JRRD Volume 48, Number 5, 2011
Pages 493–502
Journal of Rehabilitation Research & Development

Preliminary analysis of posttraumatic stress disorder screening within specialty clinic setting for OIF/OEF veterans seeking care for neck or back pain

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Abstract—Escalating prevalence estimates of posttraumatic stress disorder (PTSD) among recently returning Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF) veterans highlight the need for early detection and management for reducing chronic mental illness and disability. Because PTSD and chronic pain are common comorbid conditions among veterans, PTSD screening within specialty clinic settings addressing musculoskeletal pain may be of value. This retrospective study evaluated measures of diagnostic value for the PTSD Checklist (PCL) for a sample (n = 79) of OIF/OEF veterans seeking care for neck or back pain within a Department of Veterans Affairs specialty clinic. Because published accounts of optimal PCL cutoff scores vary considerably, we used receiver operating characteristic curves to identify whether the optimal PCL cutoff score for the sample differed from a conventional cutoff score of 50. A clinical psychologist experienced in diagnosing and managing PTSD confirmed the diagnosis of PTSD for 37 veterans through a review of clinical records. The prevalence of diagnosed PTSD was 46.8%, with an optimal PCL cutoff score of 44. These findings may guide future research and influence clinical practice regarding PTSD screening for recently returning veterans with chronic pain.

Key words: back pain, health psychology, musculoskeletal phenomena, neck pain, neural physiological phenomena, Operation Enduring Freedom, Operation Iraqi Freedom, posttraumatic stress disorder, rehabilitation, sensitivity, specificity, veterans.

INTRODUCTION

Posttraumatic stress disorder (PTSD) is defined by behavioral symptoms of reexperiencing, avoidance, and autonomic hyperarousal stemming from exposure to a threatening traumatic event that resulted in a response of fear, helplessness, or horror [1]. The criteria for the diagnosis of PTSD specify that symptoms must be present for more than 4 weeks and cause distress or impairment regarding social, occupational, or other areas of functioning [1]. In addition to the effect PTSD has on individual health, quality of life, general function, and healthcare service use, the healthcare system and society as a whole are considerably

Abbreviations: CI = confidence interval, OEF = Operation Enduring Freedom, OIF = Operation Iraqi Freedom, PCL = PTSD Checklist, PC-PTSD = primary care PTSD, PTSD = posttraumatic stress disorder, ROC = receiver operating characteristic, VA = Department of Veterans Affairs, VAWNYHS = VA Western New York Healthcare System.

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DOI:10.1682/JRRD.2010.05.0104

burdened economically [2–5]. Among returning Operation Iraqi Freedom (OIF)/Operation Enduring Freedom (OEF) Veterans, most prevalence estimates of PTSD range from 5 to 20 percent and are generally higher among those seeking treatment [6]. The prevalence and costs associated with PTSD establish a need for detecting PTSD early and accurately and implementing evidence-based interventions to prevent chronic mental illness and disability [7].

Studies have also reported that a substantial percentage of OIF/OEF and Persian Gulf war veterans experience chronic pain following their period of Active Duty [8–10]. Mounting evidence exists within the scientific literature regarding the co-occurrence of and the relationship between PTSD and chronic pain [11–18]. Otis et al. has published a comprehensive summary of theoretical models, including mutual maintenance and shared vulnerability, underlying comorbid chronic pain and PTSD [14]. They report that chronic pain and PTSD frequently co-occur, they increase the symptom severity of either condition, and their interaction may negatively affect the management for either disorder [14]. Authors suggest that clinicians who evaluate and manage chronic pain or PTSD should diagnostically assess for both disorders [13–14].

Despite the use of the four-item primary care PTSD (PC-PTSD) screening tool within Department of Veterans Affairs (VA) primary care clinics [19–20], the diagnosis of PTSD is reportedly often missed within primary care settings [21]. Based upon high rates of mutually occurring PTSD and chronic pain, patients with musculoskeletal pain may have PTSD that has not been recognized. Thus, specialty clinic settings addressing musculoskeletal pain may provide additional opportunities for recognizing PTSD for appropriate referral for clinical management. The screening instrument used within this study was the PTSD Checklist (PCL) for military experiences [22]. A conventional cutoff score of 50 had been used for screening veterans within this clinic consistent with work done by Weathers et al. [22].

Because operating characteristics of the PCL vary considerably across populations and settings, use of a conventional cutoff score could lead to a PCL misapplication [23]. For this reason, this study specifically aimed to determine whether the optimal PCL cutoff score differed from 50 for a sample of OIF/OEF veterans seeking treatment for neck or back pain within a specialty clinic addressing musculoskeletal pain.

METHODS

Study Population

The sampling frame was represented by OIF/OEF veterans with a chief complaint of neck pain or back pain consecutively referred to the VA Western New York Healthcare System (VAWNYHS) chiropractic clinic during 12 months between January 1 and December 31, 2009, with a completed PCL at baseline. Patients were suspected of having PTSD based on the diagnosis being embedded either within the problem list or within patient encounters. A clinical psychologist experienced in diagnosing and managing PTSD in veterans reviewed the clinical records of patients with suspected PTSD to confirm the diagnosis of PTSD through the presence of one or more of the following criteria: (1) diagnostic evaluation by a licensed behavioral health professional, (2) positive PCL, (3) positive PC-PTSD screen, and (4) service-connected disability status for PTSD.

Source of Data

Demographic data were extracted from the clinical record within the VA Computerized Patient Record System and entered into a secure, prospectively maintained quality assurance data set at the initial consultation. Pain severity (based upon a 0–10 verbal numeric rating scale) and the chronicity of presenting neck or back pain complaints (>6 months) were obtained during the patient's history of chief complaint. The PCL is a 17-item rating instrument developed at the National Center for PTSD, with scores ranging from 17 to 85 [22]. It is one of the most widely used self-report instruments for assessing PTSD [23–24]. Published accounts of PTSD screening for both civilian and military versions of the PCL, with variations in populations, settings, reference standards, research methods, and optimality criteria, have reported optimal cutoff scores ranging from 28 to 60 [22,25–37]. Each patient was given the PCL during consultation, with an opportunity to complete in a self-reported manner so that we could gain a raw score measure of PTSD symptom severity.

Statistical Analysis

We used descriptive statistics to express the demographic characteristics of the sample. Comparative analysis of the characteristics of the subsets of OIF/OEF veterans with and without PTSD was performed with *t*-tests or chi-square, as appropriate. We generated receiver operating characteristic (ROC) curves to examine the range of PCL

values, with the confirmed diagnosis of PTSD serving as the reference standard. Measures of diagnostic value included sensitivity (true positive rate), specificity (true negative rate), accuracy (proportion of cases correctly diagnosed), the kappa statistic (chance-corrected measure of agreement with the reference standard) [38–39], and the Youden index (maximum vertical distance from the curve to the chance line) [40]. For this study, the decision threshold for optimality centered on the Youden index (sensitivity – [1 – specificity]) that represents the point on the ROC curve furthest from chance [40–41]. Perkins and Schisterman advocate the use of the Youden index to determine the optimal cutoff that mathematically maximizes the overall correct classification rates [41]. The significance level was set at $p < 0.05$. We conducted analyses using JMP 5.1 (SAS Institute; Cary, North Carolina).

RESULTS

We found 42 OIF/OEF veterans with suspected PTSD based on the diagnosis embedded either within the problem list or within patient encounters. A clinical record review by our clinical psychologist confirmed a diagnosis of PTSD for 37 of those 42 veterans based on at least one form, and often multiple forms, of diagnosis validation (diagnostic evaluation by a licensed behavioral health professional, positive PCL, or positive PC-PTSD screen). Additionally, 36 of the 37 with a confirmed diagnosis of PTSD had a service-connected disability for PTSD that was assigned following diagnostic evaluation within the compensation and pension process. The five veterans with suspected PTSD that was not confirmed through clinical records review were subsequently included in the subset of those without PTSD. Analysis was then performed for a sample of 79 OIF/OEF veterans consisting of 37 with PTSD and 42 without PTSD.

Comparisons of the demographic characteristics of the subsets of OIF/OEF veterans with and without PTSD are presented in **Table 1**. No significant differences were found between the subsets regarding pain severity, the chronic nature of the pain complaints, or the percentage of service-connected disability associated with the chief complaint of neck or back pain. Significant differences were found between the subsets in terms of both the level of overall service-connected disability and the PCL scores. The OIF/OEF veterans with PTSD had a mean service-connected disability percentage related to PTSD of 34.05 percent (95% confidence interval [CI], 24.45–43.66) (not shown in **Table 1**), while none of the sample without PTSD had a service-connected disability percentage related to PTSD.

The prevalence of PTSD among the OIF/OEF veterans was 46.8 percent (37/79), with a mean value of the PCL of 43.47 (95% CI, 39.14–47.80). The area under the ROC curve was 0.88 (95% CI, 0.78–0.94). Based on having the highest value of the Youden index (0.64), 44 was determined to be the optimal PCL cutoff score for this sample representing that point on the ROC curve furthest from the chance line. The cutoff score of 44 also had the highest

Table 1.
Comparison of characteristics for Operation Iraqi Freedom/Operation Enduring Freedom veterans with (n = 37) and without (n = 42) posttraumatic stress disorder (PTSD).

Characteristic	With PTSD *n* (%) or Mean (95% CI)	Without PTSD *n* (%) or Mean (95% CI)	*p*-Value
Male	32 (86.49)	33 (78.57)	0.35
Age	30 (27.59–32.41)	31.21 (28.67–33.76)	0.49
BMI (kg/m^2)	28.97 (27.25–30.69)	27.65 (26.22–29.09)	0.23
Depression	12 (32.43)	11 (26.19)	0.54
PCL Score (17–85)	56.65 (51.83–61.46)	31.86 (27.10–36.61)	<0.001
Chronic Pain (>6 mo)	33 (89.19)	40 (95.24)	0.31
Baseline Pain Severity (0–10)	5.16 (4.38–5.95)	4.95 (4.24–5.66)	0.69
Service-Connected Disability			
Overall	47.03 (36.97–57.09)	26.19 (16.58–35.80)	0.003
Neck or Back	5.68 (2.68–8.67)	10.0 (4.85–15.15)	0.16

BMI = body mass index, CI = confidence interval, PCL = PTSD Checklist.

values of both kappa (0.64) and accuracy (0.82), with high levels of both sensitivity (0.81) and specificity (0.83). The table of associated values and the corresponding ROC curve are presented in **Table 2** and the **Figure**, respectively.

DISCUSSION

The 46.8 percent prevalence of PTSD among OIF/OEF veterans within this study far exceeds the estimates by 12 percent within VA or community-based primary care settings and as high as 8 percent within the general population [21,42–44]. The prevalence of PTSD was reportedly 10 percent among veterans from the first Gulf war [28] and 14 percent among male Vietnam era veterans [45]. Methodological factors have reportedly varied prevalence estimates considerably for combat-related PTSD among U.S. military veterans from Vietnam through present theaters of combat [5]. Estimates of PTSD prevalence among OIF/OEF veterans generally range from 5 to 20 percent [6–7,19,46–47]. The prevalence of PTSD in this sample of OIF/OEF veterans is consistent with recent published accounts for veterans within rehabilitation settings and is of significant concern based on the implications of rapidly approaching medical and psychological needs for this population [48–49]. Within a VA Polytrauma Network Site providing specialized rehabilitation services for severely injured veterans, the prevalence of PTSD among a sample of OIF/OEF veterans has been reported to be 68.2 percent with considerable chronic pain and postconcussive symptom comorbidity [49].

Several possible explanations exist for the 46.8 percent prevalence of PTSD in the OIF/OEF sample in this study. Among recently returning veterans, an increase in the prevalence of PTSD has been associated with multiple factors, including (1) exposure to combat [47], (2) battle versus nonbattle injuries [50], (3) increase of deployment intensity and duration [51], and (4) blast injuries as opposed to other mechanisms of injury [9]. Elements of modern body armor, improved battlefield healthcare, and rapid medical evacuation have helped decrease combat-related mortality with an associated increase in the percentage of soldiers surviving severe traumatic injuries [49,52–53]. Based on the previously discussed relationship between chronic pain and PTSD, one would expect that the prevalence of PTSD would be high within VA specialty clinic settings that evaluate and manage musculoskeletal pain. Another possibility is that OIF/OEF veterans are more willing to self-report

Table 2.
Measures of diagnostic value of Posttraumatic Stress Disorder Checklist for sample Operation Iraqi Freedom/Operation Enduring Freedom veterans (n = 79). Bold values identify optimal cutoff value of each measure.

Cutoff	Sens	Spec	Sens – (1 – Spec)	Kappa	Accuracy
60	0.51	0.93	0.44	0.45	0.73
58	0.62	0.93	0.55	0.56	0.78
57	0.62	0.90	0.53	0.53	0.77
56	0.68	0.90	0.58	0.59	0.80
55	0.68	0.86	0.53	0.54	0.77
53	0.70	0.86	0.56	0.56	0.78
49	0.70	0.83	0.54	0.54	0.77
47	0.78	0.83	0.62	0.62	0.81
44	**0.81**	**0.83**	**0.64**	**0.64**	**0.82**
42	0.81	0.79	0.60	0.59	0.80
41	0.86	0.74	0.60	0.60	0.80
40	0.89	0.71	0.61	0.60	0.80
39	0.92	0.69	0.61	0.60	0.80
38	0.92	0.64	0.56	0.55	0.77
33	0.95	0.62	0.56	0.55	0.77
32	0.95	0.60	0.54	0.53	0.76
28	0.95	0.57	0.52	0.50	0.75
27	0.97	0.57	0.54	0.53	0.76
26	0.97	0.45	0.43	0.41	0.70

Sens = sensitivity, Spec = specificity.

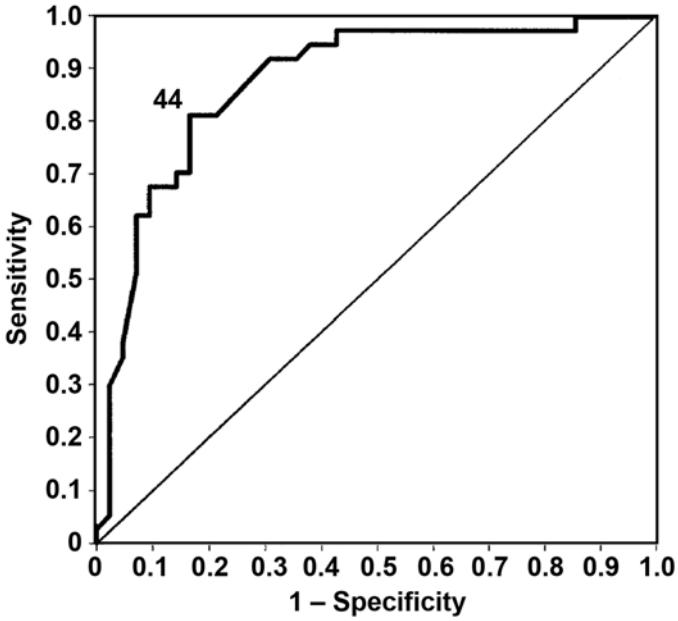

Figure.
Receiver operating characteristic curve (ROC) for (*n* = 79) Operation Iraqi Freedom/Operation Enduring Freedom, veterans with 46.8% posttraumatic stress disorder prevalence. 44 = optimal cutoff score that represents point on ROC curve farthest from chance line.

symptoms of PTSD than veterans of previous conflicts and generations. Finally, increased clinical awareness and screening efforts are likely identifying PTSD symptoms among OIF/OEF veterans that might have gone undetected in veterans from previous conflicts.

Studies have demonstrated both high levels of PTSD symptom severity among patients with chronic pain [54] and high rates of chronic pain among patients with PTSD [16–17,55]. PTSD symptom severity has been associated with poorer health functioning among OIF/OEF veterans [56–57]. Additionally, PTSD symptom expression has been shown to differ between pain and pain-free populations [58]. Shipherd et al. suggest that healthcare providers dedicated to pain management should be aware of the prevalence and potential impact of behavioral health disorders, including PTSD, on clinical outcomes [59]. While further investigation is needed to understand the impact that PTSD has, alone or in combination with other behavioral health disorders, on conservative forms of pain management, providers of pain management for musculoskeletal conditions need to be knowledgeable about PTSD, to incorporate screening procedures to recognize PTSD, and to establish multidisciplinary relationships with behavioral health clinicians to facilitate the referral process for patients, as appropriate. We believe that significant improvements in chronic pain for patients with comorbid PTSD will be difficult to attain without appropriate behavioral healthcare being provided.

While a series of measures of diagnostic values for the PCL were presented to enhance interpretation of the data, we attempted to justify the use of the Youden index as the primary basis for determining the optimal PCL cutoff score. While both accuracy and kappa are reported, they can be misleading because of their high level of dependence on disease prevalence, making them potentially less than ideal determinants of optimal cutoff scores [60–62]. With the methodology applied, the current findings suggest that a PCL cutoff score of 50 was too high for this sample.

Bliese et al. reported on variations in optimal PCL cutoff scores based on different settings, data collection procedures, and populations used within validation studies [35]. Terhakopian et al. stressed that determining the ideal PCL cutoff score should be a function of the purpose of the measure (clinical screening tool vs estimation of population prevalence) and the population prevalence of PTSD [63]. Lower cutoff scores may also be of value in detecting PTSD on screening instruments among recent military returnees who may have a stigma against reporting PTSD symptoms and other psychological problems [46]. One can reasonably speculate that PCL cutoffs within a sample of veterans seeking care for musculoskeletal complaints would fall between the lowest PCL scores associated within primary care or Active Duty samples (stigma-related concerns about admitting behavioral health problems resulting in underreporting) and the highest PCL scores associated with populations seeking treatment within behavioral health settings (less stigma-related concerns because they are seeking or already receiving behavioral healthcare) [35].

This retrospective study had a number of limitations. While sufficient for analysis, the sample size was relatively small and the findings should not be generalized outside of the study sample. The OIF/OEF veteran patients within this study were seen within a specialty clinic setting that was subject to gatekeeper referral bias and may not fully represent veterans generally seen within other clinical settings. Additionally, analysis did not account for those undergoing treatment for PTSD and the potential influence of partially treated PTSD on PCL values. While we attempted to confirm the diagnosis of

PTSD within the clinical record as a diagnostic reference standard, analysis lacked comparison with the Clinician Administered PTSD Scale that is considered the gold standard criterion for PTSD diagnosis [64–66]. Considerable variation in published optimal PCL cutoff scores and the preliminary findings within this study show that further research is needed.

CONCLUSIONS

We found a 46.8 percent prevalence of PTSD among this sample of OIF/OEF veterans seeking care for neck or back pain in a specialty clinic setting. Considerable variation has been reported in the operating characteristics of the PCL across populations, setting, and research methods. While a conventional PCL cutoff score for veterans of 50 had been used for PTSD screening within this clinic, the optimal PCL cutoff score for this sample was determined to be 44. The findings imply that future research is needed regarding PTSD screening for OIF/OEF veterans with chronic pain. In terms of conservative pain management, a high prevalence of PTSD and the interrelationships between PTSD and chronic pain may represent a considerable clinical challenge for both patients and providers, highlighting the significance of identifying optimal collaborative management strategies for this unique patient population.

ACKNOWLEDGMENTS

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Acquisition of data: A. S. Dunn, L. R. Formolo.

Analysis and interpretation of data: A. S. Dunn, T. Julian, B. N. Green, D. R. Chicoine.

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Critical revision of manuscript for important intellectual content: T. Julian.

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Financial Disclosure: The authors have declared that no competing interests exist.

Funding/Support: This material is the result of work supported with resources and the use of facilities at VAWNYHS, Buffalo, New York.

Institutional Review: The study was approved through the VAWNYHS Research and Development Committee and Institutional Review Board.

Participant Follow-Up: The authors do not plan to inform participants of the publication of this study.

Disclaimer: The views expressed in this article are those of the authors and do not reflect the official policy or position of the Department of the Navy, Department of Defense, or U.S. Government.

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Submitted for publication May 31, 2010. Accepted in revised form December 6, 2010.

This article and any supplementary material should be cited as follows:
Dunn AS, Julian T, Formolo LR, Green BN, Chicoine DR. Preliminary analysis of posttraumatic stress disorder screening within specialty clinic setting for OIF/OEF veterans seeking care for neck or back pain. J Rehabil Res Dev. 2011;48(5):493–502.
DOI:10.1682/JRRD.2010.05.0104