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Veterans seeking treatment for posttraumatic stress disorder: What about comorbid chronic pain?

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Abstract—Our primary aim was to document the rate of comorbidity of physician-diagnosed chronic pain conditions in veterans who were seeking treatment for posttraumatic stress disorder (PTSD). Chronic pain diagnoses (e.g., chronic low-back pain and osteoarthritis) were examined with retrospective chart review. Of the patients with PTSD, 66% had chronic pain diagnoses at pretreatment. These findings are consistent with previous studies that documented the high comorbidity of chronic pain and PTSD using samples of pain patients. Our secondary aim was to examine pain ratings before, during, and after PTSD treatment. Using data that were a part of clinical practice, we found that patients with more pain before treatment reported reductions in pain over the course of PTSD treatment and in the 4 months following treatment. While our results must be interpreted cautiously because of multiple confounding factors and the absence of experimental manipulation, they highlight the importance of PTSD and pain comorbidity.

Key words: chart review, chronic pain, comorbidity, generalizability, pain, posttraumatic stress disorder, PTSD, rehabilitation, treatment, veterans.

INTRODUCTION

Posttraumatic stress disorder (PTSD) can occur following a traumatic event and is marked by intrusive recollections of the event, avoidance of reminders, emotional numbing, and hyperarousal [1].The prevalence of PTSD in the United States is estimated to be 6 percent in males and 12 percent in females [2]. Among those populations with higher incidences of trauma exposure (e.g., combat veterans), the rates of PTSD are even higher. The National Vietnam Veterans Readjustment Study found that 30 percent of veterans met criteria for PTSD at some point in their lifetimes and 15 percent met criteria for PTSD at the time of the survey, several decades after combat exposure [3–4]. Recent reanalysis of these data revealed slightly lower rates of PTSD when more stringent criteria were used but still found elevated rates of 18.7 percent for lifetime and

Abbreviations: ANOVA = analysis of variance, CAPS = Clinician Administered Posttraumatic Stress Disorder Scale, DSM-III = Diagnostic and Statistical Manual of Mental Disorders-Third Edition, ICD-9 = International Classification of Diseases-Ninth Edition, ISTSS = International Society for Traumatic Stress Studies, PTSD = posttraumatic stress disorder, SD = standard deviation, SSRI = selective serotonin reuptake inhibitor, VA = Department of Veterans Affairs, VAMC = VA medical center.

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9.1 percent for current PTSD at 11 to 12 years posttrauma [5]. PTSD can be a debilitating disorder and is frequently comorbid with other disabling psychiatric conditions, such as substance abuse or dependence, depression, and other anxiety disorders [6].

In addition to psychiatric comorbidity, one clear effect of PTSD on patients is an elevated rate of physical health problems [7–8]. The relationship between PTSD and increased health problems remains even when one excludes physical injuries from the trauma from the analyses [9–10] and controls for other psychological concomitants, such as depression [10–12]. Furthermore, the impact of PTSD on health does not appear to be limited to a specific disease-state, since patients with PTSD appear to have an increased risk for cardiovascular problems, headaches, diabetes, respiratory problems (e.g., asthma), gastrointestinal symptoms, musculoskeletal disorders resulting in chronic pain, and other disabling diseases [9,11,13–18].

Chronic pain is believed to be one of the most commonly co-occurring physical problems for patients with PTSD [19]. However, the majority of evidence that patients with PTSD have chronic pain comes from studies of chronic pain patients who reported high rates of PTSD symptoms [20–31], especially patients with fibromyalgia and chronic fatigue syndrome [32–37]. Studies of pain patients often include appropriate diagnostic tools for PTSD and report high levels of PTSD symptoms [35]. However, the majority of studies on the relationship between chronic pain and PTSD are with specific types of chronic pain samples. By definition, these studies cannot assess the extent of chronic pain conditions in patients with PTSD.

Only a handful of studies have been conducted in which patients with PTSD were asked about their chronic pain complaints. These studies all show elevated rates of self-reported pain. For example, chronic pain problems where the pain persists for at least 3 to 6 months are estimated to be present in about 10 percent of the general population [38]. In contrast, a study of Vietnam veterans presenting for outpatient treatment of PTSD revealed that 80 percent also reported experiencing chronic pain, although they did not specify the type of pain (e.g., back pain, arthritis), and the chronic pain diagnosis was not confirmed by their doctors [39]. Another study indicated that female veterans who used Department of Veterans Affairs (VA) services reported levels of comorbidity consistent with those reported by males [40]. However, this study did not specifically examine patients with PTSD but rather all female veterans using VA services; self-report of pain problems was used rather than actual diagnoses. The relationship between PTSD and chronic pain has also been explored in nontreatment-seeking samples of patients with PTSD and found elevated rates of chronic pain [16,41], suggesting that this is an important comorbidity to understand. However, all the studies of patients with PTSD just reviewed relied on self-reported pain problems rather than physician-diagnosed pain conditions. Physician-diagnosed pain problems require the corroboration of a problem area by a trained professional who can order appropriate tests prior to diagnosis. Using physician-diagnosed medical conditions is generally considered more methodologically rigorous, reliable, and a more objective indicator of health than self-reported problems [42–43].

To our knowledge, only one study examined the rates of physician-diagnosed pain problems in patients with PTSD [19]. In that study, 60 percent of patients with PTSD had multiple medical problems and 25 percent were diagnosed with a pain-related condition. This finding suggests that the rate of chronic-pain diagnoses in patients with PTSD is approximately double that of the general population. However, in that study, PTSD was diagnosed by attending physicians (rather than mental health providers with expertise in trauma recovery) using Diagnostic and Statistical Manual of Mental Disorders-Third Edition (DSM-III) criteria [44] for the diagnosis [19]. Thus, the only study of patients with PTSD examined the rate of comorbid chronic pain problems using substantially outdated PTSD criteria and nonexpert raters. Therefore, how common physician-diagnosed chronic pain problems are in patients with PTSD diagnosed by mental health providers with trauma expertise using contemporary diagnostic criteria is unclear.

Several theories help explain why patients with PTSD may be at increased risk for chronic pain problems [45–48]. One is “shared vulnerability,” in which several underlying mechanisms are implicated as possibly driving both PTSD and chronic pain problems [45,48]. One hypothesized mechanism is anxiety sensitivity, defined as the belief that anxiety is harmful, leading to fearful responses to anxiety symptoms [49–50]. To illustrate, a person with high anxiety sensitivity is at an increased risk for developing PTSD because the fear created by the trauma itself is amplified by a fearful response to normal anxiety responses to the trauma. The patient with PTSD also responds to pain experiences with high anxiety sensitivity, thus intensifying the pain problem to a diagnosable level.

Given that high rates of comorbid chronic pain diagnoses are likely in PTSD treatment-seeking veterans, considering how this might influence treatment planning becomes salient. Studies suggest that the comorbidity of PTSD and pain may profoundly affect psychosocial and physical functioning as well as quality of life [51–54]. From a theoretical perspective, the concept of "mutual maintenance" of pain and PTSD becomes important to consider [45,48]. Similar to the theory of shared vulnerability, the mutual maintenance hypothesis proposes that the cognitive, affective, psychophysiological, and behavioral symptoms of both disorders react in synergistic ways. For example, a patient with PTSD who develops a back problem may overreact to the painful stimuli (e.g., as though it were life-threatening). Thus, the patient becomes more likely to avoid any situation that he or she believes may trigger pain in addition to the situations he or she avoids for fear of triggering memories of the trauma. The result of this cycle of avoidance is increased restriction and disability. Fortunately, cognitive-behavioral treatment programs that emphasize the importance of exposures to feared situations in a safe and controlled manner are recommended for both PTSD and chronic pain problems [55–56]. Further, these treatment programs address underlying maladaptive cognitions (e.g., belief that back pain is life-threatening) through cognitive restructuring. Given that cognitive behavioral interventions are empirically supported for the treatment of both PTSD and chronic pain and that these programs may target mutually maintaining factors (e.g., avoidance behavior), examining the effect of PTSD treatment on chronic pain is important.

Unfortunately, very few PTSD treatment studies have also directly examined the effect of the treatment on pain problems and most are case studies. A study of three patients with both pain and PTSD revealed that while pain treatment was not effective, PTSD treatment was useful [29]. Similarly, in a small study of headache patients, no improvement was shown until the PTSD symptoms were addressed in patients with both headaches and PTSD [57]. In contrast, at a recent case conference, experts discussed a single patient with pain and PTSD for whom PTSD treatment was not effective [58–59], although leaders in the field had all recommended this approach [60–62]. Shipherd and colleagues investigated the effect of PTSD treatment on chronic pain with a sample of six women with chronic pain and PTSD after car accidents [63]. These women received 12 weeks of manualized cognitive behavioral PTSD treatment that explicitly avoided discussion of pain-related issues. Results indicated a decrease in PTSD symptoms as well as in other psychiatric symptoms for most patients. Although subjective pain ratings did not change posttreatment, pain-related functional improvements were noted, including a return to full-time work for the majority of participants. These results suggest that the benefits of PTSD treatment may generalize to comorbid chronic pain problems. However, importantly, the treatment took place in a carefully controlled research context that may or may not be applicable to naturally occurring treatment venues [64]. The studies conducted to date on the effects of PTSD treatment on comorbid chronic pain complaints have all been small sample studies with some promising results. However, large-scale controlled studies of the effects of PTSD treatment on pain have not yet been published. Another limitation of the existing literature is that the treatments have been conducted in small controlled trials, in spite of the availability of large databases of naturally collected data from PTSD treatment (e.g., VA databases) that have yet to be fully explored in this regard. The current study is one attempt to use this preexisting data to better understand the prevalence of chronic pain problems in patients with PTSD and to explore whether any changes occur in pain ratings before, during, or after PTSD treatment.

The purpose of this study was twofold. The primary aim was to document the rates of physician-diagnosed chronic pain problems in veterans who were diagnosed and treated for PTSD by specialists at the Atlanta VA Medical Center (VAMC) intensive outpatient PTSD treatment program. This was the first study to examine the rates of chronic pain diagnoses in patients diagnosed with PTSD according to DSM-IV (Fourth Edition) criteria [1] by mental health professionals, with patients then completing PTSD treatment (suggesting that patients concurred with the diagnosis). In our sample of patients with PTSD, we examined the rate of physician-diagnosed conditions, which is a more stringent criterion than self-reported pain. Based on the extant literature, we hypothesized that a high rate of comorbidity would exist in this population. The second aim was to conduct an exploratory investigation of pain ratings from 1 year of primary-care appointments (before, during, and after treatment) for veterans who had undergone PTSD treatment. In this way, we could determine whether during and/or following PTSD treatment (provided outside a rigorous experimental setting), patients with pain reported changes (either increases or decreases) in their pain severity. Both theoretical and some limited empirical evidence suggest that patients might report a reduction in pain following treatment. If such reductions in

pain were found, this study would add to the growing body of literature suggesting that the benefit from PTSD treatment may generalize to comorbid chronic pain.

METHODS

Participants

This study used a retrospective chart review conducted at the Atlanta VAMC. Basic demographic information, including age, race/ethnicity, period of service, percent service connection, and diagnosed conditions, were extracted from the Atlanta VAMC computerized medical records. We confirmed diagnoses by comparing the diagnoses found in the "problems" list of the computerized record with the content of the provider's note to ensure that the diagnosis was not entered in error. **Table 1** reflects the diagnoses associated with the problem for which the patient was seeking help at that visit, even though some patients had multiple pain-related diagnoses. The most common pain conditions were chronic low back pain, general chronic pain secondary to another diagnosis (e.g., diabetes), and osteoarthritis. To be stringent in our criteria, transient pain conditions such as "angina pectoris" were not included as chronic pain conditions. This study was approved by the Atlanta VAMC's Research and Development Committee and Emory University's Institutional Review Board. The sample consisted of 90 male veterans who completed PTSD treatment between September 2001 and August 2004.* Each patient's percentage of attendance in the PTSD treatment program (described in the next paragraph) was calculated. Based on these findings, 5 cases were excluded from further analysis because of less than 50 percent attendance. Average percentage of attendance for the final sample of 85 veterans was high at 94.3 ± 8.6 standard deviation (SD).

The mean age of the veterans was 55.4 ± 4.1 years. Approximately half the sample was Caucasian (n = 44, 51.8%) and the remaining participants were African American (n = 41, 48.2%). The sample consisted mainly of Vietnam veterans (n = 82, 96.5%) with two Gulf War veterans and one Korean War veteran. All patients had been experiencing chronic PTSD over a period of at least 5 years and for as many as 30 years. For all patients, treatment was for PTSD following combat trauma. Fifteen participants stated that they had sustained physical injuries during the trauma, although whether these injuries were related to ongoing pain problems is unknown. Hypertension was present in a majority of the patients (n = 50, 58.8%), many had diabetes (n = 26, 30.6%), and some had been diagnosed with hepatitis C (n = 10, 11.8%) or cardiac disease (n = 9, 10.6%). As is typical in PTSD treatment programs, many patients had comorbid mood disorders (n = 27, 31.8%), substance abuse or dependence (n = 21, 24.7%), and a few had additional anxiety disorders (n = 5, 5.9%).

With regard to psychiatric medications, at pretreatment, 57.6 percent (n = 49) were prescribed selective serotonin reuptake inhibitors (SSRIs), 64.7 percent (n = 55) antidepressants other than SSRIs (e.g., tricyclics, Effexor, duloxetine hydrochloride), 21.2 percent (n = 18) antipsychotics, 16.5 percent (n = 14) benzodiazepines, 12.9 percent (n = 11) hypnotics, and 10.6 percent (n = 9) mood stabilizers. For pain medications at pretreatment, 17.6 percent (n = 15) had been prescribed opiate medications and 32.9 percent (n = 28) were taking other pain medications

Table 1.
Frequency of chronic pain diagnoses (with associated features and diagnoses).

Number	Diagnosis
16	Chronic low back pain
14	General chronic pain, secondary to other conditions (diabetic neuropathy, lymphoma, emphysema, prostate cancer, coronary heart disease, hepatitis C, and/or hypertension)
8	Osteoarthritis
4	Persistent headache/migraines
5	Joint pain (hip, knee, ankle)
2	Chest pain (chronic obstructive pulmonary disease and cardiac stent, gastro reflux)
2	Neck injury
2	Arthralgia/sciatica
1	Fibromyalgia
1	Carpel tunnel syndrome
1	Degenerative disk disorder

*PTSD treatment program is a naturally occurring clinic that addresses veterans' needs at the Atlanta VAMC. As such, the treatment program has developed and changed over time. Treatment elements remained constant throughout the period on which we focused, although emphasis on importance of exposure therapy in the treatment increased over time. For example, by August 2003, the treatment program included audiotaping of exposure accounts and assigning of the tape as daily homework. For more extensive data on treatment outcome in this program, see Ready D, Worley V, Lorenz A, Brown K, Baltzell D. Group-based exposure therapy for PTSD combat veterans. Proceedings of the 20th annual meeting of the International Society for Traumatic Stress Studies (ISTSS) [poster presentation]; 16 Nov 2004; New Orleans, LA. Northbrook (IL); ISTSS: 2004. p. 107.

(e.g., naproxen, 800 mg Advil). However, one should note that some psychiatric medications are also prescribed for pain management (e.g., tricyclics) but were classified with psychiatric medications for our purposes.

Several medication changes took place during and after PTSD treatment with both psychiatric and pain medications (**Tables 2** and **3**). When reviewing the medication changes, one must recognize that many patients were taking multiple medications. As summarized across all classes of psychiatric medications in **Table 2**, the treatment phase resulted in maintenance of medication dose (as compared with the 4 months of pretreatment) on at least one medication in the majority of cases. Changes in psychiatric medication included increased dose on at least one prescription for 40 patients, decreased dose for 2 patients, medication added for 65 patients, medication withdrawn for 10 patients, and a switch to a medication in the same class for 4 patients. As summarized in **Table 3,** in the treatment phase pain medication changes across both opiate and nonopiate medications, 30 patients maintained the doses, 1 increased the dose, 15 added pain medication, 9 stopped pain medications, and 3 switched to another pain medication in the same class.

After treatment, the vast majority of medications being prescribed were maintained at the same dose (n = 159). Changes in medication from treatment phase levels for psychiatric medications included 25 increases in dose, 5 decreases in dose, 14 additions of psychiatric medications, 12 withdrawals of psychiatric medication, and 6 switches to another medication in the same class (**Table 2**). Similarly, the majority of pain prescriptions were maintained at the same dose (n = 35) from treatment to posttreatment (including both opiate and nonopiate). One pain medication dose increase occurred, as well as one decrease, fifteen additions of pain medications, four withdrawals of pain medication, and three switches to another drug in the same class (**Table 3**).

PTSD Treatment

The sample participated in an intensive 16-week group-based outpatient program, with patients attending 3 hours of therapy 2 days each week (6 hours weekly), for a total of 96 hours of therapy. Treatment groups were typically run with ten patients per cycle. The group format helped patients normalize experiences and receive crucial feedback about the specific details of traumatic events from other war veterans who had often survived similar events. Group treatment was provided by a licensed clinical psychologist and social worker who have extensive experience working with veterans with PTSD over the past 20 years.

Table 2.
Summary of psychiatric medicine changes during and following posttraumatic stress disorder treatment. Reported as number of individuals in each category.

Medicine Change	Antidep	SSRI	Antipsychotic	Benzod	Hypnotic	Mood Stabilizer
During Treatment*						
Maintained dose	25	29	14	9	10	5
Dose increased	17	15	3	3	0	2
Dose decreased	0	1	0	0	0	1
Medication added	23	11	5	11	11	4
Medication stopped	4	3	0	1	1	1
Switched to another in class	2	2	0	0	0	0
Following Treatment†						
Maintained dose	48	45	19	18	17	12
Dose increased	14	8	1	1	1	0
Dose decreased	1	4	0	0	0	0
Medication added	1	3	1	1	7	1
Medication stopped	3	1	4	2	1	1
Switched to another in class	2	1	1	1	1	0

*Change from status at pretreatment.
†Change from status during treatment.
Antidep = antidepressant, Benzod = benzodiazepine, SSRI = selective serotonin reuptake inhibitor.

Table 3.
Summary of pain medication changes during and following posttraumatic stress disorder treatment. Reported as number of individuals in each category.

Medicine Change	Opiate	Nonopiate
During Treatment*		
Maintained dose	10	20
Dose increased	1	0
Dose decreased	0	0
Medication added	7	8
Medication stopped	5	4
Switched to another in class	0	3
Following Treatment†		
Maintained dose	17	18
Dose increased	0	1
Dose decreased	0	1
Medication added	5	10
Medication stopped	0	4
Switched to another in class	0	3

*Change from status at pretreatment.
†Change from status during treatment.

Evaluation for admittance to this PTSD treatment program involved a clinical interview and administration of the Clinician Administered PTSD Scale (CAPS)* [65], the Combat Exposure Scale [66], and the Mississippi Scale for Combat-Related PTSD [67] to confirm PTSD diagnosis. Patients were also required to provide military discharge paperwork to verify combat exposure. A diagnosis of severe war-related PTSD, a firm commitment to treatment, and at least 6 months of sobriety were required for admission. Exclusion criteria for this 16-week treatment program included a positive urine drug or alcohol screen, psychotic symptoms at intake, and organic impairment. This PTSD treatment program was based on a cognitive-behavioral model and comprised three phases: (1) a group-building and didactic training phase, (2) an exposure therapy phase, and (3) a bereavement and relapse-prevention phase. The first phase (weeks 1 to 6) focused on didactic presentations about the symptoms of PTSD, breathing retraining, instruction in thought-stopping, grounding techniques, and information about how maladaptive thoughts influence emotions. In addition, during group-building exercises, each participant spoke to the group about their premilitary and basic training history. In this way, group members got to know and feel connected to one another, since many of them had similar military training histories. Throughout treatment, participants were encouraged to call other group members between sessions (social support building). Homework assignments to call one another in the initial weeks of treatment encouraged this behavior. The second phase of treatment (weeks 7 to 13), focused on imaginal exposure—each patient made a 1-hour presentation about their most traumatic war-experience, which was also audio-taped and assigned as daily exposure homework. The final phase of treatment (weeks 13 to 16) addressed guilt and grief, anger management, relapse prevention, and wellness skills. In addition, each participant received feedback from other group participants.

*For 15 participants, both pre- and posttreatment CAPS scores were available. The average pretreatment CAPS score was 85.7 ± 15.3, which is well above commonly used diagnostic threshold of 50. The average change in CAPS total scores (summary of frequency and intensity of 17 symptoms) from pre- to posttreatment was 22.4 ± 31.9, indicating successful treatment. Among treatment responders (decreased CAPS, n = 10), an improvement of 35.8 ± 25 points occurred. In treatment nonresponders (increased CAPS, n = 5), symptoms increased by an average 10.4 ± 9.4 points.

Measures

Patients' comorbid medical diagnoses and pain ratings were extracted from the Atlanta VAMC computerized medical records as recorded by their primary-care providers. A 1-year period was evaluated and divided into three intervals (4 months pretreatment, 4 months during treatment, 4 months posttreatment).

Chronic Pain Conditions

We identified several conditions as pain-related conditions using International Classification of Diseases-Ninth Edition (ICD-9) codes. The pain diagnoses included all forms of arthritis (e.g., osteoarthritis, rheumatoid arthritis, degenerative joint disease), persistent headaches (e.g., migraine, chronic headache), fibromyalgia, polyarthralgia, chronic back pain, and joint pain (including ankle, knee, shoulder, or wrist). Many other diagnoses can be associated with pain (e.g., diabetes, multiple sclerosis, cancer), but we conservatively included only those diagnoses that had an additional pain diagnosis (**Table 1**). Patients who had one of these pain conditions in their list of active diagnoses during the 4 months prior to PTSD treatment were identified. Then, we confirmed pain diagnoses by examining progress notes associated with the problem being assigned to the patient to ensure that the medical provider had intended that diagnosis.

Verbal Rating Scale of Pain Intensity

Pain was rated by all patients at their regular medical appointments on a 0 to 10 scale, with 0 being a complete

absence of pain and 10 being the most pain they have ever experienced. This scale is considered a gold standard in the measurement of pain and is recommended by the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials [68]. Pain ratings were assessed as part of the patients' regular care with their VA primary-care provider (not a member of the PTSD treatment team). In the VA system, a verbal rating of pain intensity should be gathered at every visit with all patients. Compliance with this mandate is a performance measure for primary-care providers.

We calculated an average pain rating for each 4-month period (pre-, during, and posttreatment). While this type of analysis may mask variability of pain over these periods, it provides an accurate overall picture of the pain intensity. Further, it allows comparison across individuals with differing frequencies of healthcare use. On average, the patients attended 1.87 ± 1.7 primary-care appointments during the 4 months before treatment, 1.56 ± 1.5 appointments during the 4 months of the treatment, and 1.62 ± 1.5 appointments in the 4 months following treatment.

RESULTS

Prevalence of Comorbid Pain Conditions

A significant majority of the sample ($n = 56$, 66%, $\chi^2 = 8.58$, $p < 0.01$) had a chronic pain disorder at pretreatment. Demographic information for patients with and without pain diagnosis is listed in **Table 4**. We compared the two groups using one-way analysis of variance (ANOVA) and chi-square analyses for between-group differences on demographic and diagnostic variables. No differences were found between the groups on demographic variables. Interestingly, no group differences were found in medications at pretreatment between those with and without pain diagnoses. However, when opiate and other pain medications were grouped together, the anticipated significant difference emerged in χ^2 testing, with pain patients taking more pain medications ($n = 31$) than nonpain patients ($n = 8$, $p < 0.05$). No significant differences were found between the two groups on any variable at $\alpha = 0.05$.

Pain Ratings and PTSD Treatment

To examine the pain ratings over the course of treatment, we conducted a repeated measures ANOVA, with the within-subjects factor of treatment (three levels: pre-, during, and posttreatment). The presence or absence of a comorbid pain diagnosis was the between-groups factor; however, no significant effects were found.

To explore pain ratings further, we compared veterans who reported zero pain in their primary-care visits during the 4 months before PTSD treatment (No Pain/PTSD) with those who reported pain (Pain/PTSD). In the No Pain/PTSD group were 36 veterans and in the Pain/PTSD group, 22 veterans. For various reasons, 27 veterans had missing data, with some primary care received outside the VA system. We analyzed pain ratings using

Table 4.
Descriptive information for patients with posttraumatic stress disorder with and without comorbid pain diagnoses. No significant differences were found on these variables with one-way analysis of variance and chi-square analyses, $p < 0.05$.

Variable	Pain Diagnosis ($n = 56$)	No Pain Diagnosis ($n = 29$)
Average Age (mean ± standard deviation [SD])	55.4 ± 4.4	55.4 ± 3.7
Substance Diagnosis (abuse and dependence) (%)	23.2	27.6
Mood Disorder (%)	32.1	31.0
Anxiety Disorder (%)	7.1	3.4
Service Connection (%, mean ± SD)	63.7 ± 29.6	66.9 ± 29.4
Attendance (%, mean ± SD)	95.5 ± 6.6	92.1 ± 11.4
Antidepressants (*n*)	32	23
Antipsychotics (*n*)	14	4
Benzodiazepines (*n*)	11	3
Hypnotics (*n*)	6	5
Mood Stabilizers (*n*)	6	3
Selective Serotonin Reuptake Inhibitors (*n*)	29	20
Opiates (*n*)	13	2
Other Pain Medications (*n*)	21	7

repeated measures ANOVA, with the within-subjects factor of time (three levels: pre-, during, and posttreatment) and the between-groups factor of group status (Pain/PTSD, No Pain/PTSD). Significant interaction effects were followed up by Tukey tests. We used $\alpha = 0.05$, and effect sizes are reported with partial eta squared (η^2).

The ANOVA found an interaction of time and group status ($F_{2, 55} = 15.01$, $p < 0.001$, $\eta^2 = 0.35$). For the interaction, planned follow-up tests revealed that within the No Pain/PTSD group pain significantly increased from pretreatment paraneoplastic (zero) to during treatment (mean 1.55 ± 3.04) but that during treatment and posttreatment (mean 1.15 ± 2.17) pain ratings did not significantly differ. Within the Pain/PTSD group, pain significantly reduced at each time point, with mean pain ratings dropping from 4.93 ± 2.16 at pretreatment to 3.39 ± 3.20 during treatment and 2.22 ± 2.56 at posttreatment. Comparisons between the groups indicated that the Pain/PTSD group differed from the No Pain/PTSD group at pretreatment and during treatment, but the two groups reported comparable pain ratings at posttreatment (**Figure**).

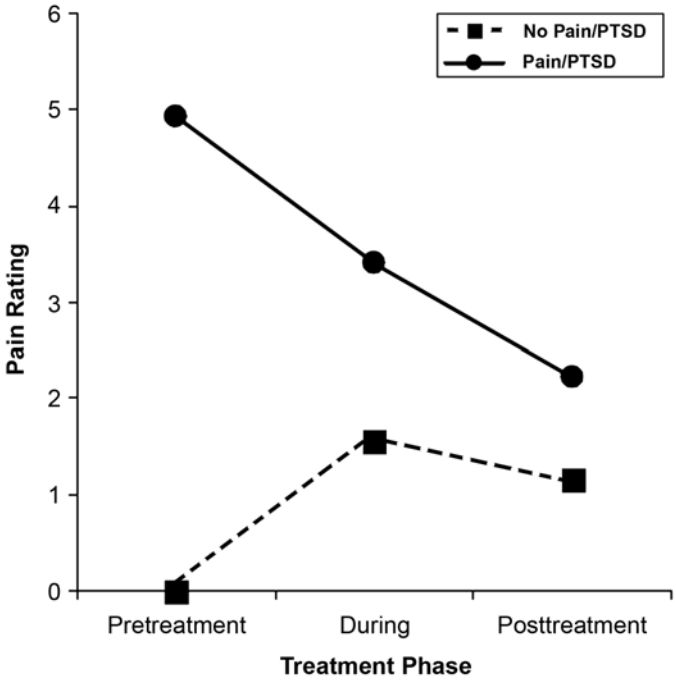

Figure.
Pain intensity across time for patients with posttraumatic stress disorder (PTSD). No Pain/PTSD group ($n = 36$) reported no pain and Pain/PTSD group ($n = 22$) reported pain during 4 months before treatment.

DISCUSSION

Our study found that rates of physician-diagnosed chronic pain conditions were high in a sample of veterans treated in an intensive PTSD program. Specifically, 66 percent of the patients with PTSD had a comorbid chronic pain diagnosis, confirming the high rate of comorbidity found in earlier studies of self-reported pain in patients with PTSD. The most directly comparable study of chronic pain in patients with PTSD revealed a rate of 80 percent of self-reported pain problems [38]. Thus, when we used more stringent physician-diagnosed problems that are clearly associated with chronic pain, our study revealed somewhat lower rates than the study using self-reported pain. However, given that only 10 percent of the general population is expected to have chronic pain [38] and that an earlier chart review revealed a rate of 25 percent comorbidity [19], the comorbidity of 66 percent is much higher than anticipated. The high rate of comorbidity of physician-diagnosed chronic pain problems in PTSD treatment-seeking veterans emphasizes the importance of understanding this presentation and implications for treatment.

Various theories have postulated mechanisms underlying the comorbidity of PTSD and chronic pain [45–48,69–70], including the mutual maintenance model [48] and the shared vulnerability model [70]. These two models suggest that PTSD and chronic pain are connected based on various cognitive, affective, physiological, and behavioral features underlying both disorders. These features include an individual's ability to tolerate symptoms of anxiety, avoidance of events that invoke thoughts and feelings related to the trauma or acute pain, and attentional bias towards cues associated with the trauma or pain. Our naturalistically collected data cannot determine the mechanisms underlying the pathology associated with this comorbidity, but these data do suggest that this is an important area of continued study. Basic empirical investigations of each of these dimensions have provided some support for these concepts [71–74] and continued investigation may help elucidate the mechanisms that maintain this comorbidity.

The treatment needs of individuals with PTSD and chronic pain must also be addressed, especially given that they are likely to use more healthcare services [75–77]. Thus, VA healthcare providers should be informed about the various effects of PTSD treatment on veterans. In our

study, veterans who reported pain in their physician visits prior to starting PTSD treatment had a reduction in pain following treatment. In patients with Pain/PTSD, reports of pain reduced from 4.93 (on a 0–10 scale) in the 4 months prior to treatment to 2.20 in the 4 months posttreatment for PTSD. Although chronic pain was not addressed in this treatment program, some treatment interventions overlap in cognitive-behavioral programs for PTSD and for chronic pain. Perhaps the reduction in general negative mood state that patients experienced with PTSD treatment also helped reduce their pain levels. Alternatively, the decrease in pain ratings may be due to the similarities in the therapeutic approach for these disorders. The intensive PTSD treatment program that these veterans completed used exposure therapy, cognitive restructuring, emotional processing, and relaxation. The purpose of these interventions was to decrease avoidant behaviors, to promote emotional regulation through changing maladaptive thought processes, and to develop positive strategies for coping with anxiety. The intensive PTSD treatment may have provided coping strategies (e.g., cognitive restructuring, relaxation) that the patients effectively generalized to manage their chronic pain complaints. However, given that these were observational data without appropriate control groups, drawing any conclusions is impossible, other than that further investigation of the treatment needs of veterans with pain and PTSD is needed.

This study has several limitations. First, we classified chronic pain status based on ICD-9 codes that are clearly associated with chronic pain complaints. Additional diagnoses (e.g., multiple sclerosis, cancer) could also be associated with pain but were only included in these analyses when an additional chronic pain diagnosis was associated with the problem area. Second, while we confirmed all diagnoses through chart review to ensure that the medical provider had intended the diagnosis (rather than having entered it in error), we conducted no independent evaluation to determine the chronic pain classification. Therefore, whether the data over- or under-represent the true prevalence of chronic pain in this sample is unknown. Third, because this was a naturalistic chart review study, no experimental control existed concerning the diagnostic assessments or the administration of PTSD treatment. Fourth, considering our lack of experimental control, medication changes for several patients could account for the reductions in pain intensity. This is particularly likely for the handful of individuals who were started on opiate medication. Fifth, the sample size was limited because of missing data. While these naturally collected pain ratings make the results of the study more generalizable, no experimental control of the pain ratings existed. Sixth, because the sample was composed of male veterans in a medical setting who completed an intensive group-based PTSD treatment program, we had no nontreatment PTSD control group from which to determine the prevalence of pain and changes in a nontreatment group of similar age. Thus, the generalizability of our findings is limited. A final limitation of the study is that the reduction in pain ratings for the Pain/PTSD group may be attributable to regression to the mean and unrelated to the treatment, a question that can only be addressed with controlled studies.

Further investigation of this interesting and frequent comorbidity of PTSD and chronic pain is needed. A trend is growing toward developing integrated treatments for PTSD and comorbid diagnoses, such as substance abuse [78] and smoking [79]. Although determining the cause of changes in pain ratings is not possible, especially given that no comparison data exist, this naturalistic examination suggests that changes in pain ratings over time are possible in this treatment-resistant population. While the improvements in pain that were noted using these naturally collected data, as well as the improvements noted in a previous study [63], are promising, this issue requires more carefully controlled exploration, as the findings from this study are not unequivocal. The interaction of pain and PTSD symptoms may provide a potential barrier to successful treatment of either disorder [45,47]. As research continues to explore the complex relationship between PTSD and chronic pain, a need will likely emerge for the development of a new intervention based on an integrated care model. This issue is timely because the injured veterans returning from Iraq (n = 17,869 confirmed by the Department of Defense in June 2006; http://icasualties.org/oif/) are at increased risk for both PTSD and chronic pain problems.

CONCLUSIONS

In a sample of treatment-seeking veterans with PTSD, a high rate of comorbid chronic pain diagnoses was found (66%), even with stringent diagnostic criteria for pain. Exploratory analyses with naturally collected data for these veterans showed a decline in pain ratings with PTSD treatment for those who reported pain prior to treatment. However, these data must be interpreted cautiously, as regression to the mean and other confounding

issues such as medication changes may explain the data. Our study suggests that treatment for veterans with comorbid pain and PTSD should be explored in a more controlled way.

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