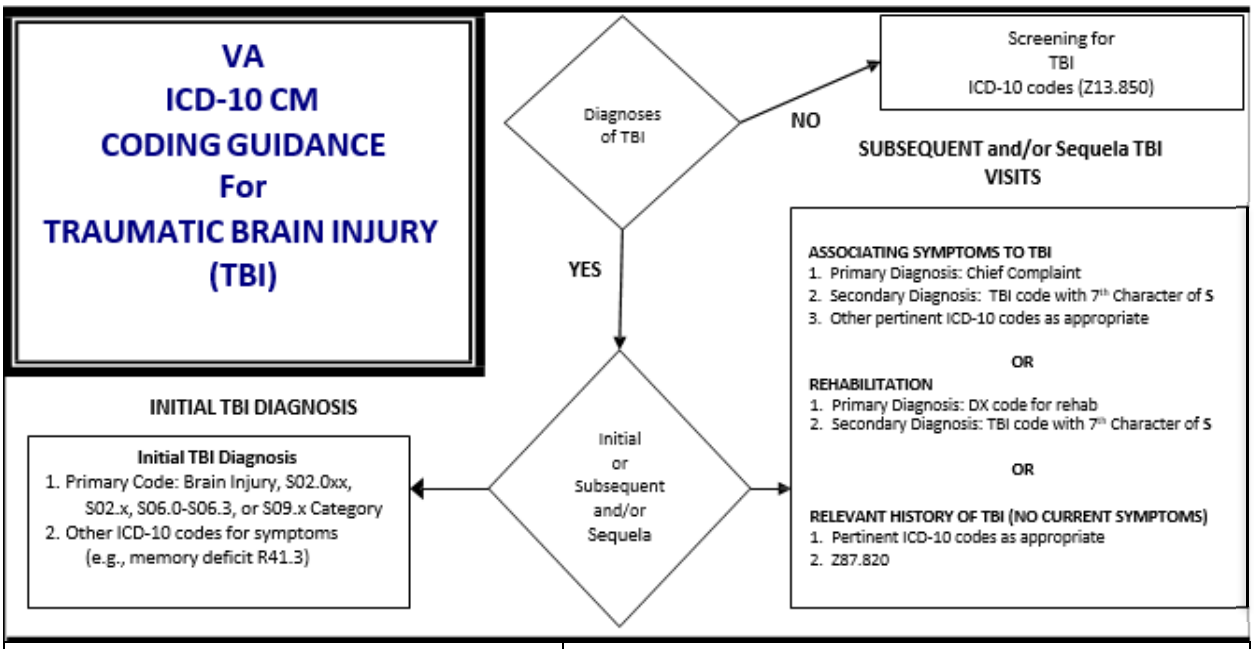

Review all existing documentation, including that from outside sources, to ensure that a previous TBI code has not been assigned. Clarify the patient's documented symptoms by answering the below questions	**Severity of TBI**
Duration: Has the symptom existed for days, weeks, or months? Has the symptom occurred only intermittently? Are there times of the day when the symptom(s) is worse? Particularly with regard to pain and fatigue, can the patient define if these symptoms occur 2 or 3 days per month or constantly?	The below diagnostic criteria does not predict functional or rehabilitative outcome of the patient. The level of injury is based on the status of the patient at the time of injury, based on observable signs such as level of consciousness, posttraumatic amnesia and coma scaling.
Onset: Can the patient recall exactly how the symptoms began? Were the triggering events, either physical or emotional? Was the onset subtle and gradual, or are there changing patterns?	
Location: Is the symptom localized or diffuse? Can the patient localize the symptom by pointing to it? If the pain is diffuse, does it involve more than one body area or quadrant?	AOC – Alteration of consciousness/mental state LOC – Loss of consciousness PTA – Post-traumatic amnesia GCS – Glasgow Coma Scale
Comorbidity: Does the patient have any diagnosed co-existing diagnoses? What is the relationship between the onset and severity of the co-existing illnesses and the symptoms of fatigue and/or pain? Are there co-morbid diagnoses? Are there new changes to the patient's weight, mood, or diet?	

Mild	Moderate	Severe
Normal structural imaging	Normal or abnormal structural imaging	Normal or abnormal structural imaging
LOC = 0-30 min	LOC >30 min and < 24 hours	LOC > 24 hrs.
AOC = a moment up to 24 hrs.	AOC >24 hours. Severity based on other criteria	
PTA = 0-1 day	PTA >1 and <7 days	PTA > 7 days
GCS=13-15	GCS=9-12	GCS <9

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Previous Episodes: If the symptoms are episodic, what is the pattern with regard to timing, intensity, triggering events, and response to treatment?	**Additional Procedure Coding for TBI Care**
Intensity and Impact: How severe are the symptoms (1–10 rating scale)? Ask the patient to describe any new limitations they have experience compared to their usual life-style, such as limitations in physical endurance or strength (e.g. climbing stairs, shopping, or sleep quality).	If the psychomotor Neurobehavioral Status Exam is completed, the provider should also utilize the CPT code 96116. This code includes the time for testing, interpreting, and a written report must be prepared. Coding is completed in 1-hr units but anything less than an hour is claimed as 1 unit. Documentation must include clinically indicated portions of an assessment of thinking, reasoning and judgment (e.g., attention, acquired knowledge, language, memory and problem solving).
Previous Treatment and Medications: Request that patient bring copies of previous medical records regarding treatment of injury, or have patient authorize VA to receive copies and/or discuss medical history with previous clinician. Ask that the patient bring their medications bottles with them and document them within CPRS. Discuss with the patient which mediations have or have not been helpful.	Documentation Questions retrieved from the tables in the VA/DoD Clinical Practice Guidelines for Management of Concussion/mTBI 2.0, Retrieved August 5, 2015, from VA/DoD Clinical Practice Guidelines

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M21-1 Compensation and Pension Manual[1]

Contents

M21-1, Part IV, Subpart ii, Chapter 2, Section C—Service Connection (SC) for Disabilities Resulting From Exposure to Environmental Hazards or Service in the Republic of Vietnam (RVN)

This section discusses the rating guidelines pertaining to claims based on various exposures to include ionizing radiation, asbestos, herbicides, mustard gas, and other environmental hazards.

M21-1, Part IV, Subpart ii, Chapter 2, Section F—Compensation Based on Individual Unemployability (IU)

To provide guidance in processing, developing, and adjudicating claims for total disability due to individual unemployability.

M21-1, Part IV, Subpart ii, Chapter 2, Section B—Determining Service Connection (SC)

This section provides procedures for determining service connection on direct, presumptive, aggravation, and secondary bases. Guidance is also given for congenital, developmental, and hereditary disorders.

M21-1, Part III, Subpart ii, Chapter 2, Section B—Claims for Disability Compensation and/or Pension, and Claims for Survivors Benefits

This section contains information about the process of applying for disability compensation and/or pension for Veterans and the process of applying for survivors benefits such as dependency and indemnity compensation (DIC) and pension.

M21-1, Part III, Subpart iii, Chapter 1, Section C—Requesting Evidence from Federal Record Custodians

This section provides general information on requesting evidence from Federal records custodians.

M21-1, Part IV, Subpart ii, Chapter 1, Section D—Claims for Service Connection (SC) for Post-traumatic Stress Disorder (PTSD)

This section contains guidance on developing claims for service connection for posttraumatic stress disorder (PTSD).

[1] Published by the Department of Veterans Affairs. See https://www.benefits.va.gov/WARMS/M21_1MR.asp (accessed December 28, 2018).

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M21-1, Part IV, Subpart ii, Chapter 1, Section H—Developing Claims for Service Connection (SC) Based on Herbicide Exposure

This section contains development guidance for claims based on herbicide exposure.

M21-1, Part III, Subpart iv, Chapter 4, Section A—Musculoskeletal Conditions

This chapter provides general information on evaluating musculoskeletal conditions.

M21-1, Part III, Subpart v, Chapter 2, Section B—Decision Notices

This section contains general information about decision notices, preparing decision notices for visually impaired Veterans, decision notices that contain FTI, and the generation of decision notices using RADL.

M21-1, Part III, Subpart iv, Chapter 3, Section D—Examination Reports

This section includes information about location of, requirements for, and reviewing examination reports.

M21-1, Part III, Subpart ii, Chapter 3, Section C—System Updates

This section contains information on various system updates for both Share and the Veterans Benefits Management System (VBMS) including changing contact information, third party information requests, updating power of attorney appointments, and military service information.

M21-1, Part III, Subpart iii, Chapter 5, Section K—Verification of Marital Status and the Status of Dependents

This section pertains to the periodic verification of marital status and the status of dependents to include screening of questionnaires, award actions based on information provided in the questionnaire, and what to do if a questionnaire is not received.

M21-1, Part III, Subpart ii, Chapter 6, Section A—Establishing Veteran Status

This section contains information regarding eligibility requirements for Veteran status to include Reserves and National Guard.

M21-1, Part III, Subpart iii, Chapter 5, Section A—General Information on Relationship and Dependency

This section contains information on the establishment of relationship and dependency, jurisdiction over relationship determinations, handling notices and claims from beneficiaries regarding their dependents, and the requirement for disclosure of SSNs.

M21-1, Part III, Subpart ii, Chapter 1, Section C—Initial Screening Policies

This section provides an overview of the policies and procedures for initial screening of mail.

M21-1, Part III, Subpart ii, Chapter 2, Section C—Informal Claims Received Prior to March 24, 2015, Communication of an Intent to File (ITF), and Requests for Application

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This section contains information about informal claims, Intent to File and Request for Application processes, incomplete applications, claims based on examination or hospitalization reports, and incorrectly established claims.

M21-1, Part III, Subpart iv, Chapter 4, Section N—Neurological Conditions and Convulsive Disorders

Topics on neurological conditions and convulsive disorders to include traumatic brain injury (TBI), multiple sclerosis (MS), amyotrophic lateral sclerosis (ALS), peripheral nerve impairment, epilepsy, and migraine headaches.

M21-1, Part III, Subpart iv, Chapter 6, Section B—Determining the Issues

This section provides information for determining the types of issues and claims for the rating process including consideration of subordinate issues, ancillary benefits, paired organs and extremities, and extra-schedular considerations.

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Review Posttraumatic Stress Disorder (PTSD) Disability Benefits Questionnaire

Published by the Department of Veterans Affairs. See https://www.vba.va.gov/pubs/forms/VBA-21-0960P-3-ARE.pdf (accessed March 27, 2019).

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OMB Control No. 2900-0779
Respondent Burden: 30 Minutes
Expiration Date: 05/31/2021

Department of Veterans Affairs

REVIEW POST TRAUMATIC STRESS DISORDER (PTSD) DISABILITY BENEFITS QUESTIONNAIRE

IMPORTANT - THE DEPARTMENT OF VETERANS AFFAIRS (VA) ***WILL NOT PAY*** OR ***REIMBURSE*** ANY EXPENSES OR COST INCURRED IN THE PROCESS OF COMPLETING AND/OR SUBMITTING THIS FORM. PLEASE READ THE PRIVACY ACT AND RESPONDENT BURDEN INFORMATION BEFORE COMPLETING THIS FORM.

NAME OF PATIENT/VETERAN

PATIENT/VETERAN'S SOCIAL SECURITY NUMBER

___ - __ - ____

NOTE TO PSYCHIATRIST/PSYCHOLOGIST - Your patient is applying to the U. S. Department of Veterans Affairs (VA) for disability benefits. VA will consider the information you provide on this questionnaire as part of their evaluation in processing the veteran's claim. Please note that this questionnaire is for disability evaluation, not for treatment purposes. VA reserves the right to confirm the authenticity of ALL DBQs completed by private health care providers.

NOTE: If the Veteran experiences a mental health emergency during the interview, please terminate the interview and obtain help, using local resources as appropriate. You may also contact the Veterans Crisis Line at 1-800-273-TALK (8255). Stay on the Crisis Line until help can link the Veteran to emergency care.

The following health care providers can perform REVIEW examinations for PTSD: a board-certified or board-eligible psychiatrist; a licensed doctorate-level psychologist; a doctorate-level mental health provider under the close supervision of a board-certified or board-eligible psychiatrist or licensed doctorate-level psychologist; a psychiatry resident under close supervision of a board-certified or board-eligible psychiatrist or licensed doctorate-level psychologist; a clinical or counseling psychologist completing a one-year internship or residency (for purposes of a doctorate-level degree) under close supervision of a board-certified or board-eligible psychiatrist or licensed doctorate-level psychologist; or a licensed clinical social worker (LCSW), a nurse practitioner, a clinical nurse specialist, or a physician assistant, under close supervision of a board-certified or board-eligible psychiatrist or licensed doctorate-level psychologist.

SECTION I - DIAGNOSTIC SUMMARY

NOTE: This section should be completed based on the current examination and clinical findings.

1. DOES THE VETERAN NOW HAVE OR HAS HE OR SHE EVER BEEN DIAGNOSED WITH PTSD?

☐ YES ☐ NO *(If "Yes," continue to complete this Questionnaire)*
(If no diagnosis of PTSD, and the veteran has another Axis I and/or II diagnosis, then continue to complete this Questionnaire and/or VA Form 21-0960P-1, Eating Disorders Disability Benefits Questionnaire)

SECTION II - CURRENT DIAGNOSES

2A. LIST CURRENT DIAGNOSES

DIAGNOSIS #1: _____

ICD CODE: _____ INDICATE THE AXIS CATEGORY: ☐ AXIS I ☐ AXIS II

COMMENTS, IF ANY: _____

DIAGNOSIS #2: _____

ICD CODE: _____ INDICATE THE AXIS CATEGORY: ☐ AXIS I ☐ AXIS II

COMMENTS, IF ANY: _____

DIAGNOSIS #3: _____

ICD CODE: _____ INDICATE THE AXIS CATEGORY: ☐ AXIS I ☐ AXIS II

COMMENTS, IF ANY: _____

DIAGNOSIS #4: _____

ICD CODE: _____ INDICATE THE AXIS CATEGORY: ☐ AXIS I ☐ AXIS II

COMMENTS, IF ANY: _____

IF ADDITIONAL DIAGNOSES, DESCRIBE USING ABOVE FORMAT:

2B. AXIS III - MEDICAL DIAGNOSES *(to include TBI)*:

ICD CODE: _____

COMMENTS, IF ANY:

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SECTION II - CURRENT DIAGNOSES *(Continued)*

2C. AXIS IV - PSYCHOSOCIAL AND ENVIRONMENTAL PROBLEMS *(describe, if any):*

2D. AXIS V - CURRENT GLOBAL ASSESSMENT OF FUNCTIONING *(GAF)* SCORE:

COMMENTS, IF ANY:

SECTION III - DIFFERENTIATION OF SYMPTOMS

3A. DOES THE VETERAN HAVE MORE THAN ONE MENTAL DISORDER DIAGNOSED?

☐ YES ☐ NO *(If "Yes," complete Item 3B)*

3B. IS IT POSSIBLE TO DIFFERENTIATE WHAT SYMPTOM(S) IS/ARE ATTRIBUTABLE TO EACH DIAGNOSIS?

☐ YES ☐ NO ☐ NOT APPLICABLE

(If "No," provide reason that it is not possible to differentiate what portion of each symptom is attributable to each diagnosis):

(If "Yes," list which symptoms are attributable to each diagnosis):

3C. DOES THE VETERAN HAVE A DIAGNOSED TRAUMATIC BRAIN INJURY *(TBI)*?

☐ YES ☐ NO ☐ NOT SHOWN IN RECORDS REVIEWED *(If "Yes," complete Item 3D)*

(Comments, if any):

3D. IS IT POSSIBLE TO DIFFERENTIATE WHAT SYMPTOM(S) IS/ARE ATTRIBUTABLE TO EACH DIAGNOSIS?

☐ YES ☐ NO ☐ NOT APPLICABLE

(If "No," provide reason that it is not possible to differentiate what portion of each symptom is attributable to each diagnosis):

(If "Yes," list which symptoms are attributable to each diagnosis):

SECTION IV - OCCUPATIONAL AND SOCIAL IMPAIRMENT

4A. WHICH OF THE FOLLOWING BEST SUMMARIZES THE VETERAN'S LEVEL OF OCCUPATIONAL AND SOCIAL IMPAIRMENT WITH REGARDS TO ALL MENTAL DIAGNOSES? *(Check only one)*

☐ NO MENTAL DISORDER DIAGNOSIS

☐ A MENTAL CONDITION HAS BEEN FORMALLY DIAGNOSED, BUT SYMPTOMS ARE NOT SEVERE ENOUGH EITHER TO INTERFERE WITH OCCUPATIONAL AND SOCIAL FUNCTIONING OR TO REQUIRE CONTINUOUS MEDICATION

☐ OCCUPATIONAL AND SOCIAL IMPAIRMENT DUE TO MILD OR TRANSIENT SYMPTOMS WHICH DECREASE WORK EFFICIENCY AND ABILITY TO PERFORM OCCUPATIONAL TASKS ONLY DURING PERIODS OF SIGNIFICANT STRESS, OR SYMPTOMS CONTROLLED BY MEDICATION

☐ OCCUPATIONAL AND SOCIAL IMPAIRMENT WITH OCCASIONAL DECREASE IN WORK EFFICIENCY AND INTERMITTENT PERIODS OF INABILITY TO PERFORM OCCUPATIONAL TASKS, ALTHOUGH GENERALLY FUNCTIONING SATISFACTORILY, WITH NORMAL ROUTINE BEHAVIOR, SELF-CARE AND CONVERSATION

☐ OCCUPATIONAL AND SOCIAL IMPAIRMENT WITH REDUCED RELIABILITY AND PRODUCTIVITY

☐ OCCUPATIONAL AND SOCIAL IMPAIRMENT WITH DEFICIENCIES IN MOST AREAS, SUCH AS WORK, SCHOOL, FAMILY RELATIONS, JUDGMENT, THINKING AND/OR MOOD

☐ TOTAL OCCUPATIONAL AND SOCIAL IMPAIRMENT

4B. FOR THE INDICATED LEVEL OF OCCUPATIONAL AND SOCIAL IMPAIRMENT, IS IT POSSIBLE TO DIFFERENTIATE WHAT PORTION OF THE OCCUPATIONAL AND SOCIAL IMPAIRMENT INDICATED ABOVE IS CAUSED BY EACH MENTAL DISORDER?

☐ YES ☐ NO ☐ NO OTHER MENTAL DISORDER HAS BEEN DIAGNOSED

(If "No," provide reason that it is not possible to differentiate what portion of the indicated level of occupational and social impairment is attributable to each diagnosis):

(If "Yes," list which portion of the indicated level of occupational and social impairment is attributable to each diagnosis):

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SECTION IV - OCCUPATIONAL AND SOCIAL IMPAIRMENT *(Continued)*

4C. IF A DIAGNOSIS OF TBI EXISTS, IS IT POSSIBLE TO DIFFERENTIATE WHAT PORTION OF THE OCCUPATIONAL AND SOCIAL IMPAIRMENT INDICATED ABOVE IS CAUSED BY THE TBI?

☐ YES ☐ NO ☐ NO DIAGNOSIS OF TBI

(If "No," provide reason that it is not possible to differentiate what portion of the indicated level of occupational and social impairment is attributable to each diagnosis):

(If "Yes," list which portion of the indicated level of occupational and social impairment is attributable to each diagnosis):

SECTION V - CLINICAL FINDINGS

1. EVIDENCE REVIEW

5A. IF ANY RECORDS (EVIDENCE) WERE REVIEWED, PLEASE LIST:

2. RECENT HISTORY (SINCE PRIOR EXAM)

5B. RELEVANT SOCIAL/MARITAL/FAMILY HISTORY:

5C. RELEVANT OCCUPATIONAL AND EDUCATIONAL HISTORY:

5D. RELEVANT MENTAL HEALTH HISTORY, TO INCLUDE PRESCRIBED MEDICATIONS AND FAMILY MENTAL HEALTH:

5E. RELEVANT LEGAL AND BEHAVIORAL HISTORY:

5F. RELEVANT SUBSTANCE ABUSE HISTORY:

5G. SENTINEL EVENT(S) (OTHER THAN STRESSORS):

5H. OTHER *(If any)*:

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SECTION VI - PTSD DIAGNOSTIC CRITERIA

NOTE: Please check criteria used for establishing the current PTSD diagnosis. The diagnostic criteria for PTSD, referred to as Criteria A-F, are from the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV).

CRITERION A: The Veteran has been exposed to a traumatic event where both of the following were present

- ☐ The Veteran experienced, witnessed or was confronted with an event that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others.
- ☐ The Veteran's response involved intense fear, helplessness or horror.
- ☐ No exposure to a traumatic event.

CRITERION B: The traumatic event is persistently re-experienced in 1 or more of the following ways:

- ☐ Recurrent and distressing recollections of the event, including images, thoughts or perceptions.
- ☐ Recurrent distressing dreams of the event.
- ☐ Acting or feeling as if the traumatic event were recurring; this includes a sense of reliving the experience, illusions, hallucinations and dissociative flashback episodes, including those that occur on awakening or when intoxicated.
- ☐ Intense psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event.
- ☐ Physiological reactivity on exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event.
- ☐ The traumatic event is not persistently re-experienced.

CRITERION C: Persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness *(not present before the trauma)*, as indicated by 3 or more of the following:

- ☐ Efforts to avoid thoughts, feelings or conversations associated with the trauma.
- ☐ Efforts to avoid activities, places or people that arouse recollections of the trauma.
- ☐ Inability to recall an important aspect of the trauma.
- ☐ Markedly diminished interest or participation in significant activities.
- ☐ Feeling of detachment or estrangement from others.
- ☐ Restricted range of affection *(e.g., unable to have loving feelings).*
- ☐ Sense of a foreshortened future *(e.g., does not expect to have a career, marriage, children or a normal life span).*
- ☐ No persistent avoidance of stimuli associated with the trauma or numbing of general responsiveness.

CRITERION D: Persistent symptoms of increased arousal, not present before the trauma, as indicated by 2 or more of the following:

- ☐ Difficulty falling or staying asleep.
- ☐ Irritability or outbursts of anger.
- ☐ Difficulty concentrating.
- ☐ Hypervigilence.
- ☐ Exaggerated startle response.
- ☐ No persistent symptoms of increased arousal.

CRITERION E: Duration of symptoms:

- ☐ The duration of the symptoms described in Criteria B, C and D is more than 1 month.
- ☐ The duration of the symptoms described in Criteria B, C and D is less than 1 month.
- ☐ Veteran does not meet full criteria for PTSD.

CRITERION F: Clinically significant distress or impairment:

- ☐ The PTSD symptoms described above cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.
- ☐ The PTSD symptoms described above do NOT cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.
- ☐ Veteran does not meet full criteria for PTSD.

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PATIENT/VETERAN'S SOCIAL SECURITY NO. ☐☐☐ – ☐☐ – ☐☐☐☐

SECTION VII - SYMPTOMS

7. FOR VA RATING PURPOSES, CHECK ALL SYMPTOMS THAT APPLY TO THE VETERAN'S DIAGNOSES:

- ☐ Depressed mood
- ☐ Anxiety
- ☐ Suspiciousness
- ☐ Panic attacks that occur weekly or less often
- ☐ Panic attacks more than once a week
- ☐ Near-continuous panic or depression affecting the ability to function independently, appropriately and effectively
- ☐ Chronic sleep impairment
- ☐ Mild memory loss, such as forgetting names, directions or recent events
- ☐ Impairment of short and long term memory, for example, retention of only highly learned material, while forgetting to complete tasks
- ☐ Memory loss for names of close relatives, own occupation, or own name
- ☐ Flattened affect
- ☐ Circumstantial, circumlocutory or stereotyped speech
- ☐ Speech intermittently illogical, obscure, or irrelevant
- ☐ Difficulty in understanding complex commands
- ☐ Impaired judgment
- ☐ Impaired abstract thinking
- ☐ Gross impairment in thought processes or communication
- ☐ Disturbances of motivation and mood
- ☐ Difficulty in establishing and maintaining effective work and social relationships
- ☐ Difficulty adapting to stressful circumstances, including work or a work like setting
- ☐ Inability to establish and maintain effective relationships
- ☐ Suicidal ideation
- ☐ Obsessional rituals which interfere with routine activities
- ☐ Impaired impulse control, such as unprovoked irritability with periods of violence
- ☐ Spatial disorientation
- ☐ Persistent delusions or hallucinations
- ☐ Grossly inappropriate behavior
- ☐ Persistent danger of hurting self or others
- ☐ Neglect of personal appearance and hygiene
- ☐ Intermittent inability to perform activities of daily living, including maintenance of minimal personal hygiene
- ☐ Disorientation to time or place

SECTION VIII - OTHER SYMPTOMS

8. DOES THE VETERAN HAVE ANY OTHER SYMPTOMS ATTRIBUTABLE TO PTSD (AND OTHER MENTAL DISORDERS) THAT ARE NOT LISTED ABOVE?

☐ YES ☐ NO *(If "Yes," describe):*

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PATIENT/VETERAN'S SOCIAL SECURITY NO. ☐☐☐ – ☐☐ – ☐☐☐☐

SECTION IX - COMPETENCY

9. IS THE VETERAN CAPABLE OF MANAGING HIS OR HER FINANCIAL AFFAIRS?

☐ YES ☐ NO *(If "No," explain)*:

SECTION X - REMARKS

10. REMARKS *(If any)*:

SECTION XI - PSYCHIATRIST/PSYCHOLOGIST CERTIFICATION AND SIGNATURE

CERTIFICATION - To the best of my knowledge, the information contained herein is accurate, complete and current.

10A. PSYCHIATRIST/PSYCHOLOGIST SIGNATURE AND TITLE *(Sign in ink)*	10B. PSYCHIATRIST/PSYCHOLOGIST PRINTED NAME	10C. DATE SIGNED

10D. PSYCHIATRIST/PSYCHOLOGIST PHONE AND FAX NUMBERS	10E. NATIONAL PROVIDER IDENTIFIER (NPI) NUMBER	10F. PSYCHIATRIST/PSYCHOLOGIST ADDRESS

NOTE - VA may request additional medical information, including additional examinations, if necessary to complete VA's review of the veteran's application.

IMPORTANT - PSYCHIATRIST/PSYCHOLOGIST send the completed form to: _____

(VA Regional Office FAX No.)

NOTE - A list of VA Regional Office FAX Numbers can be found at **www.benefits.va.gov/disabilityexams** or obtained by calling 1-800-827-1000.

PRIVACY ACT NOTICE: VA will not disclose information collected on this form to any source other than what has been authorized under the Privacy Act of 1974 or Title 38, Code of Federal Regulations 1.576 for routine uses (i.e., civil or criminal law enforcement, congressional communications, epidemiological or research studies, the collection of money owed to the United States, litigation in which the United States is a party or has an interest, the administration of VA programs and delivery of VA benefits, verification of identity and status, and personnel administration) as identified in the VA system of records, 58/VA21/22/28, Compensation, Pension, Education and Vocational Rehabilitation and Employment Records - VA, published in the Federal Register. Your obligation to respond is voluntary. VA uses your SSN to identify your claim file. Providing your SSN will help ensure that your records are properly associated with your claim file. Giving us your SSN account information is voluntary. Refusal to provide your SSN by itself will not result in the denial of benefits. VA will not deny an individual benefits for refusing to provide his or her SSN unless the disclosure of the SSN is required by a Federal Statute of law in effect prior to January 1, 1975, and still in effect. The requested information is considered relevant and necessary to determine maximum benefits under the law. The responses you submit are considered confidential (38 U.S.C. 5701). Information submitted is subject to verification through computer matching programs with other agencies.

RESPONDENT BURDEN: We need this information to determine entitlement to benefits (38 U.S.C. 501). Title 38, United States Code, allows us to ask for this information. We estimate that you will need an average of 30 minutes to review the instructions, find the information, and complete the form. VA cannot conduct or sponsor a collection of information unless a valid OMB control number is displayed. You are not required to respond to a collection of information if this number is not displayed. Valid OMB control numbers can be located on the OMB Internet Page at **www.reginfo.gov/public/do/PRAMain**. If desired, you can call 1-800-827-1000 to get information on where to send comments or suggestions about this form.

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Information and Instructions for Completing Notice of Disagreement (NOD)

Published by the Department of Veterans Affairs. See https://www.vba.va.gov/pubs/forms/vba-21-0958-are.pdf (accessed March 27, 2019).

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Department of Veterans Affairs

INFORMATION AND INSTRUCTIONS FOR COMPLETING NOTICE OF DISAGREEMENT (NOD)

IMPORTANT: Please read the information below carefully to help you complete this form quickly and accurately. Some sections of the form also contain notes or specific instructions for completing that section.

The use of this form is *mandatory* to initiate an appeal from the decision on disability compensation claims you received. This form has several key components, which, when filled out completely and accurately, will decrease the amount of time it takes to process your NOD.

FREQUENTLY ASKED QUESTIONS

How do I use this standard Notice of Disagreement (NOD) form?
You ***must*** use this form if you wish to indicate that you disagree with a decision you received regarding your claim for disability compensation. Examples of these decisions may include entitlement to service connection, percentage of evaluation assigned, and effective date among other things. This form is the only way that you can initiate an appeal from a decision on your claim for disability compensation.

Should I fill out this form?
You ***must*** fill out this form if you disagree with a decision issued by the VA regional office (RO) about your disability compensation claim. This includes an initial decision, a decision for an increased rating, or any other decision with which you disagree. Only those issues that you list on this NOD will be considered on appeal. For those issues you do not list on this NOD, you will still have one year from the date of the decision notification letter to file an appeal for those issues.

Where can I get help?
You can ask the Department of Veterans Affairs (VA) to help you fill out the form by contacting us at 1-800-827-1000. Before you contact us, please make sure you gather the necessary information and materials, and complete as much of the form as you can.

You can also contact your representative, if applicable, for assistance with completing this form. If you do not already have a representative, you can find a list of approved Veterans Service Organizations at www.va.gov/vso. You can be represented by a Veterans Service Organization representative, an attorney-at-law, or "agent". Contact your local RO for assistance with appointing a representative or visit www.ebenefits.va.gov.

What should I do when I have finished my NOD?
You should provide your signature in Item 14A and the date signed in Item 14B. If you don't sign the form, VA will return it for you to sign, and it will take longer to process.

Attach any materials that support and explain your NOD.

Mail your NOD to the address included on the VA decision notice letter or take your NOD to your local RO.

Do I need to keep a copy of this NOD form?
It is important that you keep a copy of all completed forms and materials you give to VA.

What constitutes a complete NOD form?
Generally, VA will consider your NOD "complete" if the following information is provided on the form:

(1) Section I and II - Information to identify the veteran/claimant.
Please note that it would assist VA if you provide all the personal information in Section I and II. However, if you provide certain information specific to the veteran such as the veteran's last name and Social Security Number or VA file number, VA will be able to identify the veteran in our system and would not necessarily consider this NOD incomplete if other information in Section I and II, such as the claimant's address and telephone number, is excluded.

(2) Section V - Information to identify the specific nature of the disagreement.
Please list the issues or conditions for which you seek appellate review in Item 12 of Section V. At a minimum, please indicate the specific issue of disagreement in Item 12A such as "right knee disability" or "Post Traumatic Stress Disorder (PTSD)" and indicate the area of disagreement in Item 12B by checking the appropriate box. If you disagree with an evaluation of a disability, you may tell us what percentage evaluation you seek in Item 12C; however, you are not required to indicate the percentage of evaluation sought in Item 12C in order to complete this form.

(3) Section VI - Claimant's signature.
Please be sure to sign the NOD, certifying that the statements on the form are true and correct to the best of the claimant's knowledge and belief.

IMPORTANT: If you do not provide the above information on this NOD, VA will consider your form incomplete and will request clarification from you. You must respond to this request for clarification either ***60*** days from the date of VA's request for clarification or ***one year*** from the date of mailing of the notice of decision of the RO, whichever is later. If you do not provide VA with a completed form within that time frame, the decision will become final, and you will have to file a new claim.

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SPECIFIC INSTRUCTIONS FOR THE NOD

Section I and II - Personal Information

Please provide all personal contact information.

Section III - Telephone Contact

Why is VA asking to contact me by telephone?
The purpose of the optional telephone contact is to help process your NOD faster by requesting clarification of any ambiguous information on the form. If you indicate you wish to be contacted by telephone, VA may make up to two attempts to call you at the telephone number provided during the time slot you select. It is important to make sure you select a time period you will be available to speak with a RO representative by telephone.

Section IV - Election of Decision Review Officer (DRO) Review or Traditional Appellate Review

How does the DRO Review Process work?
A DRO is a senior technical expert who did not participate in the decision being reviewed who is responsible for holding post-decisional hearings, if requested, and processing appeals. The DRO will conduct a new and complete review of your claim, without deference to the original decision. The DRO will determine if there is additional evidence necessary to resolve the appeal, may ask you to participate in an informal conference, and/or may pursue additional evidence. The DRO may issue a new decision that changes the original decision by the RO.

How does the Traditional Appellate Review Process work?
A VA staff member will examine your file and any new evidence that you submit with or after your NOD. The reviewer may change the original decision based on new evidence or upon a finding of clear and unmistakable error in that decision.

How do I complete this section?
If you wish to elect the DRO Review Process, please check the "Decision Review Officer (DRO) Review Process" box in Item 10. If you wish to continue in the Traditional Appellate Review Process, please check the "Traditional Appellate Review Process" box in Item 10. Please note that failure to complete this section will not render the form incomplete.

Section V - Specific Issues of Disagreement

What date do I enter in the Notification/Decision Letter Date?
You should enter the date stamped on the notification or decision letter you received that you disagree with in Item 11. Please do not enter today's date in this field. If you need help identifying the date of the notification or decision you disagree with, contact us at 1-800-827-1000.

How do I complete this section?
The purpose of this section is for you to individually identify each area of disagreement that you have with the VA decision notification letter. Please list ***only*** the issues or disabilities with which you disagree. Only those issues that you list on this NOD will be considered on appeal. For those issues you do not list on this NOD, you will still have ***one*** year from the date of the decision notification letter to file an appeal for those issues.

In the Specific Issue of Disagreement column in Item 12A, please individually identify in separate boxes each of the issues with which you disagree. For example, "left knee condition," "hearing loss," etc.

In the "Area of Disagreement" column, Item 12B, please check the area with which you disagree. For example, if you disagree with the effective date that VA assigned for a particular benefit, check the "Effective Date of Award" option. If VA granted a benefit, but you disagree with the evaluation that we assigned, check the "Evaluation of Disability" option. If you were claiming service connection for an injury or disability that you believe to be the result of your military service, and VA denied that claim, please check the "Service Connection" option. If you are disagreeing with our decision for reasons other than listed in the "Area of Disagreement" column, please check "Other" and specify your reason.

If you disagree with a disability evaluation that we have assigned and believe that the evidence justifies a specific evaluation, please list the percentage that you believe the evidence to warrant in the "Percentage of Evaluation Sought If Known" column, Item 12C, within Section V of the form. To assist, please refer to our decision notification letter where we indicate what the evidence must show for the evaluation we assigned as well as the next higher evaluation. Please note that this information is not required and that, even if you limit your appeal by indicating a specific percentage evaluation sought in Item 12C, evaluation levels above the percentage evaluation sought will be considered in cases where the evidence supports a higher evaluation.

There is extra space provided for you in Item 13A, to explain why you feel VA incorrectly decided your claim, and to list any disagreements not covered by the form. Please utilize this space to briefly and clearly explain why you disagree with our decision.

Section VI - Certification and Signature

Sign and date the NOD, certifying that the statements on the form are true to the best of your knowledge and belief.

Privacy Act Notice: VA will not disclose information collected on this form to any source other than what has been authorized under the Privacy Act of 1974 or Title 38, Code of Federal Regulations 1.576 for routine uses (i.e., civil or criminal law enforcement, congressional communications, epidemiological or research studies, the collection of money owed to the United States, litigation in which the United States is a party or has an interest, the administration of VA programs and delivery of VA benefits, verification of identity and status, and personnel administration) as identified in the VA system of records, 58/VA21/22/28, Compensation, Pension, Education and Vocational Rehabilitation and Employment Records - VA, published in the Federal Register. Your obligation to respond is required to obtain or retain benefits. VA uses your SSN to identify your claim file. Providing your SSN will help ensure that your records are properly associated with your claim file. Giving us your SSN account information is voluntary. Refusal to provide your SSN by itself will not result in the denial of benefits. VA will not deny an individual benefits for refusing to provide his or her SSN unless the disclosure of the SSN is required by a Federal Statute of law in effect prior to January 1, 1975, and still in effect. The requested information is considered relevant and necessary to determine maximum benefits under the law. The responses you submit are considered confidential (38 U.S.C. 5701). Information submitted is subject to verification through computer matching programs with other agencies.
Respondent Burden: We need this information to determine entitlement to benefits (38 U.S.C. 501). Title 38, United States Code, allows us to ask for this information. We estimate that you will need an average of 15 minutes to review the instructions, find the information, and complete the form. VA cannot conduct or sponsor a collection of information unless a valid OMB control number is displayed. You are not required to respond to a collection of information if this number is not displayed. Valid OMB control numbers can be located on the OMB Internet Page at **www.reginfo.gov/public/do/PRAMain**. If desired, you can call 1-800-827-1000 to get information on where to send comments or suggestions about this form.

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OMB Approved No. 2900-0791
Respondent Burden: 15 minutes
Expiration Date: 09/30/2021

Department of Veterans Affairs

(DO NOT WRITE IN THIS SPACE)
(VA DATE STAMP)

NOTICE OF DISAGREEMENT

INSTRUCTIONS: A claimant or his or her duly appointed representative may file notice expressing their dissatification or disagreement with an adjudicative determination by the VA regional office. A desire to contest the result will constitute a notice of disagreement (NOD). While special wording is not required, the NOD must be in terms that can be reasonably construed as disagreement with the determination and a desire for appellate review. (Authority 38 U.S.C. 7105) To file a valid NOD, there is a time limit of one year from the date VA mailed the notification of the decision to the claimant. For contested claims, including claims of apportionment, the time limit is 60 days from the date VA mailed the notification of the decision to the claimant.

NOTE: You can ***either*** complete the form online or by hand. Please print information using blue or black ink, neatly, and legibly to help process the form.

SECTION I - VETERAN'S IDENTIFICATION INFORMATION

1. VETERAN'S NAME *(First, Middle Initial, Last)*

2. VETERAN'S SOCIAL SECURITY NUMBER – –

3. VA FILE NUMBER

4. VETERAN'S DATE OF BIRTH
Month – Day – Year

SECTION II - CLAIMANT'S INFORMATION (If other than veteran)

5. CLAIMANT'S NAME *(First, Middle Initial, Last)*

6. CURRENT MAILING ADDRESS *(Number and street or rural route, P.O. Box, City, State, ZIP Code and Country)*

No. & Street

Apt./Unit Number City

State/Province Country ZIP Code/Postal Code –

7. TELEPHONE NUMBER *(Include Area Code)*

8. E-MAIL ADDRESS *(Optional)*

SECTION III - TELEPHONE CONTACT

9. WOULD YOU LIKE TO RECEIVE A TELEPHONE CALL OR E-MAIL FROM A REPRESENTATIVE AT YOUR LOCAL REGIONAL OFFICE REGARDING YOUR NOD?

☐ YES ☐ NO

(If you answered "Yes," VA will make up to two attempts to call you between 8:00 a.m. and 4:30 p.m. local time at the telephone number and time period you select below. Please select up to two time periods you are available to receive a phone call.)

☐ 8:00 a.m. - 10:00 a.m. ☐ 10:00 a.m. - 12:30 p.m. ☐ 12:30 p.m. - 2:00 p.m. ☐ 2:00 p.m. - 4:30 p.m.

Phone number I can be reached at the above checked time:_____

SECTION IV - APPEAL PROCESS ELECTION

10. SELECT ONE OF THE APPEALS PROCESSING METHODS BELOW *(See Specific Instructions, Page 2, Section IV for additional information)*

☐ Decision Review Officer (DRO) Review Process

☐ Traditional Appellate Review Process

VA FORM SEP 2018 **21-0958** SUPERSEDES VA FORM 21-0958, SEP 2015, WHICH WILL NOT BE USED. Page 3

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VETERAN'S SSN ☐☐☐ – ☐☐ – ☐☐☐☐

SECTION V - SPECIFIC ISSUES OF DISAGREEMENT

11. NOTIFICATION/DECISION LETTER DATE

12. PLEASE LIST EACH SPECIFIC ISSUE OF DISAGREEMENT AND NOTE THE AREA OF DISAGREEMENT. IF YOU DISAGREE ON THE EVALUATION OF A DISABILITY, SPECIFY PERCENTAGE EVALUATION SOUGHT, IF KNOWN. PLEASE LIST ONLY ONE DISABILITY IN EACH BOX. YOU MAY ATTACH ADDITIONAL SHEETS IF NECESSARY.

A. Specific Issue of Disagreement	B. Area of Disagreement	C. Percentage (%) Evaluation Sought *(If known)*
	☐ Service Connection ☐ Effective Date of Award ☐ Evaluation of Disability ☐ Other *(Please specify below)* _____	
	☐ Service Connection ☐ Effective Date of Award ☐ Evaluation of Disability ☐ Other *(Please specify below)* _____	
	☐ Service Connection ☐ Effective Date of Award ☐ Evaluation of Disability ☐ Other *(Please specify below)* _____	
	☐ Service Connection ☐ Effective Date of Award ☐ Evaluation of Disability ☐ Other *(Please specify below)* _____	
	☐ Service Connection ☐ Effective Date of Award ☐ Evaluation of Disability ☐ Other *(Please specify below)* _____	

13A. IN THE SPACE BELOW, OR ON A SEPARATE PAGE, PLEASE EXPLAIN WHY YOU FEEL WE INCORRECTLY DECIDED YOUR CLAIM, AND LIST ANY DISAGREEMENT(S) NOT COVERED ABOVE:

13B. DID YOU ATTACH ADDITIONAL PAGES TO THIS NOD?

☐YES ☐NO *(If so, how many?)*

SECTION VI - CERTIFICATION AND SIGNATURE

I CERTIFY THAT THE STATEMENTS ON THIS FORM ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

14A. SIGNATURE *(Sign in ink)*	14B. DATE SIGNED

PENALTY: THE LAW PROVIDES SEVERE PENALTIES WHICH INCLUDE A FINE, IMPRISONMENT, OR BOTH, FOR THE WILLFUL SUBMISSION OF ANY STATEMENT OR EVIDENCE OF A MATERIAL FACT, KNOWING IT TO BE FALSE.

VA FORM 21-0958, SEP 2018 Page 4

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Appeal to Board of Veterans' Appeals

Published by the Department of Veterans Affairs. See https://www.va.gov/vaforms/va/pdf/va9.pdf (accessed March 27, 2019).

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Form Approved: OMB No. 2900-0674
Expiration Date: Feb. 28, 2022
Respondent Burden: 1 Hour

Department of Veterans Affairs

APPEAL TO BOARD OF VETERANS' APPEALS

IMPORTANT: *Read the attached instructions before you fill out this form. VA also encourages you to get assistance from your representative in filling out this form.*

1. NAME OF VETERAN *(Last Name, First Name, Middle Initial)*	2. CLAIM FILE NO. *(Include prefix)*	3. INSURANCE FILE NO., OR LOAN NO.

4. I AM THE:
☐ VETERAN ☐ VETERAN'S WIDOW/ER ☐ VETERAN'S CHILD ☐ VETERAN'S PARENT
☐ OTHER *(Specify)*

5. TELEPHONE NUMBERS		6. MY ADDRESS IS: *(Number & Street or Post Office Box, City, State & ZIP Code)*
A. HOME *(Include Area Code)*	B. WORK *(Include Area Code)*	
7. IF I AM NOT THE VETERAN, MY NAME IS: *(Last Name, First Name, Middle Initial)*		

8. THESE ARE THE ISSUES I WANT TO APPEAL TO THE BOARD: *(Be sure to read the information about this block in paragraph 6 of the attached instructions.)*

A. ☐ I HAVE READ THE STATEMENT OF THE CASE AND ANY SUPPLEMENTAL STATEMENT OF THE CASE I RECEIVED. I AM **ONLY** APPEALING THESE ISSUES:
(List below.)

B. ☐ I WANT TO APPEAL **ALL** OF THE ISSUES LISTED ON THE STATEMENT OF THE CASE AND ANY SUPPLEMENTAL STATEMENT OF THE CASE THAT MY LOCAL VA OFFICE SENT TO ME.

9. HERE IS WHY I THINK THAT VA DECIDED MY CASE INCORRECTLY: *(Be sure to read the information about this block in paragraph 6 of the attached instructions.)*

(Continue on the back, or attach sheets of paper, if you need more space.)

10. **OPTIONAL** BOARD HEARING

IMPORTANT: *Read the information about this block in paragraph 6 of the attached instructions. This block is used to request an optional Board of Veterans' Appeals (Board) hearing. DO NOT USE THIS FORM TO REQUEST A HEARING BEFORE VA REGIONAL OFFICE PERSONNEL.*
Check one (and only one) of the following boxes:

A. ☐ I DO NOT WANT AN OPTIONAL BOARD HEARING. *(Choosing this option often results in the Board issuing its decision most quickly. If you choose, you may write down what you would say at a hearing and submit it directly to the Board.)*

I WANT AN OPTIONAL BOARD HEARING:

B. ☐ BY LIVE VIDEOCONFERENCE AT A LOCAL VA OFFICE. *(Choosing this option will add delay to issuance of a Board decision.)*

C. ☐ IN WASHINGTON, DC. *(Choosing this option will add delay to issuance of a Board decision.)*

D. ☐ AT A LOCAL VA OFFICE.* *(Choosing this option will add **significant** delay to issuance of a Board decision.)*
**This option is not available at the Washington, DC, or Baltimore, MD, Regional Offices.*

11. SIGNATURE OF PERSON MAKING THIS APPEAL *(Ink signature required)*	12. DATE *(MM/DD/YYYY)*	13. SIGNATURE OF APPOINTED REPRESENTATIVE, IF ANY *(Not required if signed by appellant. See paragraph 6 of the instructions.) (Ink signature)*	14. DATE *(MM/DD/YYYY)*

VA FORM FEB 2019 **9**

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CONTINUATION SHEET FOR ITEM 9
(Attach additional sheets, if necessary)

2

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We are required by law to give you the information in this box. Instructions for filling out the form follow the box.

RESPONDENT BURDEN: VA may not conduct or sponsor, and the respondent is not required to respond to, this collection of information unless it displays a valid Office of Management and Budget (OMB) Control Number. The information requested is approved under OMB Control Number (2900-0085). Public reporting burden for this collection of information is estimated to average one hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspects of this collection, including suggestions for reducing this burden to: VA Clearance Officer (005R1B), 810 Vermont Ave., NW, Washington, DC 20420. **DO NOT** send requests for benefits to this address.

PRIVACY ACT STATEMENT: Our authority for asking for the information you give to us when you fill out this form is 38 U.S.C. 7105(d)(3), a Federal statute that sets out the requirement for you to file a formal appeal to complete your appeal on a VA benefits determination. You use this form to present your appeal to the Board of Veterans' Appeals (Board). It is used by VA in processing your appeal and it is used by the Board in deciding your appeal. Providing this information to VA is voluntary, but if you fail to furnish this information VA will close your appeal and you may lose your right to appeal the benefit determinations you told us you disagreed with. The Privacy Act of 1974 (5 U.S.C. 552a) and VA's confidentiality statute (38 U.S.C. 5701), as implemented by 38 C.F.R. 1.526(a) and 1.576(b), require individuals to provide written consent before documents or information can be disclosed to third parties not allowed to receive records or information under any other provision of law. However, the law permits VA to disclose the information you include on this form to people outside of VA in some circumstances. Information about that is given in notices about VA's "systems of records" that are periodically published in the *Federal Register* as required by the Privacy Act of 1974. Examples of situations in which the information included in this form might be released to individuals outside of VA include release to the United States Court of Appeals for Veterans Claims, if you later appeal the Board's decision in your case to that court; disclosure to a medical expert outside of VA, should VA exercise its statutory authority under 38 U.S.C. 5109 or 7109, to ask for an expert medical opinion to help decide your case; disclosure to law enforcement personnel and security guards in order to alert them to the presence of a dangerous person; disclosure to law enforcement agencies should the information indicate that there has been a violation of law; disclosure to a congressional office in order to answer an inquiry from the congressional office made at your request; and disclosure to Federal government personnel who have the duty of inspecting VA's records to make sure that they are being properly maintained. See the *Federal Register* notices described above for further details.

INSTRUCTIONS

1. CONSIDER GETTING ASSISTANCE: We have tried to give you the general information most people need to complete this form in these instructions, but the law about veterans' benefits can be complicated. If you have a representative, we encourage you to work with your representative in completing this form. If you do not have a representative, we urge you to consider getting one. Most people who appeal to the Board of Veterans' Appeals (Board) do get a representative. Veterans Service Organizations (VSOs) will represent you at no charge and most people (more than 80 percent) are represented by VSOs. You can find a listing of VSOs on the Internet at: http://www.va.gov/vso. Under certain circumstances, you may pay a lawyer or "agent" to represent you. Your local VA office can further assist you with questions regarding how to appoint a VSO, attorney, or agent to represent you. You can reach your local VA office toll-free at 1-800-827-1000. Your local bar association may be able to provide you with the names of attorneys who specialize in veterans' law.

2. WHAT IS THIS FORM FOR? You told your local VA office that you disagreed with some decision it made on your claim for VA benefits, called filing a "Notice of Disagreement." That office then mailed you a "Statement of the Case" (SOC) that told you why and how it came to the decision that it did. After you have read the SOC, you must decide if you want to go ahead and complete your appeal so that the Board will review your case. If you do, you or your representative must fill out this form and file it with VA. "Filing" means delivering the completed form to VA in person or by mailing it based on the instructions you received with your SOC. Paragraph 4 tells you how much time you have to file this form and paragraph 7 tells you where you file it.

When we refer to "your local VA office" in these instructions, we mean the VA Regional Office that sent you the SOC or, if you have moved out of the area served by that office, the VA Regional Office that now has your VA records.

3. DO I HAVE TO FILL OUT THIS FORM AND FILE IT? Fill out this form and file it with VA *if* you want to complete your appeal. If you do not, VA will close your appeal without sending it to the Board for a decision. If you decide that you no longer want to appeal after you have read the SOC, you don't have to do anything.

4. HOW LONG DO I HAVE TO COMPLETE THIS FORM AND FILE IT? Under current law, there are three different ways to calculate how much time you have to complete and file this form. The one that applies to you is the one that gives you the *most* time:

(a) You have one year from the day your local VA office mailed you the notice of the decision you are appealing.

(b) You have 60 days from the day that your local VA office mailed you the SOC.

(c) Your local VA office may have sent you an update to the SOC, called a "Supplemental Statement of the Case" (SSOC). If that SSOC was provided to you in response to evidence you or your representative submitted within the one-year period described in paragraph 4(a) of these instructions, above, and if you have not already filed this form, then you have at least 60 days from the time your local VA office mailed you the SSOC to file it even though the one-year period has already expired. *See* 38 C.F.R. 20.302(b)(2).

There is one special kind of case, called a "simultaneously contested claim," where you have 30 days to file this form instead of the longer time periods described above. A "simultaneously contested claim" is a case where two different people are asking for the same kind of VA benefit and one will either lose, or get less, if the other wins. If you are not sure whether this special exception applies, ask your representative or call your local VA office.

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If you have *any* questions about the filing deadline in your case, ask your representative or your local VA office. **Filing on time is very important. Failing to file on time could result in you losing your right to appeal.**

5. WHAT IF I NEED MORE TIME? If you need more time to complete this form and file it, write to the address included on your SOC, explaining why you need more time. *You must file your request for more time before the normal time for filing this form runs out.* If you file by mail, VA will use the postmark date to decide whether you filed the form, or the request for more time to file it, on time.

6. WHAT KIND OF INFORMATION DO I NEED TO INCLUDE WHEN I FILL OUT THE FORM? While most of the form is easy to understand, please refer to the sections below for additional information regarding each block.

Block 3. If your appeal involves an insurance claim or some issue related to a VA home loan, enter your VA insurance or VA loan number here. For most kinds of cases, you will leave this block blank.

Blocks 4-7. These blocks are for information about the person who is filing this appeal. If you are a representative filling out this form for the person filing the appeal, fill in the information about that person, not yourself. Block 7 can be left blank if the person filing the appeal is the Veteran.

Block 8. This is the block where you tell us exactly *what* you are appealing. You do this by identifying the "issues" you are appealing. Your local VA office has tried to accurately identify the issues and has listed them on the SOC and any SSOC it sent you. Save what you want to tell us about *why* you are appealing for the next block (Block 9).

Check the first check box in Block 8 if you only want to continue your appeal on some of the issues listed on the SOC and any SSOC you received. List the specific issues you want to appeal in the space under the first box. While you should not use this form to file a new claim or to appeal new issues for the first time, you can also use this space to call the Board's attention to issues, if any, you told your local VA office in your Notice of Disagreement you wanted to appeal that are not included in the SOC or any SSOC. If you want to file a new claim, or appeal new issues (file a new Notice of Disagreement), do that in separate correspondence. *Do not check the second box if you check this box.*

If you think that your local VA office has correctly identified the issues you are appealing and, after reading the SOC and any SSOC you received, you still want to appeal its decisions on *all* those issues, check the second box in Block 8. *Do not check the first box if you check this box.*

Block 9. Use this block to tell us why you disagree with the decision made by your local VA office. Tie your arguments to the issues you identified in Block 8. Tell us what facts you think VA got wrong and/or how you think VA misapplied the law in your case. Try to be specific. If you are appealing a rating percentage your local VA office assigned for one or more of your service-connected disabilities, tell us *for each service-connected disability rating you have appealed* what rating would satisfy your appeal (The SOC, or SSOC, includes information about what disability percentages can be assigned for each disability under VA's "Rating Schedule.") You may want to refer to the specific items of evidence that you feel support your appeal, but you do not have to describe all of the evidence you have submitted. The Board will have your complete file when it considers your case. You should not attach copies of evidence you have already sent to VA.

In completing this block, please also let us know if there is any additional evidence that you feel needs to be obtained to support your appeal. You may either submit this evidence along with this response, or at a minimum notify VA of its existence so that the evidence can be obtained on your behalf.

If you need more space to complete Block 9, you can continue it on the back of the form and/or you can attach sheets of paper to the form. If you want to complete this part of the form using a computer word-processor, you may do so. Just attach the sheets from your printer to the form and write "see attachment" in Block 9.

Block 10. It is very important for you to check one, *and only one*, of the boxes in Block 10. This lets us know whether or not you want to appear at a Board hearing and, if so, where you want to appear. **Please keep in mind that a Board hearing is entirely optional, and it is not necessary for you to have a hearing for the Board to decide your appeal. Hearings often increase wait time for a Board decision.** *If you do not check any of the boxes, the Board will assume that you DO NOT want a Board hearing and your case will be decided taking into consideration the arguments already made, including your explanation on this form as to why you think VA decided your case incorrectly.*

If you ask for a Board hearing, you and your representative (if you have one) can tell us why you think the Board should act favorably on your appeal (present argument). You can also tell us about the facts behind your claim and you can bring others (witnesses) to the hearing who have information to give the Board about your case. At your option, you can submit more evidence at a Board hearing. If you do ask for a Board hearing, it can be very helpful to have a representative assist you at the hearing. Please note that VA *cannot* pay any expenses that you (or your representative or witnesses) incur in connection with attending any Board hearing.

The purpose of a hearing is to receive argument and testimony relevant and material to the issue or issues in your case that are on appeal. Hearings conducted by the Board are nonadversarial in nature. Parties to a hearing are permitted to ask questions, including follow-up questions, but cross-examination is not allowed. While the types of questions that may be asked are not limited by the legal rules of evidence that typically apply in an adversarial trial setting, reasonable bounds of relevancy and materiality still must be maintained.

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Here is specific information about each of the check boxes in Block 10:

Box A: Check Box A if you decide that you *do not* want a Board hearing. It is *not* necessary for you to have a hearing for the Board to decide your appeal, and this is often the fastest option to issuance of a Board decision. If you feel that you have already sent VA everything that the Board will need to decide your case, including making all desired arguments in support of your appeal, then there is no need for a hearing to be held. In addition, a hearing is not needed if the only thing you would like to do is submit additional evidence in support of your appeal. Instead, you may submit such additional evidence, or at a minimum notify VA of its existence and request that it be obtained, without a hearing being held. If you choose, you may also write down what you would say at a hearing and submit it directly to the Board. *If you check this box, do not check any of the other boxes in Block 10.*

Box B: Check Box B if you want to appear at a live Board videoconference hearing. This option allows you to have a hearing by way of videoconferencing where you will be at the local VA office and the Veterans Law Judge hearing your case will be at the Board's offices in Washington, DC. Videoconferencing allows the Veterans Law Judge holding the hearing to see and hear you, your representative, and witnesses (if any). You will also be able to see and hear the Veterans Law Judge. *Please note that choosing a live videoconference hearing will delay issuance of a Board decision in your appeal due to scheduling demands. This type of hearing, however, can often be scheduled more quickly than a Board hearing where all participants (including the Veterans Law Judge) are physically present together at the local VA office.*

Box C: Check Box C if you want to appear for a hearing at the Board's offices in Washington, DC. Having your Board hearing by live videoconference (Box B) is usually less expensive for you, because you will not incur expenses associated with travel to Washington, DC. *Please note that choosing a Board hearing in Washington, DC, will delay issuance of a Board decision in your appeal due to scheduling demands.*

Box D: Check Box D if you want a Board hearing at your local VA office. If you select this option, both you and the Veterans Law Judge assigned to hear your case will be physically present together at the local VA office. *Please note that this option will* ***significantly*** *delay issuance of a Board decision in your appeal due to travel requirements and scheduling demands for Board personnel.* You can check with your local VA office for an estimate of how long it may take before your case could be scheduled for a Board hearing at that local VA office.

HEARINGS BEFORE VA REGIONAL OFFICE PERSONNEL: A hearing before VA regional office personnel, instead of before a Veterans Law Judge, is not a Board hearing. You can request a hearing before VA regional office personnel by writing directly to the regional office. DO NOT use this form to request that kind of hearing. If you do, it will delay your appeal. You should also know that requesting a hearing before VA regional office personnel does not extend the time for filing this form.

Blocks 11 and 12. This form can be signed and filed by *either* the person appealing the local VA decision, or by his or her representative. Sign the form in Block 11 if you are the person appealing, or if you are a guardian or other properly appointed fiduciary filing this appeal for someone else. In cases where an incompetent person has no fiduciary, or the fiduciary has not acted, that person's "next friend," such as a family member, can sign and file this form. If the representative is filing this form, Block 11 can be left blank. Regardless of who signs the form, we encourage you to have your representative check it over before it is filed. Place the date you sign in Block 12.

Blocks 13 and 14. If you are a representative filing this form for the appellant, sign in Block 13. Otherwise, leave Block 13 blank. If you are an accredited representative of a VSO, also insert the name of the VSO in Block 13. Note that signing this form will not serve to appoint you as the appellant's representative. Contact your local VA office if you need information on appointment. Place the date you sign in Block 14.

7. WHERE DO I FILE THE FORM ONCE I HAVE COMPLETED IT? When you have completed the form, signed and dated it, follow the instructions you received with your SOC of where to send the form.

8. OTHER SOURCES OF INFORMATION: You can find a "plain language" pamphlet that describes the VA appeals process called "How Do I Appeal" on the Internet at: http://www.bva.va.gov/How_Do_I_Appeal.asp. You can also find the formal rules for the VA appeals process in title 38, Code of Federal Regulations, Part 20. A complete copy of the Code of Federal Regulations is available on the Internet at: http://www.gpoaccess.gov/cfr/index.html. A printed copy of the Code of Federal Regulations may also be available at your local law library. More general information about VA benefit programs and eligibility can be found on the Internet at: **http://www.va.gov**.

9. SPECIAL NOTE FOR ATTORNEYS AND VA ACCREDITED AGENTS. There are statutory and regulatory restrictions on the payment of your fees and expenses and requirements for filing copies of your fee agreement with your client with VA. *See* 38 U.S.C. 5904 and 38 C.F.R. 14.636-637.

NOTE: Please separate these instructions from the form before you file it with VA. We suggest that you keep these instructions with your other papers about your appeal for future reference.

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M

Neck (Cervical Spine) Conditions Disability Benefits Questionnaire

Published by the Department of Veterans Affairs. See https://www.vba.va.gov/pubs/forms/VBA-21-0960M-13-ARE.pdf (accessed March 27, 2019).

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OMB Approved No. 2900-0807
Respondent Burden: 45 Minutes
Expiration Date: 03/31/2021

Department of Veterans Affairs

NECK (CERVICAL SPINE) CONDITIONS DISABILITY BENEFITS QUESTIONNAIRE

IMPORTANT - THE DEPARTMENT OF VETERANS AFFAIRS (VA) ***WILL NOT PAY*** OR ***REIMBURSE*** ANY EXPENSES OR COST INCURRED IN THE PROCESS OF COMPLETING AND/OR SUBMITTING THIS FORM. PLEASE READ THE PRIVACY ACT AND RESPONDENT BURDEN INFORMATION ON REVERSE BEFORE COMPLETING FORM.

NAME OF PATIENT/VETERAN

PATIENT/VETERAN'S SOCIAL SECURITY NUMBER

___ – __ – ____

NOTE TO PHYSICIAN - The veteran or service member is applying to the U.S. Department of Veterans Affairs (VA) for disability benefits. VA will consider the information you provide on this questionnaire as part of their evaluation in processing the claim. VA reserves the right to confirm the authenticity of ALL DBQs completed by private health care providers.

MEDICAL RECORD REVIEW

WAS THE VETERAN'S VA CLAIMS FILE REVIEWED?

☐ YES ☐ NO

IF YES, LIST ANY RECORDS THAT WERE REVIEWED BUT WERE NOT INCLUDED IN THE VETERAN'S VA CLAIMS FILE:

IF NO, CHECK ALL RECORDS REVIEWED:

- ☐ Military service treatment records
- ☐ Military service personnel records
- ☐ Military enlistment examination
- ☐ Military separation examination
- ☐ Military post-deployment questionnaire
- ☐ Department of Defense Form 214 Separation Documents
- ☐ Veterans Health Administration medical records *(VA treatment records)*
- ☐ Civilian medical records
- ☐ Interviews with collateral witnesses *(family and others who have known the veteran before and after military service)*
- ☐ Other: _____
- ☐ No records were reviewed

SECTION I - DIAGNOSIS

NOTE: These are condition(s) for which an evaluation has been requested on an exam request form (Internal VA) or for which the Veteran has requested medical evidence be provided for submission to VA.

1A. LIST THE CLAIMED CONDITION(S) THAT PERTAIN TO THIS DBQ:

NOTE: These are the diagnoses determined during this current evaluation of the claimed condition(s) listed above. If there is no diagnosis, if the diagnosis is different from a previous diagnosis for this condition, or if there is a diagnosis of a complication due to the claimed condition, explain your findings and reasons in comments section.

Date of diagnosis can be the date of the evaluation if the clinician is making the initial diagnosis, or an approximate date determined through record review or reported history.

1B. SELECT DIAGNOSES ASSOCIATED WITH THE CLAIMED CONDITION(S) *(Check all that apply)*:

☐ The Veteran does not have a current diagnosis associated with any claimed condition listed above. *(Explain your findings and reasons in comments section.)*

☐ Mechanical cervical pain syndrome	ICD Code: _____	Date of diagnosis: _____
☐ Cervical sprain/strain	ICD Code: _____	Date of diagnosis: _____
☐ Cervical spondylosis *(degenerative joint disease of cervical spine)*	ICD Code: _____	Date of diagnosis: _____
☐ Degenerative disc disease	ICD Code: _____	Date of diagnosis: _____
☐ Foraminal stenosis/central stenosis	ICD Code: _____	Date of diagnosis: _____
☐ Intervertebral disc syndrome	ICD Code: _____	Date of diagnosis: _____
☐ Radiculopathy	ICD Code: _____	Date of diagnosis: _____
☐ Myelopathy	ICD Code: _____	Date of diagnosis: _____
☐ Ankylosis of the cervical spine	ICD Code: _____	Date of diagnosis: _____
☐ Ankylosing spondylitis of the cervical spine *(neck)*	ICD Code: _____	Date of diagnosis: _____
☐ Vertebral fracture *(vertebrae of the neck)*	ICD Code: _____	Date of diagnosis: _____

☐ Other *(specify)*

Other diagnosis #1: _____

ICD Code: _____ Date of diagnosis: _____

Other diagnosis #2: _____

ICD Code: _____ Date of diagnosis: _____

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SECTION I - DIAGNOSIS *(Continued)*

Other diagnosis #3: _____

ICD Code: _____ Date of diagnosis: _____

1C. COMMENTS *(if any)*:

1D. WAS AN OPINION REQUESTED ABOUT THIS CONDITION *(internal VA only)*?

☐ YES ☐ NO ☐ N/A

SECTION II - MEDICAL HISTORY

2A. DESCRIBE THE HISTORY *(including onset and course)* OF THE VETERAN'S CERVICAL SPINE *(neck)* CONDITION *(brief summary)*:

2B. DOMINANT HAND:

☐ RIGHT ☐ LEFT ☐ AMBIDEXTROUS

2C. DOES THE VETERAN REPORT THAT FLARE-UPS IMPACT THE FUNCTION OF THE CERVICAL SPINE *(neck)*?

☐ YES ☐ NO

IF YES, DOCUMENT THE VETERAN'S DESCRIPTION OF THE IMPACT OF FLARE-UPS IN HIS OR HER OWN WORDS:

2D. DOES THE VETERAN REPORT HAVING ANY FUNCTIONAL LOSS OR FUNCTIONAL IMPAIRMENT OF THE CERVICAL SPINE *(neck) (regardless of repetitive use)*?

☐ YES ☐ NO

IF YES, DOCUMENT THE VETERAN'S DESCRIPTION OF FUNCTIONAL LOSS OR FUNCTIONAL IMPAIRMENT IN HIS OR HER OWN WORDS:

SECTION III - INITIAL RANGE OF MOTION *(ROM)* MEASUREMENTS

Measure ROM with a goniometer. During the examination be cognizant of painful motion, which could be evidenced by visible behavior such as facial expression, wincing, etc..., on pressure or manipulation. Document painful movement in Section 5.

Following the initial assessment of ROM, perform repetitive use testing. For VA purposes, repetitive use testing must be included in all joint exams. The VA has determined that 3 repetitions of ROM (at a minimum) can serve as a representative test of the effect of repetitive use. After the initial measurement, reassess ROM after 3 repetitions. Report post-test measurements in question 4A.

3A. INITIAL ROM MEASUREMENTS

	Joint Movement	ROM Measurement	If ROM testing is not indicated for the veteran's condition or not able to be performed, please explain why, and then proceed to Section 5:
NECK All Normal	Forward Flexion (normal endpoint = 45 degrees)	_____ ☐ Not indicated ☐ Not able to perform	
	Extension (normal endpoint = 45 degrees)	_____ ☐ Not indicated ☐ Not able to perform	
	Right Lateral Flexion (normal endpoint = 45 degrees)	_____ ☐ Not indicated ☐ Not able to perform	
	Left Lateral Flexion (normal endpoint = 45 degrees)	_____ ☐ Not indicated ☐ Not able to perform	
	Right Lateral Rotation (normal endpoint = 80 degrees)	_____ ☐ Not indicated ☐ Not able to perform	
	Left Lateral Rotation (normal endpoint = 80 degrees)	_____ ☐ Not indicated ☐ Not able to perform	

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SECTION III - INITIAL RANGE OF MOTION *(ROM)* MEASUREMENTS *(Continued)*

3B. DO ANY ABNORMAL ROMs NOTED ABOVE CONTRIBUTE TO FUNCTIONAL LOSS?

☐ YES *(you will be asked to further describe these limitations in Section 7 below)*

☐ NO, EXPLAIN WHY THE ABNORMAL ROMs DO NOT CONTRIBUTE:

3C. IF ROM DOES NOT CONFORM TO THE NORMAL RANGE OF MOTION IDENTIFIED ABOVE BUT IS NORMAL FOR THIS VETERAN *(for reasons other than a neck condition, such as age, body habitus, neurologic disease)*, EXPLAIN:

SECTION IV - ROM MEASUREMENTS AFTER REPETITIVE USE TESTING

4A. POST-TEST ROM MEASUREMENTS

Is the veteran able to perform repetitive-use testing?	Is there additional limitation in ROM after repetitive-use testing?	Joint Movement	Post-test ROM Measurement
☐ Yes If yes, perform repetitive-use testing ☐ No If no, provide reason below, then proceed to Section 5	☐ Yes ☐ No, there is no change in ROM after repetitive testing If yes, report ROM after a minimum of 3 repetitions. If no, documentation of ROM after repetitive-use testing is not required.	Forward Flexion	_____
		Extension	_____
		Left Lateral Flexion	_____
		Right Lateral Flexion	_____
		Left Lateral Rotation	_____
		Right Lateral Rotation	_____

4B. DO ANY POST-TEST ADDITIONAL LIMITATIONS OF ROMs NOTED ABOVE CONTRIBUTE TO FUNCTIONAL LOSS?

☐ YES *(you will be asked to further describe these limitations in Section 7 below)*

☐ NO, EXPLAIN WHY THE POST-TEST ADDITIONAL LIMITATIONS OF ROMs DO NOT CONTRIBUTE:

SECTION V - PAIN

5A. ROM MOVEMENTS PAINFUL ON ACTIVE, PASSIVE AND/OR REPETITIVE USE TESTING

Are any ROM movements painful on active, passive and/or repetitive use testing? *(If yes, identify whether active, passive, and/or repetitive use in question 5D)*	If yes *(there are painful movements)*, does the pain contribute to functional loss or additional limitation of ROM?	If no *(the pain does not contribute to functional loss or additional limitation of ROM)*, explain why the pain does not contribute:
☐ Yes ☐ No	☐ Yes *(you will be asked to further describe these limitations in Section 7 below)* ☐ No	

5B. PAIN WHEN USED IN WEIGHT-BEARING OR IN NON WEIGHT-BEARING

Is there pain when the joint is used in weight-bearing or non weight-bearing? *(If yes, identify whether weight-bearing or non weight-bearing in question 5D)*	If yes *(there is pain when used in weight-bearing or non weight-bearing)*, does the pain contribute to functional loss or additional limitation of ROM?	If no *(the pain does not contribute to functional loss or additional limitation of ROM)*, explain why the pain does not contribute:
☐ Yes ☐ No	☐ Yes *(you will be asked to further describe these limitations in Section 7 below)* ☐ No	

5C. LOCALIZED TENDERNESS OR PAIN ON PALPATION

Does the Veteran have localized tenderness or pain on palpation of joints or soft tissue?	If yes, describe including location, severity and relationship to condition(s) listed in the Diagnosis section:
☐ Yes ☐ No	

5D. COMMENTS, IF ANY:

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SECTION VI - GUARDING AND MUSCLE SPASM

6A. DOES THE VETERAN HAVE GUARDING OR MUSCLE SPASM OF THE CERVICAL SPINE *(neck)*?

☐ YES ☐ NO

6B. GAIT:

☐ NORMAL

☐ ABNORMAL

Due to:

☐ Muscle spasm

☐ Guarding

☐ Other, describe and provide etiology:

☐ UNABLE TO EVALUATE, PROVIDE REASON:

6C. SPINAL CONTOUR:

☐ NORMAL

☐ ABNORMAL

Due to:

☐ Muscle spasm

☐ Guarding

☐ Other, describe and provide etiology:

☐ UNABLE TO EVALUATE, PROVIDE REASON:

SECTION VII - FUNCTIONAL LOSS AND ADDITIONAL LIMITATION OF ROM

NOTE: The VA defines functional loss as the inability, due to damage or infection in parts of the system, to perform normal working movements of the body with normal excursion, strength, speed, coordination and/or endurance. As regards the joints, factors of disability reside in reductions of their normal excursion of movements in different planes.
Using information from the history and physical exam, select the factors below that contribute to functional loss or impairment (regardless of repetitive use) or to additional limitation of ROM after repetitive use for the joint or extremity being evaluated on this DBQ:

7A. CONTRIBUTING FACTORS OF DISABILITY *(check all that apply and indicate side affected)*:

☐ Less movement than normal *(due to ankylosis, limitation or blocking, adhesions, tendon-tie-ups, contracted scars, etc.)*

☐ More movement than normal *(from flail joints, resections, nonunion of fractures, relaxation of ligaments, etc.)*

☐ Weakened movement *(due to muscle injury, disease or injury of peripheral nerves, divided or lengthened tendons, etc.)*

☐ Excess fatigability

☐ Incoordination, impaired ability to execute skilled movements smoothly

☐ Pain on movement

☐ Swelling

☐ Deformity

☐ Atrophy of disuse

☐ Instability of station

☐ Disturbance of locomotion

☐ Interference with sitting

☐ Interference with standing

☐ Other, describe:

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SECTION VII - FUNCTIONAL LOSS AND ADDITIONAL LIMITATION OF ROM *(Continued)*

NOTE: If any of the above factors is/are associated with limitation of motion, the examiner must give an opinion on whether pain, weakness, fatigability, or incoordination could significantly limit functional ability during flare-ups or when the joint is ***used repeatedly over a period of time*** and that opinion, if feasible, should be expressed in terms of the degree of additional ROM loss due to pain on use or during flare-ups. The following section will assist you in providing this required opinion.

7B. ARE ANY OF THE ABOVE FACTORS ASSOCIATED WITH LIMITATION OF MOTION?

☐ YES *(If yes, complete question 7C and 7D)*

☐ NO *(If no, proceed to question 7D)*

7C. CONTRIBUTING FACTORS OF DISABILITY ASSOCIATED WITH LIMITATION OF MOTION

Can pain, weakness, fatigability, or incoordination significantly limit functional ability during flare-ups or when the joint is ***used repeatedly over a period of time?***	If yes, please estimate ROM due to pain and/or functional loss during flare-ups or when the joint is used repeatedly over a period of time:			If there is a functional loss due to pain, during flare-ups and/or when the joint is used repeatedly over a period of time but the limitation of ROM cannot be estimated, please describe the functional loss:
☐ Yes ☐ No	Forward Flexion	_____	☐ Est. ROM is not feasible	
	Extension	_____	☐ Est. ROM is not feasible	
	Right Lateral Flexion	_____	☐ Est. ROM is not feasible	
	Left Lateral Flexion	_____	☐ Est. ROM is not feasible	
	Right Lateral Rotation	_____	☐ Est. ROM is not feasible	
	Left Lateral Rotation	_____	☐ Est. ROM is not feasible	

7D. CONTRIBUTING FACTORS OF DISABILITY NOT ASSOCIATED WITH LIMITATION OF MOTION

IS THERE ANY FUNCTIONAL LOSS *(not associated with limitation of motion)* DURING FLARE-UPS OR WHEN THE JOINT IS USED REPEATEDLY OVER A PERIOD OF TIME OR OTHERWISE?

☐ YES ☐ NO

IF YES, DESCRIBE:

SECTION VIII - MUSCLE STRENGTH TESTING

8A. MUSCLE STRENGTH - RATE STRENGTH ACCORDING TO THE FOLLOWING SCALE:

0/5 No muscle movement
1/5 Palpable or visible muscle contraction, but no joint movement
2/5 Active movement with gravity eliminated
3/5 Active movement against gravity
4/5 Active movement against some resistance
5/5 Normal strength

Side	Flexion/ Extension	Rate Strength	Is there a reduction in muscle strength?	If yes, is the reduction entirely due to the claimed condition in the Diagnosis section?	If no (the reduction is not entirely due to the claimed condition), provide rationale:
RIGHT	Shoulder Adduction	/5	☐ Yes ☐ No	☐ Yes ☐ No	
	Shoulder Abduction	/5			
	Shoulder Flexion	/5			
	Shoulder Rotation	/5			
All Normal	Elbow Flexion	/5			
	Elbow Extension	/5			
	Wrist Flexion	/5			
	Wrist Extension	/5			
	Finger Flexion	/5			
	Finger Abduction	/5			

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SECTION VIII - MUSCLE STRENGTH TESTING *(Continued)*

8A. MUSCLE STRENGTH - RATE STRENGTH ACCORDING TO THE FOLLOWING SCALE *(Continued)*:

0/5 No muscle movement
1/5 Palpable or visible muscle contraction, but no joint movement
2/5 Active movement with gravity eliminated
3/5 Active movement against gravity
4/5 Active movement against some resistance
5/5 Normal strength

Side	Flexion/ Extension	Rate Strength	Is there a reduction in muscle strength?	If yes, is the reduction entirely due to the claimed condition in the Diagnosis section?	If no (the reduction is not entirely due to the claimed condition), provide rationale:
LEFT All Normal	Shoulder Adduction	/5	☐ Yes ☐ No	☐ Yes ☐ No	
	Shoulder Abduction	/5			
	Shoulder Flexion	/5			
	Shoulder Rotation	/5			
	Elbow Flexion	/5			
	Elbow Extension	/5			
	Wrist Flexion	/5			
	Wrist Extension	/5			
	Finger Flexion	/5			
	Finger Abduction	/5			

8B. DOES THE VETERAN HAVE MUSCLE ATROPHY?

☐ YES ☐ NO

IF YES, IS THE MUSCLE ATROPHY DUE TO THE CLAIMED CONDITION IN THE DIAGNOSIS SECTION?

☐ YES ☐ NO IF NO, PROVIDE RATIONALE:

FOR ANY MUSCLE ATROPHY DUE TO A DIAGNOSES LISTED IN SECTION 1, INDICATE SIDE AND SPECIFIC LOCATION OF ATROPHY, PROVIDING MEASUREMENTS IN CENTIMETERS OF NORMAL SIDE AND CORRESPONDING ATROPHIED SIDE, MEASURED AT MAXIMUM MUSCLE BULK.

LOCATION OF MUSCLE ATROPHY:

☐ RIGHT UPPER EXTREMITY *(specify location of measurement such as "10cm above or below elbow")*:

CIRCUMFERENCE OF MORE NORMAL SIDE: _____ cm CIRCUMFERENCE OF ATROPHIED SIDE: _____ cm

☐ LEFT UPPER EXTREMITY *(specify location of measurement such as "10cm above or below elbow")*:

CIRCUMFERENCE OF MORE NORMAL SIDE: _____ cm CIRCUMFERENCE OF ATROPHIED SIDE: _____ cm

8C. COMMENTS, IF ANY:

SECTION IX - ANKYLOSIS

COMPLETE THIS SECTION IF VETERAN HAS ANKYLOSIS OF THE CERVICAL SPINE *(neck)*.

NOTE: For VA compensation purposes, unfavorable ankylosis is a condition in which the entire cervical spine, the entire thoracolumbar spine, or the entire spine is fixed in flexion or extension, and the ankylosis results in one or more of the following: difficulty walking because of a limited line of vision; restricted opening of the mouth and chewing; breathing limited to diaphragmatic respiration; gastrointestinal symptoms due to pressure of the costal margin on the abdomen; dyspnea or dysphagia; atlantoaxial or cervical subluxation or dislocation; or neurologic symptoms due to nerve root stretching. Fixation of a spinal segment in neutral position (0 degrees) always represents favorable ankylosis.

9A. INDICATE SEVERITY OF ANKYLOSIS:

☐ Favorable ankylosis of the entire cervical spine
☐ Unfavorable ankylosis of the entire cervical spine
☐ Unfavorable ankylosis of the entire spine *(cervical and thoracolumbar)*
☐ No ankylosis

9B. COMMENTS, IF ANY:

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SECTION X - REFLEX EXAM

10A. DEEP TENDON REFLEXES - RATE DEEP TENDON REFLEXES (DTRs) ACCORDING TO THE FOLLOWING SCALE:

0 Absent
1+ Hypoactive
2+ Normal
3+ Hyperactive without clonus
4+ Hyperactive with clonus

RIGHT: All Normal BICEPS: + TRICEPS: + BRACHIORADIALS: +

LEFT: All Normal BICEPS: + TRICEPS: + BRACHIORADIALS: +

10B. COMMENTS, IF ANY:

SECTION XI - SENSORY EXAM

11A. RESULTS FOR SENSATION TO LIGHT TOUCH *(dermatome)* TESTING:

Side	Shoulder Area *(C5)*	Inner/Outer Forearm *(C6/T1)*	Hand/Fingers *(C6-8)*
RIGHT All Normal	☐ Normal ☐ Decreased ☐ Absent	☐ Normal ☐ Decreased ☐ Absent	☐ Normal ☐ Decreased ☐ Absent
LEFT All Normal	☐ Normal ☐ Decreased ☐ Absent	☐ Normal ☐ Decreased ☐ Absent	☐ Normal ☐ Decreased ☐ Absent

11B. WERE OTHER SENSORY TESTS INDICATED AND PERFORMED?

☐ YES ☐ NO

IF YES, INDICATE RESULTS:

Side	Position Sense *(grasp index finger/great toe on sides and ask patient to identify up and down movement)* ☐ Not tested	Vibration Sensation *(place low-pitched tuning fork over DIP joint of index finger/IP joint of great toe)* ☐ Not tested	Cold Sensation *(test distal extremities for cold sensation with side of tuning fork or other cold object)* ☐ Not tested
RIGHT	☐ Normal ☐ Decreased ☐ Absent	☐ Normal ☐ Decreased ☐ Absent	☐ Normal ☐ Decreased ☐ Absent
LEFT	☐ Normal ☐ Decreased ☐ Absent	☐ Normal ☐ Decreased ☐ Absent	☐ Normal ☐ Decreased ☐ Absent

11C. OTHER SENSORY FINDINGS, IF ANY:

SECTION XII - RADICULOPATHY

NOTE: Radiculopathy is considered to be any condition due to disease of the nerve roots and nerves located in the neck.

12A. DOES THE VETERAN HAVE RADICULAR PAIN OR ANY OTHER SUBJECTIVE SYMPTOMS DUE TO RADICULOPATHY?

☐ YES ☐ NO

IF YES, COMPLETE QUESTIONS 12B-12K, INCLUDING SYMPTOMS, SEVERITY OF RADICULOPATHY AND NERVE ROOTS INVOLVED *(check all that apply)*

IF THE VETERAN REPORTED RADICULAR-TYPE SYMPTOMS IN THE MEDICAL HISTORY SECTION ABOVE THAT YOU FIND ARE NOT DUE TO RADICULOPATHY, PLEASE PROVIDE RATIONALE:

12B. CONSTANT PAIN, AT TIMES EXCRUCIATING *(subjective symptom)*

☐ Present ☐ Absent *(does not occur)* ☐ Pain is present, but not due to radiculopathy *(if checked, provide rationale in question 12J below)*

If present, indicate location and severity:

Right upper extremity: ☐ None ☐ Mild ☐ Moderate ☐ Severe

Left upper extremity: ☐ None ☐ Mild ☐ Moderate ☐ Severe

12C. INTERMITTENT PAIN *(subjective symptom)*

☐ Present ☐ Absent *(does not occur)* ☐ Pain is present, but not due to radiculopathy *(if checked, provide rationale in question 12J below)*

If present, indicate location and severity:

Right upper extremity: ☐ None ☐ Mild ☐ Moderate ☐ Severe

Left upper extremity: ☐ None ☐ Mild ☐ Moderate ☐ Severe

12D. DULL PAIN *(subjective symptom)*

☐ Present ☐ Absent *(does not occur)* ☐ Pain is present, but not due to radiculopathy *(if checked, provide rationale in question 12J below)*

If present, indicate location and severity:

Right upper extremity: ☐ None ☐ Mild ☐ Moderate ☐ Severe

Left upper extremity: ☐ None ☐ Mild ☐ Moderate ☐ Severe

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SECTION XII - RADICULOPATHY *(Continued)*

12E. PARESTHESIAS AND/OR DYSESTHESIAS *(subjective symptom)*

☐ Present ☐ Absent *(does not occur)* ☐ Paresthesias and/or dysesthesias are present, but not due to radiculopathy *(if checked, provide rationale in question 12J below)*

If present, indicate location and severity:

Right upper extremity: ☐ None ☐ Mild ☐ Moderate ☐ Severe

Left upper extremity: ☐ None ☐ Mild ☐ Moderate ☐ Severe

12F. NUMBNESS *(subjective symptom)*

☐ Present ☐ Absent *(does not occur)* ☐ Numbness is present, but not due to radiculopathy *(if checked, provide rationale in question 12J below)*

If present, indicate location and severity:

Right upper extremity: ☐ None ☐ Mild ☐ Moderate ☐ Severe

Left upper extremity: ☐ None ☐ Mild ☐ Moderate ☐ Severe

12G. DOES THE VETERAN HAVE ANY OBJECTIVE FINDINGS DUE TO RADICULOPATHY NOT ADDRESSED IN THE PHYSICAL EXAM SECTION?

☐ YES ☐ NO

IF YES, DESCRIBE:

12H. INDICATE SEVERITY OF RADICULOPATHY *(evaluate severity by incorporating the effects of subjective symptoms and objective findings, if any)* AND SIDE AFFECTED:

Right upper extremity: ☐ Not affected ☐ Mild ☐ Moderate ☐ Severe

Left upper extremity: ☐ Not affected ☐ Mild ☐ Moderate ☐ Severe

12I. SPECIFY NERVE ROOTS INVOLVED *(check all that apply)*:

☐ INVOLVEMENT OF C5/C6 NERVE ROOTS *(upper radicular group)*

If checked, indicate side affected: ☐ Right ☐ Left ☐ Both

☐ INVOLVEMENT OF C7 NERVE ROOTS *(middle radicular group)*

If checked, indicate side affected: ☐ Right ☐ Left ☐ Both

☐ INVOLVEMENT OF C8/TI NERVE ROOTS *(lower radicular group)*

If checked, indicate side affected: ☐ Right ☐ Left ☐ Both

12J. COMMENTS, IF ANY:

SECTION XIII - OTHER NEUROLOGIC ABNORMALITIES

13. DOES THE VETERAN HAVE ANY OTHER OBJECTIVE NEUROLOGIC ABNORMALITIES OR FINDINGS *(including, but not limited to bowel or bladder problems due to cervical myelopathy)* ASSOCIATED WITH A CERVICAL SPINE *(neck)* CONDITION?

☐ YES ☐ NO

IF YES, DESCRIBE CONDITION AND ITS RELATIONSHIP TO ANY CONDITION LISTED IN THE DIAGNOSIS SECTION:

NOTE: If there are neurological abnormalities other than those addressed in the Physical Exam or Radiculopathy sections above, ALSO complete appropriate Disability Benefits Questionnaire for each condition identified.

SECTION XIV - INTERVERTEBRAL DISC SYNDROME *(IVDS)* AND INCAPACITATING EPISODES

NOTE: For VA purposes, IVDS is a group of signs and symptoms due to nerve root irritation that commonly includes back pain and sciatica (pain along the course of the sciatic nerve) in the case of lumbar disc disease, and neck and arm or hand pain in the case of cervical disc disease.

14A. DOES THE VETERAN HAVE IVDS OF THE CERVICAL SPINE?

☐ YES ☐ NO

14B. IF YES TO QUESTION 14A ABOVE, HAS THE VETERAN HAD ANY INCAPACITATING EPISODES *(a period of acute signs and symptoms due to IVDS that requires bed rest prescribed by a physician and treatment by a physician)* OVER THE PAST 12 MONTHS?

☐ YES ☐ NO

14C. IF YES TO QUESTION 14B ABOVE, PROVIDE THE TOTAL DURATION OF ALL INCAPACITATING EPISODES OVER THE PAST 12 MONTHS:

☐ Less than 1 week

☐ At least 1 week but less than 2 weeks

☐ At least 2 weeks but less than 4 weeks

☐ At least 4 weeks but less than 6 weeks

☐ At least 6 weeks

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SECTION XIV - INTERVERTEBRAL DISC SYNDROME *(IVDS)* AND INCAPACITATING EPISODES *(Continued)*

14D. COMMENTS, IF ANY:

SECTION XV - OTHER PERTINENT PHYSICAL FINDINGS, COMPLICATIONS, CONDITIONS, SIGNS, SYMPTOMS AND SCARS

15A. DOES THE VETERAN HAVE ANY OTHER PERTINENT PHYSICAL FINDINGS, COMPLICATIONS, CONDITIONS, SIGNS OR SYMPTOMS, OR ANY SCARS *(surgical or otherwise)* RELATED TO ANY CONDITIONS OR TO THE TREATMENT OF ANY CONDITIONS LISTED IN THE DIAGNOSIS SECTION ABOVE?

☐ YES ☐ NO IF YES, COMPLETE QUESTIONS 15B-15D.

15B. DOES THE VETERAN HAVE ANY OTHER PERTINENT PHYSICAL FINDINGS, COMPLICATIONS, CONDITIONS, SIGNS OR SYMPTOMS RELATED TO ANY CONDITIONS LISTED IN THE DIAGNOSIS SECTION ABOVE?

☐ YES ☐ NO IF YES, DESCRIBE *(brief summary)*:

15C. DOES THE VETERAN HAVE ANY SCARS *(surgical or otherwise)* RELATED TO ANY CONDITIONS OR TO THE TREATMENT OF ANY CONDITIONS LISTED IN THE DIAGNOSIS SECTION ABOVE?

☐ YES ☐ NO

IF YES, ARE ANY OF THESE SCARS PAINFUL OR UNSTABLE; HAVE A TOTAL AREA EQUAL TO OR GREATER THAN 39 SQUARE CM *(6 square inches);* OR ARE LOCATED ON THE HEAD, FACE OR NECK?

☐ YES ☐ NO IF YES, ALSO COMPLETE VA FORM 21-0960F-1, SCARS/DISFIGUREMENT.

IF NO, PROVIDE LOCATION AND MEASUREMENTS OF SCAR IN CENTIMETERS.

Location: _____ Measurements: length _____ cm X width _____ cm.

NOTE: An "unstable scar" is one where, for any reason, there is frequent loss of covering of the skin over the scar. If there are multiple scars, enter additional locations and measurements in Comment section below. It is not necessary to also complete a Scars DBQ.

15D. COMMENTS, IF ANY:

SECTION XVI - ASSISTIVE DEVICES

16A. DOES THE VETERAN USE ANY ASSISTIVE DEVICES AS A NORMAL MODE OF LOCOMOTION, ALTHOUGH OCCASIONAL LOCOMOTION BY OTHER METHODS MAY BE POSSIBLE?

☐ YES ☐ NO IF YES, IDENTIFY ASSISTIVE DEVICES USED *(check all that apply and indicate frequency)*:

☐ Wheelchair	Frequency of use:	☐ Occasional	☐ Regular	☐ Constant
☐ Brace	Frequency of use:	☐ Occasional	☐ Regular	☐ Constant
☐ Crutches	Frequency of use:	☐ Occasional	☐ Regular	☐ Constant
☐ Cane	Frequency of use:	☐ Occasional	☐ Regular	☐ Constant
☐ Walker	Frequency of use:	☐ Occasional	☐ Regular	☐ Constant
☐ Other: _____	Frequency of use:	☐ Occasional	☐ Regular	☐ Constant

16B. IF THE VETERAN USES ANY ASSISTIVE DEVICES, SPECIFY THE CONDITION AND IDENTIFY THE ASSISTIVE DEVICE USED FOR EACH CONDITION:

SECTION XVII - REMAINING EFFECTIVE FUNCTION OF THE EXTREMITIES

17. DUE TO THE VETERAN'S CERVICAL SPINE *(neck)* CONDITION, IS THERE FUNCTIONAL IMPAIRMENT OF AN EXTREMITY SUCH THAT NO EFFECTIVE FUNCTION REMAINS OTHER THAN THAT WHICH WOULD BE EQUALLY WELL SERVED BY AN AMPUTATION WITH PROSTHESIS? *(Functions of the upper extremity include grasping, manipulation, etc., while functions for the lower extremity include balance and propulsion, etc.)*

☐ YES, FUNCTIONING IS SO DIMINISHED THAT AMPUTATION WITH PROTHESIS WOULD EQUALLY SERVE THE VETERAN.

☐ NO

IF YES, INDICATE EXTREMITIES FOR WHICH THIS APPLIES: ☐ RIGHT UPPER ☐ LEFT UPPER

FOR EACH CHECKED EXTREMITY, IDENTIFY THE CONDITION CAUSING LOSS OF FUNCTION, DESCRIBE LOSS OF EFFECTIVE FUNCTION AND PROVIDE SPECIFIC EXAMPLES *(brief summary)*:

NOTE: The intention of this section is to permit the examiner to quantify the level of remaining function; it is not intended to inquire whether the Veteran should undergo an amputation with fitting of a prothesis. For example, if the functions of grasping (hand) or propulsion (foot) are as limited as if the Veteran had an amputation and prosthesis, the examiner should check "yes" and describe the diminished functioning. The question simply asks whether the functional loss is to the same degree as if there were an amputation of the affected limb.

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SECTION XVIII - DIAGNOSTIC TESTING

NOTE: Testing listed below is not indicated for every condition. The diagnosis of degenerative arthritis (osteoarthritis) or traumatic arthritis must be confirmed by imaging studies. Once such arthritis has been documented, even if in the past, no further imaging studies are required by VA, even if arthritis has worsened. Imaging studies are not required to make the diagnosis of IVDS; Electromyography (EMG) studies are rarely required to diagnose radiculopathy in the appropriate clinical setting. For purposes of this examination, the diagnoses of IVDS and radiculopathy can be made by a history of characteristic radiating pain and/or sensory changes in the legs, and objective clinical findings, which may include the asymmetrical loss or decrease of reflexes, decreased strength and/or abnormal sensation.

18A. HAVE IMAGING STUDIES OF THE CERVICAL SPINE BEEN PERFORMED AND ARE THE RESULTS AVAILABLE?

☐ YES ☐ NO

IF YES, IS ARTHRITIS DOCUMENTED?

☐ YES ☐ NO

18B. DOES THE VETERAN HAVE A VERTEBRAL FRACTURE?

☐ YES ☐ NO IF YES, PROVIDE PERCENT OF LOSS OF VERTEBRAL BODY HEIGHT: _____ %

18C. ARE THERE ANY OTHER SIGNIFICANT DIAGNOSTIC TEST FINDINGS OR RESULTS?

☐ YES ☐ NO IF YES, PROVIDE TYPE OF TEST OR PROCEDURE, DATE AND RESULTS *(brief summary)*:

18D. IF ANY TEST RESULTS ARE OTHER THAN NORMAL, INDICATE RELATIONSHIP OF ABNORMAL FINDINGS TO DIAGNOSED CONDITIONS:

SECTION XIX - FUNCTIONAL IMPACT

NOTE: Provide the impact of only the diagnosed condition(s), without consideration of the impact of other medical conditions or factors, such as age.

19. REGARDLESS OF THE VETERAN'S CURRENT EMPLOYMENT STATUS, DO THE CONDITION(S) LISTED IN THE DIAGNOSIS SECTION IMPACT HIS OR HER ABILITY TO PERFORM ANY TYPE OF OCCUPATIONAL TASK *(such as standing, walking, lifting, sitting, etc.)*?

☐ YES ☐ NO IF YES, DESCRIBE THE FUNCTIONAL IMPACT OF EACH CONDITION, PROVIDING ONE OR MORE EXAMPLES:

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SECTION XX - REMARKS

20. REMARKS, IF ANY:

SECTION XXI - PHYSICIAN'S CERTIFICATION AND SIGNATURE

CERTIFICATION - To the best of my knowledge, the information contained herein is accurate, complete and current.

21A. PHYSICIAN'S SIGNATURE *(Sign in ink)*	21B. PHYSICIAN'S PRINTED NAME	21C. DATE SIGNED

21D. PHYSICIAN'S PHONE AND FAX NUMBER	21E. NATIONAL PROVIDER IDENTIFIER (NPI) NUMBER	21F. PHYSICIAN'S ADDRESS

NOTE: VA may request additional medical information, including additional examinations, if necessary to complete VA's review of the veteran's application.

IMPORTANT - Physician please fax the completed form to _____
(VA Regional Office FAX No.)

NOTE: A list of VA Regional Office FAX Numbers can be found at **www.vba.va.gov/disabilityexams** or obtained by calling 1-800-827-1000.

PRIVACY ACT NOTICE: VA will not disclose information collected on this form to any source other than what has been authorized under the Privacy Act of 1974 or Title 38, Code of Federal Regulations 1.576 for routine uses (i.e., civil or criminal law enforcement, congressional communications, epidemiological or research studies, the collection of money owed to the United States, litigation in which the United States is a party or has an interest, the administration of VA programs and delivery of VA benefits, verification of identity and status, and personnel administration) as identified in the VA system of records, 58/VA21/22/28, Compensation, Pension, Education and Vocational Rehabilitation and Employment Records - VA, published in the Federal Register. Your obligation to respond is required to obtain or retain benefits. VA uses your SSN to identify your claim file. Providing your SSN will help ensure that your records are properly associated with your claim file. Giving us your SSN account information is voluntary. Refusal to provide your SSN by itself will not result in the denial of benefits. VA will not deny an individual benefits for refusing to provide his or her SSN unless the disclosure of the SSN is required by a Federal Statute of law in effect prior to January 1, 1975, and still in effect. The requested information is considered relevant and necessary to determine maximum benefits under the law. The responses you submit are considered confidential (38 U.S.C. 5701). Information submitted is subject to verification through computer matching programs with other agencies.

RESPONDENT BURDEN: We need this information to determine entitlement to benefits (38 U.S.C. 501). Title 38, United States Code, allows us to ask for this information. We estimate that you will need an average of 30 minutes to review the instructions, find the information, and complete the form. VA cannot conduct or sponsor a collection of information unless a valid OMB control number is displayed. You are not required to respond to a collection of information if this number is not displayed. Valid OMB control numbers can be located on the OMB Internet Page at **www.reginfo.gov/public/do/PRAMain**. If desired, you can call 1-800-827-1000 to get information on where to send comments or suggestions about this form.

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N

Summary Table of U.S. Government Accountability Office Reports Relevant to Adjudication of Veterans' Disability Claims

TABLE N-1 Summary Table of U.S. Government Accountability Office Reports Relevant to Adjudication of Veterans' Disability Claims

Title (Year)	Purpose of Report	Findings	Recommendations
Opportunities Exist to Better Ensure Successful Appeals Reform (2018)	The Veterans Appeals Improvement and Modernization Act of 2017 makes changes to the VA's current (legacy) appeals process, giving veterans new options to have their claims further reviewed by VBA or appeal directly to the board. The act requires the VA to submit to Congress and GAO a plan for implementing a new appeals process, and includes a provision for GAO to assess the VA's plan. This testimony focuses on the extent to which the VA's plan (1) addresses the required elements in the act and (2) reflects sound planning practices identified in prior GAO work.	The VA's plan for implementing a new disability appeals process while attending to appeals in the current process addresses most, but not all, elements required by the Veterans Appeals Improvement and Modernization Act of 2017. The VA's appeals plan addresses 17 of 22 required elements, partially addresses 4, and does not address 1. For example, not addressed is the required element to include the resources needed by the Veterans Benefits Administration (VBA) and the Board of Veterans' Appeals to implement the new appeals process and address legacy appeals under the current process. The VA's appeals plan reflects certain sound planning practices, but it could benefit from including important details in several key planning areas: performance measurement, project management, and risk assessment.	GAO recommends that the VA: • Fully address all legally required elements in its appeals plan • Articulate how it will monitor and assess the new appeals process as compared to the legacy process • Augment its master schedule for implementation • More fully address risk (See Some Progress, But Further Steps Needed to Improve Appeals Reform Planning for the VA's Progress)
Some Progress, But Further Steps	In March 2018, GAO found that the VA could help ensure successful	Since the March 2018 report, the VA has updated its plan and taken some steps to address aspects of	

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Title (Year)	Purpose of Report	Findings	Recommendations
Needed to Improve Appeals Reform Planning (2018)	implementation of appeals reform by addressing gaps in planning and made four recommendations, with which the VA agreed (See Opportunities Exist to Better Ensure Successful Appeals Reform). This testimony focuses on the steps the VA has taken to address GAO's recommendations and what aspects remain unaddressed.	these recommndations, but further steps are needed: • Address all legally required elements. GAO reported that the VA's plan did not address one and only partially addressed four of 22 elements required by the Veterans Appeals Improvement and Modernization Act of 2017, and it recommended that the VA fully address them all. In a May 2018 update to its plan, the VA took steps to address the five elements, such as developing productivity projections and a model to forecast resource needs for processing appeals. These steps address one element related to projecting productivity and partially address the four remaining elements. • Articulate performance measurement. GAO also recommended that the VA clearly articulate how it will monitor and assess the new appeals process relative to the legacy process. This recommendation includes specifying timeliness goals for five new appeals options to be made available to veterans as well as additional goals or measures of performance, such as accuracy in processing appeals. The VA's updated plan states that the agency will develop goals and measures for all appeals options after fully implementing appeals reform. Contrary to sound planning practices, it does not articulate these performance goals and measures now, which would provide a vision for what successful implementation would look like. Lacking this vision, the VA does not have an "end state" to guide its implementation and help establish accountability. • Augment project plan. GAO recommended that the VA augment its master schedule for	

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Title (Year)	Purpose of Report	Findings	Recommendations
		implementing appeals reform to include all key activities and reflect other sound practices for guiding implementation and establishing accountability. Although the VA's May 2018 updated master schedule added activities, it omitted a pilot test of the new Board of Veterans' Appeals options. More generally, the plan does not reflect interdependencies among activities. Until all key activities are accounted for and the master schedule reflects sound practices, the VA cannot provide reasonable assurance that it has the essential information needed to manage its appeals reform implementation. • Address risk fully. GAO recommended that the VA's appeals plan more fully address risks in implementing a new process by, for example, testing all appeals options prior to full implementation. In its updated plan, the VA stated it will pilot all five new appeals options. By taking these steps, the VA should be better positioned to assess implementation risks. However, the updated plan does not have well-defined, measurable criteria for assessing lessons learned from these pilots and does not articulate how well these lessons translate to a broader context. Taking these steps would improve the VA's ability to assess and mitigate risks as it implements its reforms.	
Preparations for Transitioning to a New Electronic Health Record System Are Ongoing (2018)	The VA relies on its health information system, the Veterans Health Information Systems and Technology Architecture (VistA), to provide health care services. However, the system is more than 30 years old, is costly to maintain, and does not support	GAO's preliminary results indicate that the VA is working to define VistA and identify system components to be replaced by the new system. However, according to VA officials, there is no single information source that fully defines the scope of VistA. This situation is partly due to differences in VistA at various facilities. In the absence of a complete definition of VistA, program	In 2011, GAO reported on nine common factors critical to the success of major information technology (IT) acquisitions. Such factors include ensuring the active engagement of senior officials with stakeholders

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Title (Year)	Purpose of Report	Findings	Recommendations
	interoperability with DoD and private health care providers. Since 2001, the VA has pursued multiple efforts to modernize the system. In June 2017, the VA announced plans to acquire the same system—the Cerner system—that DoD is implementing. GAO summarizes observations from its ongoing review of VistA.	officials have taken a number of steps to define the system's scope and to identify the components that the new system will replace. These steps have included conducting analyses, performing preliminary site (medical facility) assessments, and planning for a detailed assessment of each site where the new system will be deployed.	and having qualified, experienced program staff. These critical success factors can serve as a model of best practices that the VA could apply to enhance the likelihood that the acquisition of a new electronic health record system will be successfully achieved.
Better Data and Evaluation Could Help Improve Physician Staffing, Recruitment, and Retention Strategies (2017)	This report addresses (1) VHA data on how many mission-critical physicians provide care, (2) the extent to which VHA measures the workload and productivity of mission-critical physicians; and (3) what evaluations have been done on the effectiveness of VHA's recruitment and retention strategies for all physicians.	GAO identified the following issues: • Incomplete information on the number of physicians. VHA is unable to accurately count the total number of physicians who provide care in its VA medical centers (VAMCs). VHA has data on the number of mission-critical physicians it employs (more than 11,000) and on those physicians who serve on a fee-basis (about 2,800). However, VHA lacks data on the number of contract physicians and physician trainees. Five of the six VAMCs in GAO's review used contract physicians or physician trainees to meet their staffing needs, but VHA has no information on the extent to which VAMCs nationwide use these arrangements. • Inconsistent productivity data. VHA measures productivity for some mission-critical physician occupations; however, mental health departments receive conflicting sets of productivity metrics from two VHA offices—the Office of Productivity, Efficiency, and Staffing and the Office of Mental Health Operations. VHA officials said that the two offices use differing data to serve different purposes and acknowledged that while information on how to interpret the two sets of productivity	GAO makes five recommendations, including that the VA develop a process to count all physicians, provide guidance on productivity measurement, and evaluate its physician recruitment and retention strategies. The VA concurred with four of the five recommendations, but not with the one to accurately count all physicians, stating that its workforce assessment tools are sufficient. However, GAO maintains that this is essential for effective workforce planning.

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Title (Year)	Purpose of Report	Findings	Recommendations
		data is available, VAMC officials may find the data confusing. • Lack of a comprehensive evaluation of its recruitment and retention strategies. VHA has not evaluated the effectiveness of its physician recruitment and retention strategies.	
Additional Planning Would Enhance Efforts to Improve the Timeliness of Appeals Decisions (2017)	This report examines the VA's approaches to address the challenges it identified as contributing to lengthy appeals processing times and the extent to which those approaches are consistent with sound planning practices.	The VA has taken actions related to increasing staff, reforming the process, and updating IT, which are consistent with relevant sound planning practices. However, gaps in planning exist, thereby reducing the agency's ability to ensure that these actions will improve the timeliness of disability appeals decisions. • Increase staff: The VA determined that staff resources have not sufficiently kept pace with increased pending appeals and concluded that additional staff are needed, particularly at the board, to improve timeliness and reduce its appeals inventory. The board received approval to hire more staff in fiscal year 2017, and it expects to need an additional hiring surge beginning in fiscal year 2018. As of October 2016, officials estimated that if the agency does not take any action, such as increasing staff in 2018, veterans may have to wait an average of 8.5 years by fiscal year 2026 to have their appeals resolved. Consistent with sound workforce planning practices, the VA modeled different options for increasing staff levels to support its conclusion that staff increases in conjunction with process change would reduce the appeals inventory sooner. However, contrary to sound practices, the VA often used fixed estimates for key variables in its models—such as staff productivity—rather than a range of estimates (sensitivity analysis) to	GAO made five recommendations to the VA: • Apply sensitivity analyses when projecting staff needs, • Develop a more timely and detailed workforce plan, • Develop a robust plan for monitoring process reform, • Develop a strategy for assessing process reform, and • Create a schedule for IT improvements that takes into account the plans for potential process reform. The VA concurred in principle with the five recommendations, but it believes it has met the intent of those recommendations and does not need to take additional action. GAO disagrees and—while recognizing VA's ongoing efforts—believes further

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Title (Year)	Purpose of Report	Findings	Recommendations
		understand the effect that variation in these key variables could have on staffing needs. • Reform process: The VA determined that new evidence—which a veteran can submit at any point during his or her appeal—inefficiently causes an additional round of reviews and thus delays appeals decisions, and in response it proposed legislation (not enacted) to streamline the process. Consistent with sound practices for process redesign, the VA worked with veterans service organizations (VSOs) and other key stakeholders in developing the proposal and continued to update VSOs about the development of its implementation plans.	action is needed on all five recommendations to improve VA's ability to successfully implement reforms, as discussed in the report.
Improvements Needed for VA to Better Understand, Process, and Communicate Decisions on Claims (2017)	Recently, questions have been raised about whether the VA is processing GWI (Gulf War illness) claims correctly. GAO was asked to review the VA's handling of these claims. This report examines (1) recent trends in GWI disability claims, (2) challenges associated with accurately processing and clearly communicating decisions on GWI claims, and (3) how the VA uses GWI research to inform the disability compensation program.	The VA's ability to accurately process GWI claims is hampered by inadequate training, and its decision letters for denied claims do not communicate key information to veterans. The VA claims rating staff often rely on VA medical examiners to assess a veteran's disability before a decision can be made on a claim. VA medical examiners told GAO that conducting Gulf War general medical exams is challenging because of the range of symptoms that could qualify as GWI. The VA has developed elective GWI training for its medical examiners, but only 10 percent of examiners had taken the training as of February 2017. Federal internal control standards call for adequate training for staff so they can correctly carry out an agency's procedures. Medical examiners who do not take this GWI-specific training may not be able to provide the information that VA staff need to correctly decide whether to grant a veteran's claim. Once a determination is made, VA regulations also require clear	GAO recommends that VHA: • Require medical examiners to complete training, such as the 90-minute GWI web-based course, before conducting these exams. • Provide more complete information to veterans whose GWI claims are denied, and • Document a plan to develop a single case definition of GWI. This plan should include near- and long-term specific actions, such as analyzing and leveraging information in existing datasets and identifying any areas for future

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Title (Year)	Purpose of Report	Findings	Recommendations
		explanations to veterans regarding claim decisions. GAO found that decision letters for GWI claims do not always include key information on why the claim was denied.	research to help the VA achieve this goal.
Management Attention Needed to Improve Critical System Modernizations, Consolidate Data Centers, and Retire Legacy Systems (2017)	The use of IT is crucial to helping the VA effectively serve the nation's veterans, and each year the department spends over $4 billion on IT. However, over many years the VA has had difficulty managing its information systems. This statement summarizes results from key GAO reports related to increasing electronic health record interoperability between the VA and DoD; system challenges that have contributed to GAO's designation of VA health care as a high-risk area; and the VA's development of its system for processing disability benefits, data center consolidation, and legacy systems.	GAO noted in July 2016 that the VA had moved forward with an effort to modernize its health information system, VistA, but that the department is uncertain of its long-term plan for addressing its electronic health record system needs beyond fiscal year 2018. Beyond modernizing VistA, GAO reported in August 2015 that the VA and DoD had not identified outcome-oriented goals and metrics to clearly define what they aim to achieve from their efforts to increase electronic health record interoperability (i.e., the electronic exchange and use of health records) between the two departments. Moreover, the VA has begun to modernize VistA separately from DoD's planned acquisition of a commercially available electronic health record system, even though both departments have many health care business needs in common.	GAO has made numerous recommendations to the VA to improve the modernization of its IT systems. For example, GAO has recommended that the VA develop goals and metrics for determining the extent to which its modernized electronic health record system is achieving interoperability with DoD's; to address challenges associated with modernizing its scheduling system; to address shortcomings with VBMS planning and implementation; to take actions to improve progress in data center optimization; and to modernize or replace obsolete legacy IT systems.
Improvements Needed in Data and Monitoring of Clinical Productivity and Efficiency (2017)	Beginning in fiscal year 2013, the VA began implementing clinical productivity metrics to measure physician providers' time and effort to deliver various procedures in 32 clinical specialties. In addition, the VA developed 12 statistical models to measure clinical efficiency at the VA's medical centers (VAMCs).	Limitations with the VA's metrics and models: • Productivity metrics are not complete because they do not account for all providers or clinical services. Due to systems limitations, the metrics do not capture all types of providers who deliver care at VAMCs, including contract physicians and advanced practice providers, such as nurse practitioners, serving as sole providers. The VA central office officials explained that the VA data	To improve the completeness of the VA's productivity metrics, we recommended that the VA expand existing productivity metrics to track the productivity of all providers of care to veterans by, for example, including contract physicians who are

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Title (Year)	Purpose of Report	Findings	Recommendations
	Under the models, the VA calculates each VAMC's use and expenditures for different high-volume or high-expenditure components of health care delivery, such as emergency department and urgent care, and determines the extent to which use and expenditures differ from expected levels. This testimony addresses (1) whether the VA's clinical productivity metrics and efficiency models provide complete and accurate information on provider productivity and VAMC efficiency and (2) the VA's efforts to monitor and improve clinical productivity and efficiency.	system limitations and other factors have made it difficult for the VA's productivity metrics to capture the workload for all types of providers. • Productivity metrics may not accurately reflect the intensity of clinical workload. A 2016 VA audit shows that VA providers do not always accurately code the intensity of—that is, the amount of effort needed to perform—clinical procedures or services. As a result, the VA's productivity metrics may not accurately reflect provider productivity, as differences between providers may represent coding inaccuracies rather than true productivity differences. • Productivity metrics may not accurately reflect providers' clinical staffing levels. Officials at five of the six selected VAMCs we visited reported that providers do not always accurately record the amount of time they spend performing clinical duties, as distinct from other duties. The VA's productivity metrics are calculated for providers' clinical duties only. • Efficiency models may also be adversely affected by inaccurate workload and staffing data. To the extent that the intensity and amount of providers' clinical workload are inaccurately recorded, some of the VA's efficiency models examining VAMC use and expenditures may also be inaccurate.	not VA employees as well as advanced practice providers acting as sole providers. In addition, to improving the accuracy of the VA's productivity metrics and efficiency models, we recommended that the VA help ensure the accuracy of underlying workload and staffing data by, for example, developing training for all providers on coding clinical procedures. The VA agreed in principle with our recommendations but did not provide information on how it plans to make improvements.
Ongoing Efforts Can Be Improved; Goals Are Needed to Promote Increased User Satisfaction (2016)	This statement summarizes GAO's September 2015 report (GAO-15-582) on (1) the VA's progress toward completing the development and implementation of the VBMS and (2) the extent to which users report satisfaction with the system.	As GAO reported in September 2015, VBA has made progress in developing and implementing the VBMS, with deployment of the initial version of the system to all of its regional offices as of June 2013. Since then, VBA has continued developing and implementing additional system functionality and enhancements that support the electronic processing of disability compensation claims. As a	Three areas could benefit from increased management attention: • Cost estimating: The program office does not have a reliable estimate of the cost for completing the system. Without such an estimate,

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Title (Year)	Purpose of Report	Findings	Recommendations
		result, 95 percent of records related to veterans' disability claims are electronic and reside in the system. However, VBMS is not yet able to fully support disability and pension claims or appeals processing. While the Under Secretary for Benefits stated in March 2013 that the development of VBMS was expected to be completed in 2015, the implementation of functionality to fully support electronic claims processing has been delayed beyond 2015. In addition, VBA has not yet produced a plan that identifies when the system will be completed. Accordingly, holding the VA management accountable for meeting a time frame and for demonstrating progress will be difficult.	VA management and the department's stakeholders have a limited view of the system's future resource needs • System availability: Although VBA has improved its performance for ensuring the system is available to users, it has not established system response time goals. • System defects: While the program has actively managed system defects, a recent system release included unresolved defects that affected system performance and users' experiences.
Ongoing Development and Implementation Can Be Improved; Goals Are Needed to Promote Increased User Satisfaction (2015)	GAO (1) assessed the VA's progress toward completing the development and implementation of VBMS and (2) determined to what extent users report satisfaction with the system. To do so, GAO reviewed relevant program documentation, administered a survey to a stratified random sample of about 3,500 users, and interviewed appropriate VA officials.	VBA has made progress in developing and implementing the VBMS, with deployment of the system to all of its regional offices as of June 2013. While 95 percent of records related to veterans' disability claims are electronic and reside in the system, additional capabilities have not yet been completed, such as automation of the steps associated with a veteran's request for an increase in benefits. Furthermore, VBA has not yet developed and implemented pension processing capabilities in VBMS, nor has it articulated when the system will support appeals processing.	See Ongoing Efforts Can Be Improved; Goals Are Needed to Promote Increased User Satisfaction (2016)
Improvements Could Further Enhance Quality	This report evaluates (1) the extent to which VBA effectively measures and reports the accuracy of its disability compensation claim	VBA's dual approach for measuring accuracy is designed to provide additional information to better target quality improvement efforts, but its methods and practices lack rigor and transparency, thereby	Leverage appropriate expertise to help VBA do each of the following: • Weight its accuracy

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Title (Year)	Purpose of Report	Findings	Recommendations
Assurance Efforts (2014)	decisions and (2) whether VBA's other quality assurance activities are coordinated and effective. GAO analyzed VBA claims and STAR accuracy data from fiscal year 2013 (the most recent fiscal year for which complete data are available); reviewed relevant federal laws, VBA guidance, and other documents relevant to quality assurance activities; and interviewed VBA staff from headquarters and four VBA regional offices (selected to achieve variety in geography, workload, and accuracy rates) as well as veteran service organization officials.	undermining the usefulness and credibility of its measures. By not leveraging a statistician or otherwise following statistical practices in developing accuracy estimates, VBA is producing and relying on inaccurate estimates to make important internal management decisions. Similarly, by using a one-size sampling methodology, VBA is unnecessarily expending limited resources that could be used elsewhere. The systematic exclusion of redistributed claims and those moved between offices further calls into question the rigor of its accuracy estimates. Finally, VBA's reporting of its two accuracy metrics lacks sufficient transparency to help members of Congress and other stakeholders fully understand the differences and limitations of each and thus may undermine their trust in VBA's reported performance. VBA has enhanced and coordinated other aspects of its quality assurance framework, but shortcomings in implementation and evaluation detract from their overall effectiveness. For example, although VBA is disseminating the results of national STAR reviews and consistency studies and local quality review teams (QRTs) are using those results to focus related training or guidance to claims processing staff, until centralized guidance is consolidated and streamlined, staff lack ready access to information that will help them prevent errors. Moreover, absent adequate system capabilities to support local quality reviews, QRTs are unable to stop incorrect decisions from being finalized, and may not be aware of error trends that could be mitigated through training or other corrective action. Finally, although some of its quality assurance activities are	estimates to reflect the sample design for reviewed claims; • Determine and report the confidence intervals associated with its reported accuracy estimates; and • Re-examine its approach to calculating the regional office sample size for STAR. Take steps to ensure that redistributed claims and those moved between regional offices are not underrepresented in the STAR sample. • Increase transparency in explaining how the claim-based and issue-based accuracy rates are calculated as well as their key limitations when publicly reporting these metrics. • Review the multiple sources of policy guidance that VBA provides to determine ways to consolidate them. • Take steps to ensure that any future upgrades to local data systems allow QRTs to pause the claims process when errors are detected and enable QRTs to better track error trends. • Take additional steps to

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		relatively new, VBA lacks specific plans to evaluate their effectiveness and may miss opportunities to further improve or target these activities to more error-prone areas. In general, unless VBA takes steps to improve the rigor of all its quality assurance methods and practices, VBA may find progress toward achieving its goal of 98 percent accuracy in fiscal year 2015 illusive—especially in the face of challenging workloads, limited resources, and expectations of timely claim decisions.	evaluate the effectiveness of quality assurance activities to identify opportunities to improve or better target these activities.
Actions Needed to Address Hurdles Facing Program Modernization (2012)	Concerns exist that the VA's rating schedule—the criteria used to assign degree of work disability—is not consistent with changes in medicine and the labor market. GAO examined (1) the VA's progress in revising its rating schedule with updated medical and economic information and (2) the opportunities and challenges of various policy approaches proposed by commissions and others for updating the VA's disability benefits structure.	The VA initiated a comprehensive effort in 2009 to revise its disability rating schedule with both updated medical and earnings information, but it faces hurdles with several key aspects. The current revision effort takes a more comprehensive and empirical approach than the VA's past efforts. The VA has hired full-time staff to revise the rating schedule's medical information and plans to conduct studies to evaluate veterans' average loss of earnings in today's economy. As part of this effort, the VA is considering modifying the rating schedule—currently based largely on the degree of medical severity—to include a veteran's ability to function in the workplace. Moving in this direction is more consistent with how experts conceive of disability.	Conduct focused studies on various approaches to modernize disability benefits and, if necessary, propose relevant legislation. GAO is also making several recommendations to improve the VA's capacity to revise the rating schedule now and in the future. These include completing plans for conducting earnings loss studies and developing a written strategy for implementing revisions to the rating schedule.
VA Needs Plan for Assessing Consistency of Decisions (2004)	Key questions: (1) Since the issuance of GAO's 2002 report, what actions has the VA taken to assess the consistency of regional office decisions on disability compensation claims? (2) To what extent does the VA have program data that can be used to measure the	Since the issuance of GAO's 2002 report, the VA has not systematically assessed the consistency of regional office decisions on specific impairments. Existing compensation program data have limitations that preclude identifying indications of decision-making inconsistency among regional offices. However, the VA is implementing a new data collection system that may afford an	Develop a plan, and include it in the VA's annual performance plan, that details how the VA will: (1) use data collected through RBA 2000 to identify indications of possible inconsistencies among regional offices in the

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Title (Year)	Purpose of Report	Findings	Recommendations
	consistency of decision making among regional offices?	opportunity to identify indications of inconsistency in the future.	award and denial of benefits for specific impairments and (2) conduct systematic studies of consistency for specific impairments for which RBA 2000 data reveal indications of inconsistencies among decisions made by the regional offices.
Problems and Challenges Facing Disability Claims Processing (2000)	Focus on four key areas related to compensation claims processing: (1) longstanding performance problems, (2) claims-processing complexities, (3) challenges to improving performance, and (4) VBA's initiatives to improve performance.	VBA's problems with large backlogs and long waits for decisions have not yet improved, despite years of studying these problems. VBA's new quality measurement system shows that nearly one-third of decisions are incorrect or have technical or procedural errors. Many performance problems stem from the process's complexity, which is growing as the number of service-connected disabilities per veteran increases and judicial review requires more procedures and documentation. Although VBA has initiated a number of efforts to streamline its claims-processing performance, it is unclear how much improvement will be gained.	VBA may need to collect and analyze additional case-specific data to better understand its claims-processing problems and better target its corrective actions. Furthermore, because some issues affecting VBA's performance are a function of program design, more fundamental changes may have to be made.

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