A Cross-Sectional Analysis of Clinical Outcomes Following Chiropractic Care in Veterans With and Without Post-Traumatic Stress Disorder

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ABSTRACT This study was a cross-sectional analysis of clinical outcomes for 130 veteran patients with neck or low back complaints completing a course of care within the chiropractic clinic at the VA of Western New York in 2006. Multivariate analysis of variance (MANOVA) was utilized, comparing baseline and discharge scores for both the neck and low back regions and for those patients with and without post-traumatic stress disorder (PTSD). Patients with PTSD ($n = 21$) experienced significantly lower levels of score improvement than those without PTSD ($n = 119$) on self-reported outcome measures of neck and low back disability. These findings, coupled with the theorized relationships between PTSD and chronic pain, suggest that the success of conservative forms of management for veteran patients with musculoskeletal disorders may be limited by the presence of PTSD. Further research is warranted to examine the potential contributions of PTSD on chiropractic clinical outcomes with this unique patient population.

INTRODUCTION

A diagnosis of post-traumatic stress disorder (PTSD) can be conveyed when a person has been exposed to a traumatic event that could be perceived as threatening or that actually threatened the physical integrity of the individual or others, and his or her response involved fear, helplessness, or horror.[1] The person must also persistently re-experience the perception of the trauma and avoid reminders of the event while displaying symptoms of increased arousal (sleeplessness, irritability, outbursts) for at least 1 month, which disrupts their social, occupational, or other levels of functioning.[1] PTSD is reported to be an especially difficult clinical presentation to treat among veteran patients.[2] The prevalence of PTSD among veteran patients has been estimated to be between 11.5% and 24.5% over a series of studies utilizing interview and survey methods.[3–6] Among Vietnam veterans, the estimated prevalence of PTSD is as high as 30%.[7]

A recent study of patients following accidental major trauma demonstrated that persistent back pain was significantly associated with PTSD.[8] This highlights psychosocial rather than physical predictive factors for persistent back pain following trauma.[8] Patients with PTSD have demonstrated elevated rates of physical health problems including musculoskeletal (MSK) disorders.[9] While chronic pain is one of the most commonly experienced symptoms among patients with PTSD, research into the influence of PTSD on pain management outcomes is limited.[10] In a recent study by Shipherd et al.,[11] 66% of a treatment-seeking sample of veterans with PTSD had a chronic pain diagnosis at pretreatment. Patients with high levels of pretreatment pain reported reductions in pain over the course of a 16-week PTSD treatment program based on the cognitive-behavioral model that emphasized exposure therapy. The findings lend support to the theory that PTSD and chronic pain are mutually maintaining conditions by demonstrating a reduction in the experience of chronic pain with effective PTSD management.[12]

The presence of severe comorbidities or psychosocial factors has been associated with a decreased likelihood of obtaining positive clinical outcomes with conservative forms of management, including spinal manipulative therapy (SMT), for chronic low back pain.[13] Similarly, among the general population, poor psychological health is a risk factor for neck pain with several psychosocial factors being prognostic factors for clinical outcomes related to treating neck pain.[14,15] Veteran ambulatory patients have been shown to have more than twice the illness burden than non-VA ambulatory patients[16] and may respond differently than the general population to chiropractic management for neck or low back pain. The reported interactions between PTSD and chronic pain suggest that the success of conservative forms of management for veteran patients with musculoskeletal disorders may be limited by the presence of PTSD.

The purpose of this retrospective study was to evaluate clinical outcomes for a sample of veteran patients who were treated with chiropractic care for neck or low back pain at the VA of Western New York in 2006. A diagnosis of PTSD was found in 16% of the sample of veteran patients. To evaluate the potential influence of PTSD on the effectiveness of chiropractic interventions in the treatment of neck and low back pain, analysis of clinical outcomes was carried out for the subgroups of veteran patients with and without PTSD.

METHODS

Participants

The VA of Western New York Research and Development Committee reviewed and approved this study. This study was

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a retrospective chart review of a subset of the 354 completed chiropractic consultations during 2006, which served as the first calendar year of full-time clinic operation within the medical center. Data were collected from the VA Computerized Patient Record System (CPRS) from the date of the completed chiropractic consult including region of complaint, patient age, body mass index (BMI), service-connected (SC) disability percentage, MSK SC disability percentage, baseline and discharge scores on outcome measures, number of treatments, and diagnosis of PTSD. Categories of BMI from the Centers for Disease Control were utilized.[17]

Inclusion criteria for evaluation of clinical outcomes included patients with a completed chiropractic consultation during 2006 for complaints involving either the neck or the low back region. The use of a convenience sampling technique of records from 2006 generated an adequate sample size to address the purpose of this observational study. Clinical outcomes were assessed for the sample of veteran patients (n = 130) with completed baseline and discharge measures. For patients with both neck and low back complaints, outcomes were considered only for the region of chief complaint. Patients were excluded if baseline and at least one follow-up measure of outcomes were not completed. Patients were also excluded if management was for MSK complaints not related to the neck or low back, as the outcome measure instruments were region-specific.

Treatment Interventions

For the purpose of this study, chiropractic care was defined as a pragmatic approach to patient care consisting of one or more of the following: spinal manipulative therapy (SMT), spinal mobilization (without the high-velocity, low-amplitude thrust associated with SMT), flexion/distraction (F/D), and myofascial release therapy. Treatment was delivered by a single doctor of chiropractic along with supervised chiropractic students as part of their clinical training within this academically affiliated clinic. For the patients with completed baseline and discharge scores and a minimum of 4 treatments (n = 130), the mean number of treatments was 9.04 ± 4.19 (95% CI: 8.32–9.77). The typical treatment frequency included 2 treatments per week with a re-evaluation and review of updated outcome measures after every fourth treatment or earlier as indicated.

Measures

Clinical outcomes were measured as changes in scores on self-reported disability questionnaire instruments that included the Revised Oswestry Low Back Pain Disability Questionnaire (RODQ) and the Neck Disability Index (NDI).[18,19] The Oswestry Disability Index (ODI) was originally designed by Fairbanks et al.[20] in 1980 and was revised by Hudson-Cook et al.[18] in 1989. The NDI was designed by modifying the ODI and is commonly used for complaints related to the cervical spine.[19] The scoring and interpretation of the RODQ and the NDI are analogous with scores ranging from 0% to 100% as follows: 0% to 20% (minimal disability), 21% to 40% (moderate disability), 41% to 60% (severe disability), 61% to 80% (crippled), and 81% to 100% (bed-bound or exaggerating symptoms).[20,21] The primary outcome measure was the score improvement from baseline to discharge with either the RODQ or the NDI for each patient.

Although the minimally clinically important difference (MCID) for the RODQ and the NDI has not been established for this specific patient population when undergoing chiropractic care, Ostelo and de Vet[22] considered a 10-point change to be the MCID on the ODI. According to Ostelo and de Vet,[22] MCID should be determined by taking into account the initial disability scores and the characteristics of the target population. Fairbanks and Pynsent summarized published studies measuring the ODI before and after treatment and found differences based upon subgroups of patient presentations.[21] On the basis of comparable design and interpretation of RODQ and NDI, MCID was estimated to be 10 points within the present study for both instruments.

Data Analysis

Descriptive statistics including mean (M), standard deviation (SD), and 95% CI were calculated. Using multivariate analysis of variance (MANOVA), comparisons of baseline

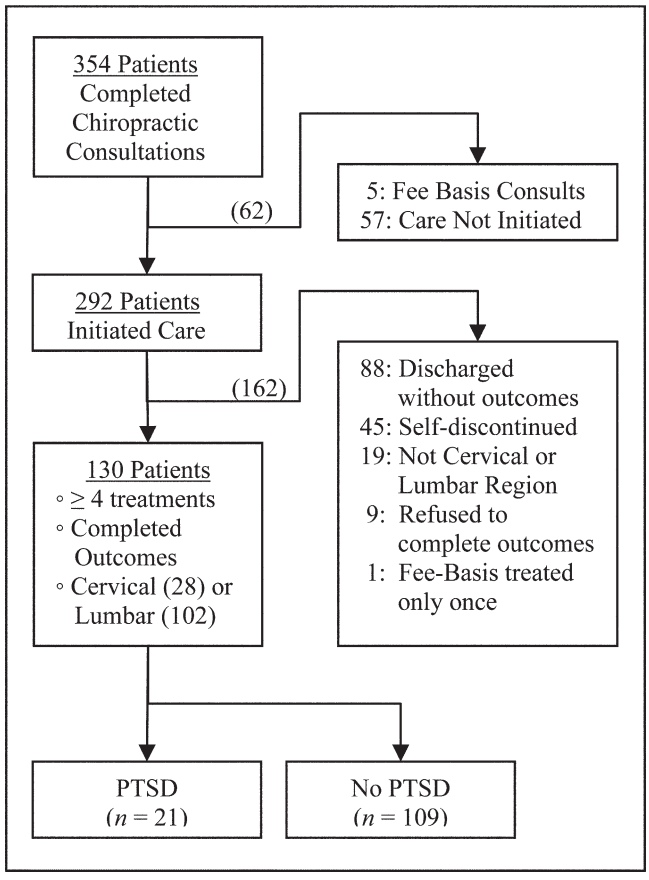

FIGURE 1. Summary of patient flow within this study.

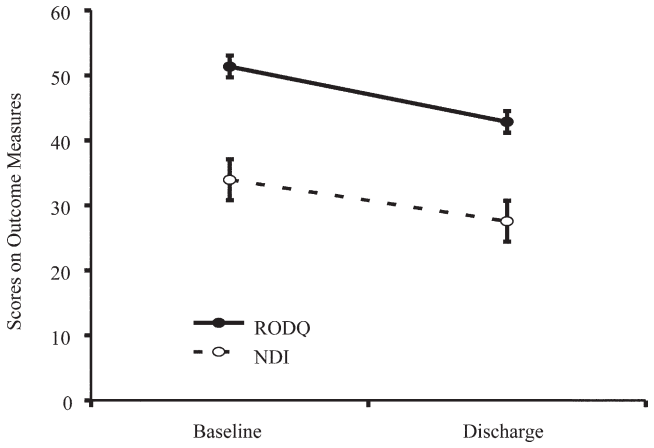

FIGURE 2. Comparison of score improvement between baseline and discharge for the RODQ (low back) and the NDI (neck).

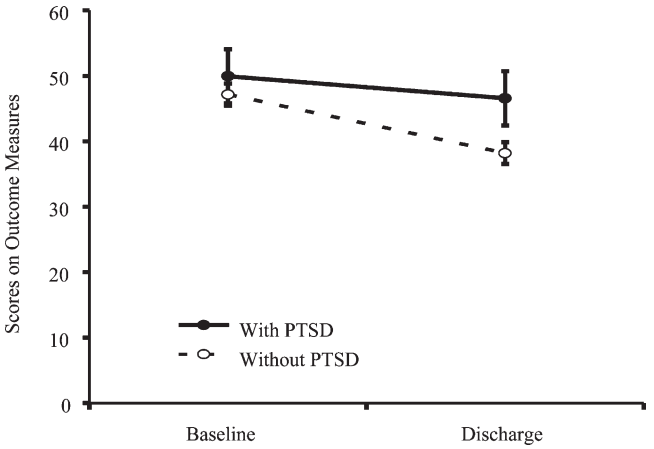

FIGURE 3. Comparison of score improvement between baseline and discharge for patients with PTSD and without PTSD.

TABLE I. Clinical Outcomes for the Sample (n = 130) of Veteran Patients

	Combined NDI and RODQ, n = 130		NDI (Neck) Only, n = 28		RODQ (Low back) Only, n = 102	
Characteristic	M (SD)	95% CI	M (SD)	95% CI	M (SD)	95% CI
Baseline Score	47.61 (16.59)	44.73–50.49	33.93 (16.74)	27.44–40.42	51.38 (14.51)	48.51–54.21
Discharge Score	39.56 (17.97)	36.44–42.68	27.55 (16.69)	21.08–34.02	42.85 (16.95)	39.52–46.18
Score Improvement	8.05 (10.47)	6.24–9.86	6.38 (11.30)	2–10.76	8.51 (10.24)	6.5–10.52
Percentage Improvement	17.7 (27.13)	13–22.4	17.85 (39.52)	2.53–33.17	17.66 (22.86)	13.17–22.15

and discharge scores were performed for the neck and low back regions and for those patients with and without PTSD. Following MANOVA, paired t tests were utilized, comparing mean score improvements for the subgroups of patients with and without PTSD. Analyses of potential demographic differences between those patients with and without PTSD were carried out using t tests. The Bonferroni correction was applied to the subgroup analysis of mean score improvement to maintain the familywise error rate at 0.05, yielding a two-tailed significance level of 0.025. Analyses were performed using JMP 5.1 (SAS Institute, Cary, North Carolina).

RESULTS

Description of Study Records

Completed outcome measures with a minimum of four treatments for neck or low back complaints were obtained for 130 (36.72%) of the 354 completed chiropractic consults. (Fig. 1) Attempts were made to ascertain the reasons for incomplete data collection in instances where cervical or lumbar spine complaints did not have completed outcome measures available for analysis. The regions of chief complaint associated with the patients with completed outcome measures were 28 (21.45%) neck and 102 (78.46%) low back.

Outcome Measures

MANOVA revealed a statistically significant difference between the mean baseline and discharge scores for the sample ($F_{1,127}$ = 17.8, $p < 0.0001$). There was no significant interaction between baseline and discharge scores for NDI and RODQ ($F_{1,127}$ = 0.64, $p < 0.42$). While the baseline and discharge scores for the RODQ were significantly higher than those for the NDI ($F_{1,127}$ = 27.78, $p < 0.0001$), score improvement trends across the two groups appeared similar (Fig. 2). Comparing the mean score improvement and percentage of improvement for the NDI and RODQ revealed no significant differences in improvement between those regions, lending support to their combined consideration within this study (Table I).

There was a significant interaction between baseline and discharge scores for those with PTSD and those without PTSD ($F_{1,127}$ = 4.83, $p < 0.030$). Examination of Figure 3 allows for further interpretation of the nature of that interaction. Analysis revealed that patients with PTSD did not experience a statistically significant score improvement (3.38 ± 10.81 points; t = 1.43, p = 0.16) while patients without PTSD did experience a statistically significant score improvement (8.95 ± 10.21 points, t = 9.15, $p < 0.001$) (Table II). There were no statistically significant demographic differences between veteran patients with PTSD and without PTSD except for a higher percentage of SC disability in veteran patients with PTSD (t = 3.56, $p < 0.001$) (Table III).

DISCUSSION

The mean score improvement for the sample (n = 130) of 8.05 ± 10.47 points approached the estimated MCID for the

TABLE II. Clinical Outcomes for Veteran Patients with PTSD and without PTSD

	With PTSD, $n = 21$		Without PTSD, $n = 109$	
Characteristic	*M* (SD)	95% CI	*M* (SD)	95% CI
Baseline Score	49.95 (17.56)	41.96–57.94	47.16 (16.44)	44.04–50.28
Discharge Score	46.57 (18.99)	37.93–55.21	38.20 (17.54)	34.87–41.53
Score Improvement	3.38 (10.81)	−1.54–8.30	8.95 (10.21)	7.01–10.89
Percentage Improvement	4.95% (27.67)	−7.64–17.54	20.16% (26.45)	15.14–25.18

TABLE III. Demographic Comparison of Veteran Patients with PTSD and without PTSD

	With PTSD, $n = 21$		Without PTSD, $n = 109$		
Characteristic	*M* (SD)	95%CI	*M* (SD)	95%CI	*p*
Age	50.05 (11.76)	44.70–55.40	56.64 (16.32)	53.54–59.74	0.080
BMI (kg/m^2)	29.79 (3.94)	28.00–31.58	29.63 (6.23)	28.45–30.81	0.909
% SC disability	48.10 (37.63)	30.97–65.23	22.30 (28.86)	16.82–27.78	<0.001[a]
% MSK SC disability	13.33 (23.09)	2.82–23.84	15.69 (25.40)	10.87–20.51	0.694
Number of treatments	8.62 (4.33)	6.65–10.59	9.13 (4.19)	8.33–9.93	0.613

[a]Statistically significant results of *t* test.

utilized instruments of 10 points with 46.92% of patients reporting a score improvement of 10 points or greater. The concept of MCID was introduced by Jaeschke, Singer, and Guyat[23] in 1989 and the definition has evolved since that time. MCID is considered to be a threshold value of important improvement for an outcome measure.[24] According to Copay et al.,[25] the purpose of MCID is to separate statistical significance from clinical importance and to enhance the interpretability of scores in outcomes research. Patients whose reported outcomes reach or exceed MCID are considered "responders" and the proportion of responders to total patients for a specific treatment provides clinicians with an indication of the potential response of additional patients to that treatment approach.[25]

Ostelo et al.[26] suggest that proposed values for MCID can and should be modified as appropriate. MCID has not yet been established for chiropractic care, including SMT, using these region-specific outcome measures for the veteran patient population. The authors suggest that the complex health status of veteran patients, the negligible cost of care for eligible veterans, and the low level of risk of conservative management with SMT[13,27] collectively lower the threshold for MCID within this patient population.

Similar to patients in the general population with severe psychosocial factors,[13–15] this sample of veteran patients with PTSD had less positive clinical outcomes than those without PTSD with chiropractic care for neck or low back complaints. SMT is a commonly employed conservative treatment approach in the chiropractic management of patients with neck and low back pain. Randomized clinical trials (RCTs) of high methodological quality provide moderate evidence of short-term efficacy for SMT in the treatment of acute low back pain, as well as SMT combined with mobilization for chronic low back pain.[28] Management of chronic low back pain with SMT and spinal mobilization is at least as effective as other efficacious and commonly used interventions.[13] Rigorous RCTs are lacking with respect to efficacy of SMT for mechanical neck pain,[29–31] despite having moderate evidence-based support for its implementation in this population.[32–35] Additional quality research endeavors using RCTs are needed to further address the efficacy of SMT.

The results of this study should be interpreted with caution on the basis of its small sample size, retrospective design, and incomplete data capture. Retrospective data extraction from the CPRS, including the diagnosis of PTSD from the problem list, represents an inherent limitation as it is dependent upon the comprehensiveness of diagnosis and coding among entering providers. It is unknown if the identified prevalence of PTSD represents the true prevalence of PTSD within this sample. The pragmatic approach to chiropractic management utilized disallowed for comparison between individual treatment approaches and specific clinical interventions. Treatments within this academic affiliation were provided in part by supervised chiropractic students so outcomes represent the combined efforts of the staff doctor of chiropractic and numerous student trainees.

Data regarding treatment duration were not extracted from the clinical records and variations in the time to complete courses of care may have influenced clinical outcomes. The authors acknowledge that the RODQ utilized within this study was a version of the original ODI that allowed for a measurement of changing symptoms but may limit direct comparison with published findings that utilized the original ODI.[21] The findings are representative only of this sample and serve as the stimulus for further study of conservative approaches to pain management in veteran patients.

Suggestions for additional research include rigorous prospective investigations of chiropractic care for patients with co-occurring chronic pain and PTSD that considers the duration of PTSD diagnosis, the severity of PTSD symptoms, and

concomitant PTSD management approaches. A larger sample size and strict treatment frequency and duration may yield a more comprehensive data set and adequately power analyses of the potential influences of other veteran-specific variables on clinical outcomes. Further research into MCID for chiropractic management of veteran patients using these or comparable instruments would be of value in refining evidence-based practice guidelines. Future studies could consider other forms of mental illness including depression, measures of active pharmacy, and measures of comorbidity as this study did not control for these variables. In an observational study of patients undergoing spinal surgery, Slover et al.[36] identified the negative impact of medical and psychosocial comorbidity on change scores, including the SF-36 and ODI, highlighting the need for clinicians and researchers to consider comorbidity when using and interpreting health survey instruments. Improved understanding of the relationships between specific comorbid conditions such as PTSD and clinical outcomes contributes to appropriateness criteria for treatment selection within this patient population.[36]

The VA serves as an ideal setting for refining evidence-based practices for patients with complex chronic diseases.[37] Due to the various health disparities of veteran patients relative to the general population, their responsiveness to chiropractic management may differ. Within this study, chiropractic management of neck or back complaints resulted in only 5% improvement for veteran patients with PTSD compared to 20% for veteran patients without PTSD. The prevalence of PTSD among military veterans and the concept of mutual maintenance of PTSD and chronic pain support the need for additional research into pain management approaches for veteran patients with concurrent PTSD and MSK disorders. A greater understanding of the influence of PTSD on the effectiveness of conservative forms of pain management can help to guide the clinical decision-making process and assist in the appropriate triaging of veteran patients along available treatment options to optimize clinical outcomes for this unique patient population.

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