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Post-deployment Polytrauma Diagnoses among Soldiers and Veterans using the Veterans Health Affairs Polytrauma System of Care and Receipt of Opioids, Nonpharmacologic, and Mental Health Treatments

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Abstract

Objectives: To determine the proportion of Army soldiers who utilized care in the Veterans Health Administration (VHA) Polytrauma System of Care (PSC) within the post-deployment year, and to describe prevalence of polytrauma diagnoses, and receipt of opioids, nonpharmacologic treatments (NPT), and mental health treatments in the VHA during the year following first PSC utilization.

Setting: VHA's four-tiered integrated PSC network of specialized rehabilitation services for military members and veterans with polytrauma.

Participants: Soldiers and veterans who used the PSC during the post-deployment year after an Afghanistan or Iraq deployment ending in fiscal years 2008–2011.

Design: Population-based cohort study

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Conflicts of Interest

The authors declare no conflicts of interest.

Main Measures: Prevalence of polytrauma diagnoses (i.e., traumatic brain injury [TBI], posttraumatic stress disorder [PTSD], and chronic pain), VHA utilization rates of opioid prescriptions, NPT, and specialty mental health treatment within one year of PSC utilization.

Results: 2.6% of the sample (n=16,590) used the PSC during the post-deployment year. Among PSC users, chronic pain (76.5%), PTSD (53.1%), and TBI (48.6%) were common and more frequently found together than in isolation. 26.6% filled an opioid prescription, 35.5% received at least one NPT, and 83.8% received specialty mental health treatment in the VHA within one year of PSC utilization.

Conclusion: Chronic pain was the most common polytrauma condition among PSC users, highlighting the importance of incorporating interdisciplinary pain management approaches within the PSC, with an effort to reduce reliance on long-term opioid therapy and improve rehabilitation.

Keywords

polytrauma; traumatic brain injury; posttraumatic stress disorder; chronic pain; military; Veterans Health Administration; opioids; nonpharmacologic; mental health

INTRODUCTION

Advancements in military body armor, battlefield medical care, and medical evacuation policies from combat zones have led to a dramatic increase in survival among injured military members returning from the Afghanistan and Iraq conflicts.^{1,2} These advances in military medicine have led to a significant number of military members returning with polytrauma; formally defined by the Veterans Health Administration (VHA) as, “two or more injuries, one of which may be life threatening, sustained in the same incident that affect multiple body parts or organ systems and result in physical, cognitive, psychological, or psychosocial impairments and functional disabilities.”^{3,4} Traumatic brain injury (TBI) is common among those with polytrauma returning from an Afghanistan or Iraq deployment (i.e., OEF/OIF/OND) and is often accompanied by mental health problems (e.g., posttraumatic stress disorder [PTSD]) and/or physical conditions (e.g., chronic pain).^{3,5–11} This specific constellation of TBI, PTSD, and chronic pain, has been referred to as the “polytrauma clinical triad.”^{7,12}

To meet the needs of military members and veterans with polytrauma, the VHA established its Polytrauma System of Care (PSC) in 2005.¹³ The PSC is a four-tiered integrated network of specialized rehabilitation services for military members and veterans with combat and non-combat related TBI and polytrauma.¹⁴ Tier I includes five Polytrauma Rehabilitation Centers, which provide acute, inpatient rehabilitation care. Tier II includes Polytrauma Network Sites within each of the VHA’s 18 Veterans Integrated Service Networks, which provide comprehensive outpatient and post-acute rehabilitation services. Tier I sites are co-located with Tier II sites and residential polytrauma transitional rehabilitation programs. Tier III Polytrauma Support Clinic Teams provide specialized outpatient rehabilitation care focusing on community reintegration and care coordination. Tier IV, designated as Polytrauma Points of Contact, deliver a more limited range of rehabilitation services and facilitate referrals to other PSC programs, as appropriate.^{14,15}

During the first years of the PSC program, studies reported high rates of TBI, PTSD, and chronic pain among VHA enrollees who used the PSC.^{1,16} These studies each focused on an individual PSC location and had small samples. In 2009, a study by Lew and colleagues¹² was the first to report the co-prevalence rates of chronic pain, PTSD, and persistent postconcussive symptoms (PPSC) among OEF/OIF veterans with a history of TBI. In that study, the researchers reviewed VHA medical records for 340 OEF/OIF VHA enrollees who used an individual Tier II Polytrauma Network Site during a 22-month study period in 2007–2008. This study confirmed high prevalence rates of chronic pain, PTSD, and PPSC among these OEF/OIF veterans, but importantly, revealed that these conditions were found more commonly in unique combinations rather than in isolation. While over 42% were diagnosed with the polytrauma clinical triad, only 10.3% had chronic pain alone, 2.9% had PTSD alone, and 5.3% had PPSC alone. This study underscored the complexity of post-deployment problems among a small sample of OEF/OIF VHA enrollees who utilized an individual PSC site, and highlighted the need for extension of these analyses with a nationwide sample to better understand the overlap of these polytrauma conditions. Soon after these findings were published, the Department of Defense (DoD) and VHA released its *Pain Management Task Force Final Report*,¹⁷ which recommended use of nonpharmacologic treatments and mental health approaches as first line treatments for pain management, instead of opioids. Yet, even though the prevalence of chronic pain is known to be very high among PSC users,^{1,12,16} it is unknown what proportion of PSC users receive opioids and/or nonpharmacologic and mental health treatments in the VHA.

To advance knowledge, our study took a population-based approach to examine post-deployment utilization of the VHA's PSC among a large cohort of soldiers and veterans in the year following deployment. The study objectives were to first, examine what proportion of Army soldiers returning from an OEF/OIF/OND deployment in fiscal years (FYs) 2008–2011 received care within the VHA's PSC during the 12 months post-deployment. Second, among PSC users, we examined the prevalence and co-prevalence rates of TBI, PTSD, and chronic pain in the VHA during the 12 months following first PSC utilization. To better understand pain and mental health treatments received in the VHA among soldiers and veterans requiring PSC treatment, we describe receipt of prescription opioids, nonpharmacologic treatments, and specialty mental health treatments in the VHA. This descriptive cohort study is intended to provide data useful for program planning, policy improvement, and to facilitate hypotheses for future research aimed at improving integrated care models for military members and veterans with these conditions.

METHODS

Analytic Sample and Data Sources

To identify a population-based post-deployment cohort, we used data from the Substance Use and Psychological Injury Combat (SUPIC) study. The SUPIC study has merged together DoD and VHA data sources to study post-deployment health issues longitudinally.^{18–21} The SUPIC sample includes 643,205 Army soldiers identified from the DoD's Contingency Tracking System who returned from an OEF/OIF/OND index deployment in FYs 2008–2011, including Active Duty (AD) and activated National Guard/Reserve (NG/R)

soldiers. From the SUPIC cohort, we identified an analytic sample who utilized the VHA's PSC within the first 12 months post-deployment (n=16,590), which included veterans who left the military and enrolled in VHA, as well as soldiers who used the PSC prior to enrolling in VHA. We refer to this cohort as PSC users. Demographic characteristics of the cohort were derived from the DoD's Defense Enrollment Eligibility Reporting System and were assessed upon return from the index deployment. PSC utilization was identified with VHA's Corporate Data Warehouse (CDW) clinic stop codes for outpatient visits to polytrauma centers (195, 196, 197, 198, 199, 219), and VHA specialty location code 112 for inpatient admissions to a polytrauma rehabilitation unit and specialty bed section location code 82 for inpatient or residential polytrauma transitional rehabilitation programs. We considered the first PSC location Tier level as a proxy for injury severity.

Polytrauma diagnoses and VHA health care utilization data came from the VHA's CDW and included treatments received within the 130 VHA medical centers during the person-specific 365 days after the first PSC utilization, not restricted to care received within the PSC.

Measures

Polytrauma conditions.—Polytrauma conditions (i.e., TBI, PTSD, and chronic pain) were examined with VHA data during the 365 days after the first PSC utilization using International Classification of Diseases Ninth Revision (ICD-9) codes. *TBI* was defined by the presence of diagnostic codes 310.2, 800.xx, 801.xx, 803.xx, 804.xx, 850.xx-854.xx, 950.1x-950.3x, 959.01, V15.5, V15.51, V15.52, V15.53, V15.59.²² *PTSD* was defined by the presence of diagnostic code 309.81. *Chronic pain* was defined as at least two diagnoses, greater than 90 days apart, from the same pain category.^{23–26} The ten pain categories assessed were developed by SUPIC investigators and are listed in Table 3.²⁷

The *polytrauma clinical triad* was defined as meeting the definition for TBI, PTSD, and chronic pain (CP). For analyses, we constructed 8 mutually-exclusive subgroups: no TBI, PTSD, or CP; TBI only; PTSD only; CP only; TBI & PTSD; PTSD & CP; TBI & CP; and the polytrauma clinical triad.

Treatments in the VHA.—All VHA treatments were examined in the 365 days after first PSC utilization. *Prescription opioid receipt* was defined as one or more prescriptions, as detailed in the Supplemental Digital Content, filled in the VHA.²⁰ We examined any opioid receipt (yes/no), and receipt of > 30 days supply of opioids (yes/no).²⁰ Utilization of *nonpharmacologic treatment (NPT)* was determined for 13 modalities (see Supplemental Digital Content) and VHA's clinic stop code 159 for VHA's complementary and alternative medicine clinics. NPT modalities²⁸ were selected based on military, VHA, and civilian integrative pain management reports and studies,^{29–34} and identified with ICD-9 codes, Current Procedural Terminology codes, VHA stop codes, and Healthcare Common Procedure Coding System codes. *Specialty mental health treatment* was provided by the VA Office of Mental Health Operations, as described in Vanneman et al. 2017,¹⁹ and is defined by outpatient clinic stop codes and inpatient and residential specialty location (bedsection) codes that primarily provide mental health treatment including for PTSD or depression.

Statistical Analysis

Calculations were performed using R version 3.4.0. Descriptive statistics (e.g., sums, proportions, and means) were calculated for study measures. The likelihood of TBI, PTSD, or chronic pain occurring in isolation versus in combination with each other during the 365 days after first PSC utilization was tested with individual χ^2 tests.

Brandeis University's Committee for Protection of Human Subjects, Stanford University's Panel on Human Subjects in Medical Research, and the Human Research Protection Program at the Office of the Assistant Secretary of Defense for Health Affairs/Defense Health Agency conducted the human subjects review and approved the study. The Defense Health Agency's Privacy and Civil Liberties Office executed the data use agreements.

RESULTS

During the year following an OEF/OIF/OND deployment, 2.6% of the SUPIC cohort utilized the VHA's PSC (n=16,590). Most PSC users were male (92.9%), White, non-Hispanic (71.0%), and junior enlisted at the end of the index deployment (E1-E4; 55.6% - see Table 1). Almost half had a previous deployment to the index. NG/R soldiers were more likely to use the PSC compared to AD soldiers; 73.7% of PSC users were NG/R compared to only 32.4% of the SUPIC cohort. Among PSC users, 79.5% of AD and 85.9% of NG/R were enrolled in VHA at the time of the first PSC utilization. Almost 7% of the sample used one of the five Tier-1 Polytrauma Rehabilitation Centers as the first PSC location and 20.9% used a Tier II Polytrauma Network Sites first. The majority of the sample (66.0%) used a Tier III Polytrauma Support Clinic Team first, and only 6.5% interacted with a Polytrauma Point of Contact first.

We determined the extent to which TBI, PTSD, and chronic pain were diagnosed in the PSC sample in the VHA (Table 2). Of the three conditions, chronic pain was most common (76.5%), followed by PTSD (53.1%) and TBI (48.6%). The prevalence of these conditions in isolation compared to in combination was significantly lower, with only 17.9% of the sample meeting the definition for chronic pain only, 4.4% having a PTSD diagnosis only, and 3.7% having a TBI diagnosis only (Figure 1). The most common subgroup was the polytrauma clinical triad (27.6%). Approximately 12% did not meet criteria for TBI, PTSD, or chronic pain. Among the subgroup with none of these conditions, 25.2% had at least one encounter with a pain diagnosis in the VHA in the year after first PSC utilization but did not meet the definition for chronic pain.

Table 3 provides detail about the types of chronic pain present among the 76.5% of the PSC sample that met the definition for chronic pain in the VHA (n=12,688). The most common types of chronic pain were back and/or neck pain (60.8%), non-traumatic joint disorders (56.5%), other musculoskeletal pain (51.3%), and headache/migraine (51.0%). Soldiers with chronic pain commonly met the definition for more than one chronic pain category (i.e., mean 2.6 categories, *standard deviation* 1.3).

Treatments Received among Subgroups

Among the PSC sample, 26.6% of soldiers filled at least one opioid prescription in the VHA. Nearly half of soldiers who filled an opioid prescription received > 30 days supply of opioids within the year following first PSC utilization. Opioid utilization and receipt of >30 days of opioids was most common among those with the polytrauma clinical triad (36.8% and 20.2%, respectively) and among those with chronic pain present.

Over one-third of the PSC sample used at least one NPT service within the VHA (Table 4). The most common modalities were exercise therapy (26.5%), other physical therapy (19.6%), superficial heat (7.7%), and massage (7.2%). Many NPT modalities were used infrequently (i.e., spinal manipulation, lumbar supports, biofeedback, acupuncture/dry needling, traction, cold laser therapy, or chiropractic care). Similarly, the VHA stop code for utilization of a complementary and alternative clinic was rarely used (3.3%). Subgroups with chronic pain had a higher prevalence of NPT utilization compared to subgroups without chronic pain. The subgroups with the polytrauma clinical triad and TBI & CP had the highest prevalence of any NPT utilization (48.4% and 43.9%, respectively).

Specialty mental health treatment in the VHA was common among the PSC sample, with 83.8% of the sample receiving at least one service within the year following first PSC utilization. Receipt of specialty mental health treatment was most common among those with the polytrauma clinical triad (98.5%) and among subgroups with PTSD.

DISCUSSION

This study took a population-based approach to examine utilization of the VHA's Polytrauma System of Care during a 4-year period among a large cohort of soldiers in the year following an OEF/OIF/OND deployment. Unlike prior studies of the PSC that focused on an individual PSC location, this study examined PSC utilization throughout the entire nationwide PSC system. Furthermore, these analyses were not limited to VHA enrollees. Because we examined PSC utilization within the entire tiered-system, we also provide new information about how soldiers and veterans first accessed care within the PSC following a deployment. Among the 16,590 Army members and veterans (2.6%) who used the PSC within the post-deployment year, only 6.6% required immediate inpatient treatment using one of the Tier I Polytrauma Rehabilitation Centers as the first point of PSC contact. Most received outpatient services first, with about 20% first using a Tier II site and 66% first accessing a Tier III location. The majority of those who used the PSC were VHA enrollees at the time of their first PSC utilization (80% of AD and 86% of NG/R).

Deployment of NG/R soldiers has risen substantially from previous conflicts, to represent over 40% of all Army deployments as of 2010.^{8,35} It is worth noting that PSC utilization was disproportionately high among NG/R soldiers in the SUPIC cohort, with almost three-fourths of PSC users being from the NG/R compared to comprising only 32% of the SUPIC cohort.¹⁸ Post-deployment screening surveys among the SUPIC cohort revealed that NG/R soldiers disproportionately reported higher rates of being wounded, injured, assaulted, or hurt during their index deployment compared to AD soldiers (27.0% versus 16.9%, respectively).¹⁸ It is unclear if these differences reflect the fact that wounded AD soldiers receive more of

their treatment for polytrauma within the Military Health System, or if NG/R soldiers in the SUPIC cohort had more severe polytrauma needs. Additional research is needed to examine how the transition between the Military Health System and VHA affects the quality of care received and outcomes for military members and veterans with complex deployment-related polytrauma.

Among PSC users in our study, chronic pain was most common (76.5%), followed by PTSD (53.1%) and TBI (48.6%), with 27.6% of soldiers having the polytrauma clinical triad. We report lower prevalence rates than the Lew et al. study,¹² which focused on earlier years during the OEF/OIF conflicts in which the military tempo was particularly intense. Lew et al. studied a single Tier II facility, whereas we examined the entire PSC system, including step-down Tier III and IV facilities, which may treat patients with less complex conditions. In our study, nearly 20% of PSC users were not VHA enrollees when they first used the PSC and could have been receiving health care in the Military Health System or civilian healthcare location not observed here. We do not know what proportion received their most intense care at a Military Treatment Facility before using services at the VHA. Also, even though efforts are underway to integrate the electronic health records between the DoD and VHA,³⁶ this was not accomplished during our study window, thus it is unclear how treatments received for PSC users with polytrauma were aligned or misaligned when moving between two systems of care.

Our findings reinforce the need for multi-disciplinary approaches to post-deployment treatment and rehabilitation for military members and veterans with polytrauma, and integrated treatment models that simultaneously address pain in conjunction with PTSD and/or TBI for military members and veterans moving from the DoD into the VHA.^{37,38} Consistent with other studies that examined chronic pain among PSC utilizers,^{12,39} we found that back or neck pain, non-traumatic joint disorders, other musculoskeletal pain, and headaches/migraines were the most frequent types of chronic pain. Headaches have been particularly common following combat-related TBI.⁴⁰

When examining common pain (i.e., opioids and NPT) and mental health treatments received in the VHA among subgroups of PSC users, we found that 36% of PSC users received at least one NPT treatment. The most common NPT modalities were exercise therapy and other physical therapy, but most modalities were infrequently used. A 2011 report on NPT in the VHA found that while the number of NPT modalities offered in the VHA increased from 2002 to 2011, a great deal of NPT delivered in the VHA was not documented in a progress note or associated with a procedure code.²⁹ Thus, NPT utilization may be underestimated in our study. Over a quarter of PSC users filled at least one prescription for an opioid in the VHA, and among opioid users, almost half (48.8%) used > 30 days supply of opioids in the year following first PSC utilization. Of note, many PSC users with PTSD and/or TBI received an opioid prescription, many without comorbid chronic pain, and several for more than 30 days supply. Previous research has found that OEF/OIF veterans with PTSD are at increased risk for high-risk opioid use and adverse clinical outcomes.²⁶ While opioids may be warranted to address acute pain after injuries such as a TBI, opioids may diminish cognitive function following a TBI, and additional research is warranted to examine how opioid utilization, whether acute or as long-term

opioid therapy, is associated with the long-term health and functioning after a history of TBI.⁴¹ DoD, VHA, and other clinical guidelines suggest that NPT approaches should be initiated for chronic pain management as an alternative to opioid therapy.^{42–45} Recent studies suggest that treatment with non-opioid approaches (i.e., NPT or non-opioid medications) was associated with improved functioning and reduced reliance on opioids.^{28,46}

Specialty mental health treatment was common (83.8% of PSC sample), with rates highest among those with the polytrauma clinical triad and subgroups with PTSD. Several studies of veterans have found that PTSD is a driver of chronic pain, particularly back and joint pain,^{26,37} and that individuals with chronic pain and mental health comorbidities are known to have more functional limitations and worse treatment outcomes.⁴⁷ The polytrauma clinical triad has been associated with increased risk for suicidal ideation and suicide attempts among OEF/OIF veterans.⁴⁸

This study has several limitations. First, post-deployment diagnoses and health care utilization estimates are likely incomplete because some care may have occurred in the Military Health System prior to enrolling in the VHA, or through private health insurance before or after VHA enrollment. We did not consider other common post-deployment mental health comorbidities such as substance use, sleep disturbance, depression, or anxiety disorders,^{37,48–50} and we did not examine TBI severity. It is plausible that soldiers may have received NPT treatments (e.g. yoga) or mental health treatment that was not captured in VHA medical records. Our definition of specialty mental health treatment may not have captured mental health services provided in the VHA outside of specialty mental health (e.g., health psychology, rehabilitation psychology, and neuropsychology), and also included depression treatment even though we did not specifically examine depression diagnoses. Study findings may not generalize to military members and veterans from other service branches. These data also may suffer from misattribution of administrative codes by providers.

Conclusions

To our knowledge, this is the first study to track a large population-based cohort of soldiers at the point of return from deployment to determine the proportion of soldiers and veterans using the PSC within the first year post-deployment, and to subsequently examine the polytrauma conditions and pain and mental health treatments received within the VHA among this population. Similar to prior studies, our findings demonstrate that the PSC is serving its intended population of military members and veterans with complex, comorbid physical and mental needs. Because chronic pain is the most common condition among this population, PSC rehabilitation services should incorporate interdisciplinary pain management approaches intended to reduce reliance on long-term opioid therapy and to address comorbid mental health problems and recovery from TBI. Future research is needed to examine the transition between the DoD and VHA for military members returning from deployments with polytrauma to examine if there is evidence of improved outcomes or efficiencies when integrating care across both systems of care for this complex population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

Post-deployment prevalence and co-prevalence of TBI, PTSD and Chronic Pain among PSC users (n=16590) Note. Chi-squared tests underscored that conditions that make up the polytrauma clinical triad are significantly more likely ($p = .001$) to occur together than in isolation. The none subgroup (11.7%) is not shown.

Table 1.

Demographic and military history characteristics of Army soldiers returning from an OEF/OIF/OND deployment in fiscal years 2008–2011, by use of the VHA's Polytrauma System of Care (PSC) in the postdeployment year

Characteristics upon return from deployment	PSC sample 16590 (2.6%)	Non-PSC sample 626615 (97.4%)
	n (%)	n (%)
Mean age in years (standard deviation)	29.8 (8.91)	28.6 (8.11)
Gender		
Male	15409 (92.9)	560171 (89.4)
Female	1181 (7.1)	66441 (10.6)
Race/Ethnicity		
Non-Hispanic white	11755 (71.0)	377523 (60.4)
Non-Hispanic African American	1992 (12.0)	103129 (16.5)
Asian / Pacific Islander	855 (5.2)	67047 (10.7)
Hispanic	1734 (10.5)	65184 (10.4)
American Indian / Alaska Native	163 (1.0)	5987 (1.0)
Other	64 (0.4)	5904 (0.9)
Marital Status		
Married	9002 (54.3)	353356 (56.4)
Never Married	6357 (38.3)	235392 (37.6)
Other	1222 (7.4)	(6.0)
Rank		
Junior Enlisted	9231 (55.6)	319537 (51.0)
Senior Enlisted	6391 (38.5)	214277 (34.2)
Warrant Officer	140 (0.8)	15089 (2.4)
Junior Officer	544 (3.3)	50391 (8.0)
Senior Officer	284 (1.7)	27310 (4.4)
Number of deployments prior to the index deployment		
None (first deployment)	8793 (53.0)	356018 (56.8)
One prior	6268 (37.8)	185508 (29.6)
Two or more prior	1529 (9.2)	85089 (13.6)
Component		
Active Duty	4367 (26.3)	430619 (68.7)
National Guard	9714 (58.6)	141156 (22.5)
Reserve	2509 (15.1)	54840 (8.8)
FY of return from index deployment		
2008	3730 (22.5)	121128 (19.3)
2009	4401 (26.5)	189055 (30.2)

Characteristics upon return from deployment	PSC sample 16590 (2.6%)	Non-PSC sample 626615 (97.4%)
2010	5171 (31.2)	195556 (31.2)
2011	3288 (19.8)	120876 (19.3)

Note: A two-sample t-test for age and Pearson chi-squared tests for categorical variables showed significant differences between the PSC cohort and non-PSC cohort for all variables. Due to rounding, not all columns add up to 100%. Other marital status includes separated, divorced, widowed and missing. Less than 0.3% of data was missing for race/ethnicity, marital status, rank, and gender.

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Table 2.

Prevalence of and co-prevalence of TBI, PTSD, and Chronic Pain Diagnoses among Polytrauma System of Care Users within the post-deployment year (n = 16590)

Diagnoses in the VHA ^a	n (%)
PTSD	
Yes	8814 (53.1)
TBI	
Yes	8063 (48.6)
Chronic pain ^b	
Yes	12688 (76.5)
Mutually exclusive conditions	
None	1936 (11.7)
PTSD only	734 (4.4)
TBI only	619 (3.7)
Chronic pain only	2970 (17.9)
PTSD & TBI	613 (3.7)
PTSD & chronic pain	2887 (17.4)
TBI & chronic pain	2251 (13.6)
PTSD, TBI, & chronic pain	4580 (27.6)

^aTBI, PTSD, and chronic pain diagnoses were based on VHA data for 365 days after the first PSC utilization.

^bChronic pain is defined as at least 2 diagnoses from the same pain category greater than 90 days apart in the 365 day observation window

Table 3.

Prevalence of chronic pain diagnosis categories among users of the VHA's PSC within the post-deployment year (n = 16590)^{a, b, c}

Pain Category	n	% of total PSC sample (n = 16590)
Peripheral/central nervous system	969	5.8
Osteoarthritis	1202	7.2
Back and/or neck pain	7714	46.5
Headache/migraine	6476	39.0
Non-traumatic joint disorders	7164	43.2
Other musculoskeletal	6513	39.3
Visceral/pelvic	857	5.2
Wounds/injuries/fractures	1076	6.5
Acute post-operative/trauma	33	0.2
Chronic pain, not specified	441	2.7

^a Pain diagnoses were examined in the VHA for 365 days after the first date of PSC utilization in the post-deployment year.

^b Chronic pain is defined as at least 2 diagnoses from the same pain category greater than 90 days apart.

^c Chronic pain categories are not mutually exclusive and are defined in Reif et al, 2018.

Table 4.

VHA treatments received during the 365 days after first day of utilization of the VHA's Polytrauma System of Care^a

Selected Therapies	PSC sample n = 16590	None n = 1936	PTSD only n = 734	TBI only n = 619	Chronic Pain only n = 2970	PTSD & TBI n = 613	PTSD & Chronic Pain n = 2887	TBI & Chronic Pain n = 2251	PTSD, TBI & Chronic Pain n = 4580
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Any nonpharmacologic modality	5890 (35.5)	144 (7.4)	92 (12.5)	100 (16.2)	1063 (35.8)	117 (19.1)	1169 (40.5)	989 (43.9)	2216 (48.4)
Exercise Therapy	4404 (26.5)	91 (4.7)	67 (9.1)	71 (11.5)	792 (26.7)	79 (12.9)	880 (30.5)	746 (33.1)	1678 (36.6)
Massage	1200 (7.2)	14 (0.7)	5 (0.7)	9 (1.5)	193 (6.5)	10 (1.6)	243 (8.4)	232 (10.3)	494 (10.8)
Other Physical Therapy	3253 (19.6)	53 (2.7)	21 (2.9)	39 (6.3)	605 (20.4)	45 (7.3)	615 (21.3)	597 (26.5)	1278 (27.9)
Superficial Heat	1276 (7.7)	14 (0.7)	6 (0.8)	7 (1.1)	216 (7.3)	8 (1.3)	251 (8.7)	225 (10.0)	549 (12.0)
TENS/electrical Modulation	1037 (6.3)	11 (0.6)	3 (0.4)	7 (1.1)	204 (6.9)	7 (1.1)	225 (7.8)	178 (7.9)	402 (8.8)
Ultrasonography	816 (4.9)	8 (0.4)	4 (0.5)	4 (0.6)	142 (4.8)	6 (1.0)	159 (5.5)	156 (6.9)	337 (7.4)
Any Opioid prescription	4409 (26.6)	137 (7.1)	70 (9.5)	55 (8.9)	780 (26.3)	58 (9.5)	1019 (35.3)	604 (26.8)	1686 (36.8)
>30 Days-Supply in one year period	2151 (13.0)	26 (1.3)	21 (2.9)	11 (1.8)	332 (11.2)	11 (1.8)	561 (19.4)	262 (11.6)	927 (20.2)
Any Specialty Mental Health Treatment	13910 (83.8)	958 (49.5)	683 (93.1)	403 (65.1)	2174 (73.2)	585 (95.4)	2814 (97.5)	1791 (79.6)	4502 (98.3)

Note: Nonpharmacologic treatment modalities with less than 3.5% utilization among the PSC sample are not displayed. TENS = Trans-Electrical Nerve Stimulation.

^a percentages of column total