Opioid Cessation and Multidimensional Outcomes After Interdisciplinary Chronic Pain Treatment

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Objectives: Although the efficacy of interdisciplinary treatment for chronic noncancer pain has been well-established in the literature, there is limited research examining interdisciplinary programs that require opioid cessation. As the long-term use of opioid analgesics remains controversial, further investigation is warranted. The aim of this study was to evaluate the associations between opioid cessation and subsequent multidomain treatment outcomes among veterans admitted to a pain rehabilitation program at a large Veterans Affairs tertiary care hospital in the southeastern United States.

Methods: A retrospective design examined the medical records of 705 consecutive admissions comparing those using opioids at admission with those who were not. Participants taking opioids agreed to taper off of these medications using a "pain cocktail" approach; otherwise patients received identical treatment. Outcome measures were administered at program admission and discharge.

Results: Repeated measures analyses were used to compare responses across time. Those who completed the program (n = 600) demonstrated improvement in all outcome measures from admission to discharge, and the opioid group improved as much or more than the nonopioid group on all measures despite opioid cessation during treatment.

Discussion: Results indicated that both groups experienced significant improvement on outcome measures, and that opioid analgesic use at admission had no discernible impact on treatment outcome in this large sample of veterans with moderate to severe chronic pain syndrome. The clinical implications of these findings for long-term chronic pain treatment, in light of the risks associated with opioid analgesics, are discussed.

Key Words: chronic pain, interdisciplinary pain treatment, opioid cessation, opioid therapy, treatment outcomes

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A 2011 report by the Institute of Medicine estimates that 116 million people in the United States, over a third of the adult population, experience chronic noncancer pain (CNP).[1] The use of opioid analgesic medications for the treatment of CNP has increased in recent decades.[2–4] Although opioids are often considered a mainstay for pain management, their use on a chronic basis is the subject of considerable debate given the lack of evidence for long-term efficacy in the literature, as well as the numerous documented adverse effects.[5] A review of randomized controlled trials (RCTs) for CNP reveals that the duration of trials was generally brief (4 to 16 wks), and although pain reduction may have been achieved, functional improvement was not.[6–10] In addition, other methodological issues such as stringent inclusionary criteria and high dropout rates often hinder the generalizability of these results.

The potential dangers of opioid therapy, particularly with the marked increase in opioid prescriptions and opioid-related mortality in the last 20 years, have been a cause for growing concern.[11,12] Of the more than 300 million prescriptions written for analgesics last year, 128 million were for hydrocodone/acetaminophen, making it the most prescribed drug in the United States in 2010.[13] In addition, the number of unintentional opioid-related overdose deaths increased 124% between 1999 and 2007.[14] Furthermore, long-term use of opioids also may be associated with opioid tolerance and the concomitant need for dose escalation, as well as the development of opioid-induced abnormal pain sensitivity, or hyperalgesia.[15] More recently, concerns have developed concerning possible links between daily opioid use and the development of central sleep apnea.[16–18] Along with the potentially harmful effects of these analgesics, many of the most commonly reported side effects such as constipation, nausea, and sedation represent issues that patients and their families frequently report as causing the most interference in their day-to-day lives.[19]

As concerns associated with sustained opioid analgesic use continue to build, alternative empirically supported approaches for treating or managing chronic pain should be considered more seriously. Interdisciplinary pain programs (IPPs) represent one of the best alternatives. IPPs have been found to improve functional status, reduce opioid analgesic medication use, improve psychologic well-being, and reduce pain severity.[6,20–23] A meta-analytic review of 65 studies that evaluated the efficacy of multidisciplinary treatment for chronic back pain demonstrated that treatment was efficacious overall, and that at long-term follow-up those treated in a multidisciplinary setting were functioning 75% better than their counterparts who were either untreated or treated by conventional, unimodal approaches.[22] A recent review of 27 RCTs examining the effectiveness of multidisciplinary treatment for CNP concluded that compared with no treatment, standard treatment, or nonmultidisciplinary treatment, strong evidence of greater effectiveness was shown.[23] In addition, gains made in IPPs are long lasting, with empirical evidence demonstrating benefits remaining for as long as 13 years.[24]

Although the advantages of IPPs have been strongly demonstrated in the literature, there is little research on the impact of opioid cessation on IPP treatment and outcomes. An original study and 6-month follow-up conducted by the pain rehabilitation program at the Mayo Clinic examined IPP treatment outcomes after opioid analgesic cessation.[25,26]

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They found that patients on opioid analgesics at admission reported higher levels of pain and depression relative to those not taking opioids, but there were no differences in the outcomes at discharge or at 6-month follow-up. This single study provides evidence of a significant and sustained improvement in pain severity and functioning regardless of previous opioid status.[25–27] Although the Mayo study provides support for opioid cessation through IPPs, there are reasons why the issue warrants further investigation. First, the participants in the only previous study were largely white (96%) females (74.2%).[25] This limitation does not allow for generalizability to the population at large, as neither men nor minorities are adequately represented. In addition, the top 3 primary pain locations reported in the Mayo study (fibromyalgia: 23.9%; low back: 21.6%; headache: 10.7%)[25] were significantly different from not only the current sample but also from the percentages represented in the US population in general, likely accounted for by the disproportionate amount of women in the sample. The current study sought to address these limitations and add to the small but growing body of literature investigating the role of opioid analgesic cessation in those with longstanding chronic pain. Given the widespread problem of CNP, the demonstrated effectiveness of IPPs as a treatment modality, and the potential dangers of long-term opioid use, further examination and understanding of appropriate treatments to help manage this growing epidemic is needed.

To address this issue we examined the multidomain treatment outcomes of 2 groups of individuals with CNP who participated in an inpatient, IPP: those taking daily opioid analgesics and those not taking daily opioid analgesics at admission. As part of the standard treatment protocol, participants who were using opioids for pain control at program admission were tapered off of these medications using a pain cocktail approach[28,29]; otherwise, the rehabilitation treatment received by the 2 groups was identical. Consistent with our clinical experience, we hypothesized that individuals who were tapered off of opioid analgesics during treatment would exhibit equivalent or enhanced treatment-related improvements when compared with those who were not taking opioids at admission.

MATERIALS AND METHODS

Sample

Eligible candidates for this study were 705 veterans or active duty service members with CNP who were admitted to the Chronic Pain Rehabilitation Program (CPRP) between July 2006 and March 2011. The CPRP is a 3-week, inpatient, IPP at a large southeastern Veterans Affairs (VA) tertiary care hospital available to veterans and active duty service members nationwide. Those interested in participating in the CPRP are evaluated for medical and psychiatric stability, as well as the presence of chronic pain syndrome (CPS). CPS, ICD-9-CM code 338.4,[30] is defined as chronic pain with significant psychosocial dysfunction. It is characterized by unsuccessful pain relief through conventional medical treatments, functional impairment in most domains of life, and negative emotional factors related to pain such as depression, anxiety, and irritability. Because of the complex nature of CPS, a biopsychosocial approach to treatment through IPPs has proven to be most effective.[21–24] After screening evaluation by medical and psychology staff, individuals who had CPS and wished to participate in the CPRP were excluded only if their current medical or psychiatric status precluded them from full engagement and maximum benefit. The most typical medical reasons for exclusion were the need for further evaluation by cardiology, neurosurgery, or pulmonology in order to determine fitness for the program's physical activities. Common barriers to psychologic clearance were psychiatric hospitalization or active illicit substance abuse within the last 90 days. Those who were excluded from admission but still wanted to participate in the program were provided with clinical treatment recommendations and rescreened for clearance at a future date.

Of those admitted during this period, 105 did not complete the program due to early discharge. Noncompleters were divided into 2 categories: (1) those whose treatment was terminated early due to medical reasons or family emergencies (n = 27) and (2) those who were discharged early due to noncompliance (n = 78). Comparisons of demographic variables between the noncompliance group and program completers yielded a single significant difference in education ($\chi^2 = 5.43$, $P < 0.05$), with noncompliers having slightly less years of education ($M = 13.14$) than program completers ($M = 13.84$). With respect to opioid analgesic use, more noncompliance group members (54.5%) were using opioids at the time of program admission than were program completers (36.8%; ($\chi^2 = 9.01$, $P < 0.01$)). However, there were no significant differences between groups in admission pain levels or on any of the outcome measures.

Patients were categorized into 2 groups based on their opioid use status at the time of admission. Those who were using opioid analgesics before admission, typically reflecting daily, sustained use, and required tapering from opioids, were assigned to the opioid (OP; n = 221) group; those who were not using opioid analgesics before admission and/or did not require any taper were placed in the nonopioid (NOP; n = 379) group. Members of the OP group reported that they received moderate pain relief from their opioid analgesics at the time of admission ($M = 5.24$ on a 0 to 10 relief scale).

Demographic and clinical data are provided in Table 1. At the time of admission no significant differences were identified between the OP and NOP groups regarding sex, marital status, age, education, primary pain site, or pain duration. However, analyses showed a significant difference in ethnicity ($\chi^2 = 7.17$, $P < 0.05$) and employment status ($\chi^2 = 6.14$, $P < 0.05$) indicating that there were significantly more whites and employed participants in the OP group. The majority of participants were men and reported their employment status as "disabled or retired." Back pain, extremity pain, and neck pain were the 3 most frequently reported primary pain sites. Study participants were individuals who had experienced CNP for many years ($M = 12.96$ y) and met the criteria for CPS.

Procedures

Outcomes

Outcome measures reported in this study were administered to and completed by all participants within the first 2 days of admission to the CPRP and readministered and completed within 2 days of discharge from the program. Questionnaires measured pain severity, treatment outcomes across the major pain-related domains of functioning, pain-coping strategies, catastrophizing, sleep, and satisfaction with treatment. Data were retrospectively extracted from

TABLE 1. Demographic Variables for Opioid (OP) and Nonopioid (NOP) Groups

Variables	OP (n = 221)	NOP (n = 339)
Age	M = 49.08, SD = 10.97	M = 50.74, SD = 11.07
Sex (%)		
Male	82.4	78.1
Female	17.6	21.9
Ethnicity* (%)		
White	66.1	57.3
African American	18.1	27.7
Hispanic	9.5	10.6
Other	6.4	4.5
Education	M = 13.86, SD = 2.45	M = 13.82, SD = 2.49
Marital status (%)		
Married	55.2	49.3
Never married	12.2	10.6
Divorced or separated	28.1	34.3
Cohabitating but not married	2.7	4.2
Widowed	1.8	1.6
Employment* (%)		
Full time	13.6	11.6
Part time	4.1	2.6
Unemployed	7.3	13.7
Disabled or retired	75.1	72.0
Primary pain site (%)		
Back	60.2	53.6
Extremity	15.4	15.0
Neck	10.0	12.1
Head	6.3	8.2
Other	8.1	11.1
Pain duration	M = 12.69, SD = 10.45	M = 13.23, SD = 11.11

*$P < 0.05$.

patients' electronic medical records. This study was reviewed and approved by the VA Research and Development Committee and by the local Institutional Review Board.

Medication

The authors of this study reviewed each patient's medication records for the period in which they participated in the CPRP to confirm opioid use status at admission and to extract a taper dose for those in the OP group. For all the OP group members, an initial daily opioid dosing was calculated from the medication logs based on the highest opioid taper dose dispensed in the first 3 days of the program. This dose was converted to a morphine equivalent dose (MED) for comparison purposes using established methods.[31] The MED range for the 221 individuals in the OP group was 8 to 360 mg daily with a mean of 61.14 mg (M = 61.14; SD = 61.17). Discharge medications targeting pain symptoms upon discharge, including analgesic and adjuvant pain medications, were assessed for all patients using discharge medication orders. Discharge medications for pain were categorized based either on medication type or purpose using the following classes: nonsteroidal anti-inflammatories (NSAIDs) and/or acetaminophen (APAP); tricyclic antidepressants; other antidepressants; topical creams; anticonvulsants; anxiolytics; muscle relaxants; sleep medications; and medications typically used in the treatment of headaches.

Measures

Pain Numeric Rating Scale (NRS)

Pain intensity was assessed using an 11-point pain NRS to measure "usual" (average) pain intensity over the last week. NRS scales are reliable and valid methods for assessing pain intensity.[32] The NRS was anchored with the phrases "no pain" (0) and "worst pain imaginable" (10) and the "usual" scale has been found to be one of the best measures of pain intensity when compared with alternatives such as "current pain" or "worst pain."[28] The NRS was administered at admission and immediately before discharge. At admission, individuals using opioid analgesics also rated the amount of pain relief they attributed to opioid analgesic medications using a 0 (no relief) to 10 (complete relief) scale.

Pain Outcomes Questionnaire-VA (POQ-VA)

The POQ-VA[33] is a multidomain pain assessment instrument developed and validated specifically for veterans. The POQ-VA assesses treatment outcomes across the major pain-related domains of functioning identified by the Rehabilitation Accreditation Commission (2002) as essential for comprehensive outcome measurement.[33] POQ-VA scales include average pain intensity (pain NRS), interference in activities of daily living (ADL) and mobility (MOB), negative affect (NA), vitality (VIT), and pain-related fear (Fear). The POQ-VA scales have been shown to have high internal reliability and good stability,[34] strong generalizability, and good discriminant and concurrent validity, and they have demonstrated sensitivity to treatment-related change.[33,35] The POQ also contains an experimental scale that was developed as a measure of highly improbable pain-related symptoms (the Symptom Implausibility Scale; SIS). The SIS consists of 10 items describing a range of unusual pain symptoms or complaints. The POQ-VA was administered at admission and immediately before discharge.

Chronic Pain Coping Inventory (CPCI)

The CPCI is a 64-item measure that was designed to assess 8 theoretically derived pain-coping subscales.[36] Research has demonstrated that the CPCI is both reliable and valid.[36–38] Pain-related coping skills were assessed using 4 subscales from the CPCI: Guarding, Relaxation, Rest, Task Persistence (Task Persist). Each of the CPCI subscales used in this study has been shown to have good internal consistency (range, 0.74 to 0.85), and test-retest reliability has exceeded 0.70.[37] The 4 CPCI scales were administered both at admission and discharge.

Coping Strategies Questionnaire (CSQ)

The CSQ[39] is a 48-item measure of cognitive and behavioral coping strategies used in the presence of pain. The internal consistency of the original subscales of the CSQ has been demonstrated with chronic pain patients, and the test-retest reliability of the items has also been shown to be adequate.[40] The current study used the 6-item Catastrophizing (CAT) subscale from the revised 26-item CSQ.[41] This scale has adequate internal consistency (0.72) and has been shown to negatively correlate with measures of activity.[41] Catastrophizing also has been positively correlated with depressive symptomatology,[42,43] negative affectivity,[44] exaggerated emotional response to aversive stimuli,[45,46] and expectation of pain and psychologic distress.[47] The CSQ-CAT subscale

was administered after admission and immediately before discharge.

Sleep Problems Questionnaire (SPQ)

The SPQ[48] is a 4-item measure of the most typical symptoms of poor sleep in both healthy and distressed populations. Responses are based on the number of days during the week that each sleep symptom occurs, and these 0 to 7 item scores are summed for an overall sleep symptom measure. The scale has good internal consistency and validity.[48] Overall sleep quality was also assessed using a single overall sleep rating based on a 0 to 10 scale with 0 indicating the "best sleep ever" and 10 representing the "worst sleep ever." The SPQ was administered at admission and again at discharge.

Treatment Satisfaction

Two items were administered after treatment completion to assess satisfaction with treatment using 0 to10 point scales. The first asked how satisfied participants were with the overall treatment received (0 = "not satisfied" to 10 = "completely satisfied"), whereas the second assessed whether graduates would recommend the program to others (0 = "not recommended" to 10 = "highly recommended").

Treatment Intervention

The CPRP is an intensive 3-week, residential, IPP with a rehabilitation philosophy that seeks to assist those with CNP by teaching self-managed skills that will improve quality of life and overall functioning. Patients who participate in the CPRP often have had little pain relief from various pharmacologic trials, interventional and surgical procedures, physical therapy, or complementary or alternative medicine approaches, and exhibit symptoms consistent with CPS. The CPRP targets the physical and emotional effects of pain, and focuses on active treatment modalities that include graduated physical therapy, aquatic therapy, daily paced walking, relaxation techniques, daily exercise sessions, occupational therapy, recreational therapy, individual psychotherapy, educational classes, and family interventions as appropriate. A cognitive-behavioral model serves as the basis of treatment. Treatment in the CPRP provides at least 6 h/d of supervised therapeutic programming during 15 consecutive workdays, coupled with an additional 2 to 3 hours of daily, independent, goal-directed assignments, and recreational and social assignments. Weekend treatment includes recreational and social activities as well as twice-daily exercise, walking, and relaxation sessions.

Effective medication management is an important program goal, and includes cessation of all opioids. Individuals using daily opioid analgesics at admission are provided with a gradual opioid taper using hydromorphone diluted in a constant amount of artificially sweetened fruit drink (a "pain cocktail").[27,28] Hydromorphone quantities are reduced over time utilizing close medical staff monitoring. Any reported or observed discomfort from the opioid reductions is addressed by time-limited prescriptions for supporting medications or by adjusting hydromorphone levels when necessary. Almost all CPRP participants who are taking daily opioids before treatment complete their taper within 7 days of admission. For all program completers, benzodiazepines or other centrally acting muscle relaxants also were discontinued during treatment except in cases where they were continued as an appropriate treatment for a severe anxiety disorder. The use of other nonopioid analgesics was reviewed at admission and adjusted throughout treatment. Those medications that were not deemed effective were discontinued, whereas trials of other adjuvant medications were initiated when indicated. Obtaining a Urine Drug Screen (UDS) at various times throughout treatment ensured compliance with the prescribed medication regimen. Patients from both the OP and NOP group submitted a UDS at admission, discharge, periodically during treatment, and whenever a pass was granted to leave the facility. Questionable UDS results were addressed immediately with the pain pharmacist or another pain team provider to determine the basis of the discrepancy and take any necessary action as appropriate. Pain-related medications prescribed at discharge reflected the most efficacious combination of agents as determined by pain providers during participants' CPRP care.

Statistical Analysis

The *t* tests and χ^2 analyses were used to compare the OP and NOP groups on demographic and descriptive variables. The Pearson product-moment correlations were computed to examine relationships between opioid taper doses and admission and discharge pain scores. One-way analyses of variance (ANOVA) were conducted to examine differences in satisfaction and program recommendation ratings between the OP and the NOP groups after treatment, and to examine differences in discharge medications. Repeated measures ANOVAs were used to compare changes in outcome measures from admission to discharge for the 2 groups.

RESULTS

A series of mixed model repeated measures ANOVAs were conducted to evaluate changes in outcome measures from admission to discharge. In each analysis, group (OP and NOP) served as the between factor, whereas time (admission and discharge) served as the within factor. Admission and discharge means and SDs for all outcomes variables are presented in Table 2.

Outcomes

Pain NRS

Examination of pain NRS scores for the 2 groups revealed a significant main effect for time Wilks $\lambda = 0.85$, $F_{1,598} = 104.75$, $P < 0.001$, $\eta^2 = 0.15$, but no significant group effect or interaction. Examination of the associated NRS means indicated that OP and NOP participants reported similar pain intensity at admission and that both groups demonstrated significant reductions in pain intensity from admission to discharge.

POQ-VA Scales

A repeated measures ANOVA of POQ-VA ADL scores revealed significant main effects for group, $F_{1,598} = 4.94$, $P = 0.027$, $\eta^2 = 0.01$, and time, Wilks $\lambda = 0.97$, $F_{1,598} = 18.91$, $P < 0.001$, $\eta^2 = 0.031$. A review of associated ADL mean scores indicated that the group main effect was due to those in the OP group reporting more impairment than NOP patients, whereas the time effect reflected improvement by both groups after treatment. There was also a significant group × time interaction, Wilks $\lambda = 0.99$, $F_{1,598} = 5.85$, $P = 0.016$, $\eta^2 = 0.01$. Examination of Figure 1, which depicts the interaction, reveals that the interaction was due to OP patients reporting more ADL impairment than NOP patients at admission, but not at

TABLE 2. Means, SDs, and Repeated Measures ANOVA of Outcomes Variables for Opioid (OP) and Nonopioid (NOP) Groups

Outcome Variables	OP (n = 221) Mean (SD)	NOP (n = 379) Mean (SD)	Group Effect	Time Effect	Group × Time Effect
Pain intensity					
Admission	7.01 (1.77)	6.91 (1.58)	0.1	< 0.001	0.11
Discharge	6.46 (1.74)	6.14 (1.79)			
POQ-ADL					
Admission	16.12 (11.92)	13.27 (10.91)	0.027	< 0.001	0.016
Discharge	13.25 (11.67)	12.31 (10.39)			
POQ-MOB					
Admission	26.97 (9.90)	25.20 (9.65)	0.029	< 0.001	0.9
Discharge	23.45 (11.01)	21.76 (10.41)			
POQ-NA					
Admission	30.29 (10.76)	27.95 (11.26)	0.013	< 0.001	0.28
Discharge	25.07 (9.93)	23.95 (10.23)			
POQ-VIT					
Admission	20.68 (5.25)	20.13 (4.89)	0.58	< 0.001	0.22
Discharge	16.14 (5.01)	16.34 (5.22)			
POQ-Fear					
Admission	11.95 (4.67)	11.83 (4.61)	0.54	< 0.001	0.85
Discharge	9.05 (4.70)	8.82 (4.85)			
POQ-SIS					
Admission	50.42 (21.46)	48.64 (19.79)	0.19	< 0.001	0.92
Discharge	38.54 (17.65)	36.60 (17.64)			
CPCI-Guarding					
Admission	4.67 (1.68)	4.38 (1.53)	0.1	< 0.001	0.21
Discharge	3.09 (1.72)	2.99 (1.74)			
CPCI-Relaxation					
Admission	2.03 (1.63)	1.89 (1.54)	0.29	< 0.001	0.64
Discharge	4.50 (1.29)	4.43 (1.30)			
CPCI-Rest					
Admission	4.61 (1.65)	4.34 (1.58)	0.39	< 0.001	0.031
Discharge	3.36 (1.59)	3.44 (1.57)			
CPCI-Task Pers					
Admission	3.00 (1.85)	3.55 (1.84)	0.002	< 0.001	0.036
Discharge	4.88 (1.59)	5.07 (1.60)			
CSQ-CAT					
Admission	20.39 (9.37)	18.18 (9.14)	0.06	< 0.001	0.012
Discharge	13.28 (9.09)	12.87 (9.27)			
SPQ					
Admission	22.25 (6.18)	21.38 (6.52)	0.031	< 0.001	0.59
Discharge	18.75 (8.29)	17.48 (7.82)			
Overall sleep					
Admission	7.10 (1.88)	6.99 (1.92)	0.018	< 0.001	0.07
Discharge	6.26 (2.51)	5.71 (2.38)			
Overall satisfaction					
Discharge	8.30 (2.02)	8.22 (2.14)			
Recommendation					
Discharge	9.28 (1.54)	9.09 (1.95)			

ADL indicates activities of daily living; ANOVA, analysis of variance; CAT, catastrophizing; CPCI, Chronic Pain Coping Inventory; CSQ, Coping Strategies Questionnaire; MOB, mobility; NA, negative affect; POQ, Patient Outcomes Questionnaire; SIS, Symptom Implausibility Scale; SPQ, Sleep Problems Questionnaire; Task Pers, Task Persistence; VIT, vitality.

discharge. Thus, although all patients reported improvement in ADL impairment, OP patients evidenced significantly greater improvement despite cessation of their opioid analgesics. Analysis of MOB scores revealed significant main effects for group, $F_{1,598} = 4.77$, $P = 0.029$, $\eta^2 = 0.01$, and time, Wilks $\lambda = 0.85$, $F_{1,598} = 108.81$, $P < 0.001$, $\eta^2 = 0.15$, but no significant group × time interaction. The means indicated that the OP group reported significantly more mobility impairment overall and that both groups improved significantly during treatment. A similar pattern emerged for NA, where significant main effects for group, $F_{1,598} = 6.14$, $P = 0.013$, $\eta^2 = 0.010$, and time, Wilks $\lambda = 0.90$, $F_{1,598} = 66.25$, $P < 0.001$, $\eta^2 = 0.10$, were obtained, but not for the group × time interaction, indicating more reported negative affect by OP patients overall as well as significant improvement by both groups from admission to discharge. POQ-VA VIT, Fear, and SIS scores revealed only single main effects for time [VIT: Wilks $\lambda = 0.76$, $F_{1,598} = 190.72$, $P < 0.001$, $\eta^2 = 0.24$; Fear: Wilks $\lambda = 0.83$, $F_{1,598} = 119.13$, $P < 0.001$, $\eta^2 = 0.17$; SIS: Wilks $\lambda = 0.70$, $F_{1,598} = 252.00$, $P < 0.001$, $\eta^2 = 0.30$], reflecting significant improvements in vitality, pain-related fear, and pain amplification after treatment with no significant differences between groups.

CPCI

Analysis of the CPCI Guarding and Relaxation scale scores yielded sole main effects for time [Guarding: Wilks $\lambda = 0.61$, $F_{1,598} = 388.01$, $P < 0.001$, $\eta^2 = 0.39$; Relaxation:

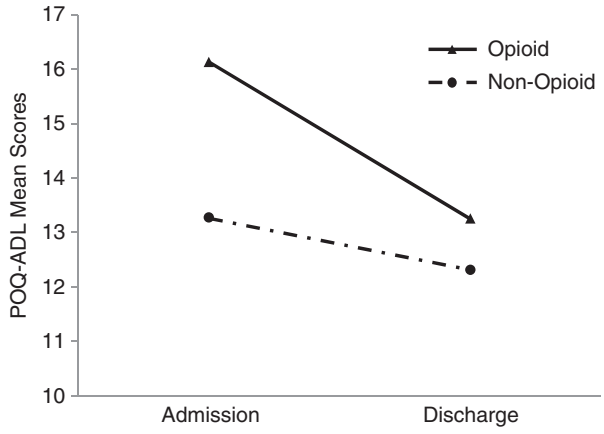

FIGURE 1. Patient Outcomes Questionnaire-Activities of Daily Living (POQ-ADL) mean scores by group.

Wilks $\lambda = 0.31$, $F_{1,595} = 1342.45$, $P < 0.001$, $\eta^2 = 0.69$]. The associated means indicated that individuals in both the OP and NOP groups improved significantly after treatment with no group differences evident. A different pattern emerged for CPCI Rest scale scores, where a significant main effect for time, Wilks $\lambda = 0.78$, $F_{1,598} = 173.14$, $P < 0.001$, $\eta^2 = 0.23$, and a significant group × time interaction, Wilks $\lambda = 0.99$, $F_{1,598} = 4.67$, $P = 0.031$, $\eta^2 = 0.01$, were obtained. The Rest scale means reveals that all patients improved (ie, rested less) over time. The interaction effects are presented in Figure 2 and illustrate that those in the OP group reported more resting at admission than NOP patients, but by discharge these differences had disappeared. Finally, analysis of CPCI Task Persistence scores yielded main effects for group, $F_{1,598} = 9.72$, $P = 0.002$, $\eta^2 = 0.02$, and time, Wilks $\lambda = 0.59$, $F_{1,598} = 408.48$, $P < 0.001$, $\eta^2 = 0.41$, along with a significant group × time interaction, Wilks $\lambda = 0.99$, $F_{1,598} = 4.43$, $P = 0.036$, $\eta^2 = 0.01$. Examination of mean scores revealed that the group main effect was due to OP participants reporting significantly less task persistence overall than NOP participants, whereas the time effect reflected significant improvement by both groups after treatment. The significant group × time interaction is presented in Figure 3 and reveals that OP patients reported significantly more ADL impairment than NOP patients at admission, but not at discharge.

CSQ-CAT

Analysis of CSQ-CAT scores yielded a single main effect for time, Wilks $\lambda = 0.67$, $F_{1,598} = 301.50$, $P < 0.001$, $\eta^2 = 0.34$, along with a significant group × time interaction, Wilks $\lambda = 0.99$, $F_{1,598} = 6.40$, $P = 0.012$, $\eta^2 = 0.01$. A review of the CAT means for the time effect revealed that scores for both the treatment groups decreased significantly after treatment. Figure 4 depicts the significant group × time interaction. It can be seen from the figure that the interaction was due to OP patients reporting more catastrophizing at admission than NOP patients, but no significant differences were apparent at discharge.

SPQ

Repeated measures of analysis of SPQ scores revealed significant main effects for group, $F_{1,598} = 4.69$, $P = 0.031$, $\eta^2 = 0.01$, and time, Wilks $\lambda = 0.84$, $F_{1,598} = 114.53$, $P < 0.001$, $\eta^2 = 0.16$, but no group × time interaction. An examination of the means associated with these main effects revealed that the group effect was accounted for by patients in the OP group reporting more sleep problems than those in the NOP group, whereas the time effect was attributable to both the groups reporting significant reductions in sleep problems after treatment. A very similar pattern emerged with respect to patients' overall sleep quality ratings: Significant main effects for group, $F_{1,598} = 5.64$, $P = 0.018$, $\eta^2 = 0.01$, and time, Wilks $\lambda = 0.87$, $F_{1,598} = 90.34$, $P < 0.001$, $\eta^2 = 0.13$, were obtained, but no significant interaction emerged. The mean values indicated that members of the OP group reported significantly poorer sleep quality than the NOP group members overall, but that the sleep quality of both the groups improved significantly over time.

Treatment Satisfaction

One-way ANOVAs were used to determine whether there were any group differences in the overall treatment satisfaction and recommendation to others ratings that were collected at discharge and are presented in Table 2. Results of the ANOVAs were nonsignificant. Both groups reported high overall satisfaction and recommendation to other ratings.

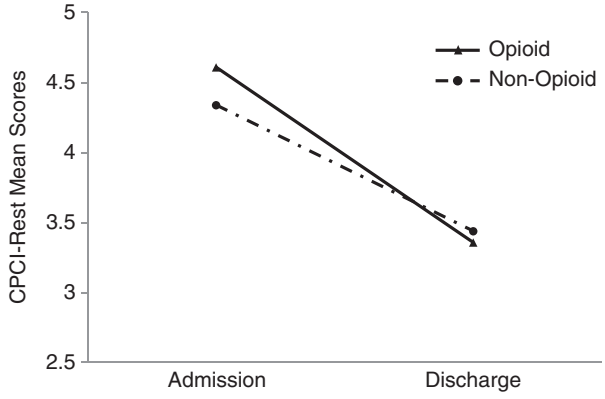

FIGURE 2. Chronic Pain Coping Inventory-Rest (CPCI-Rest) mean scores by group.

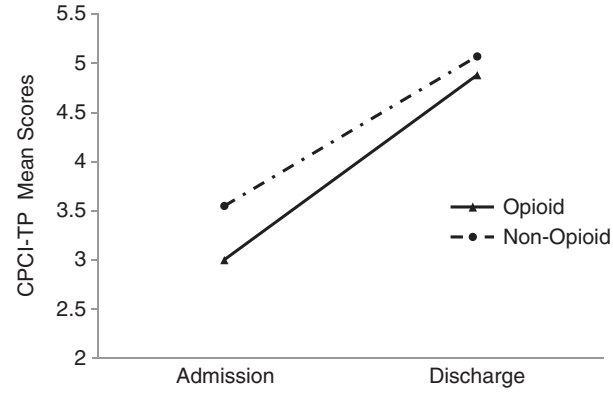

FIGURE 3. Chronic Pain Coping Inventory-Task Persistence (CPCI-TP) mean scores by group.

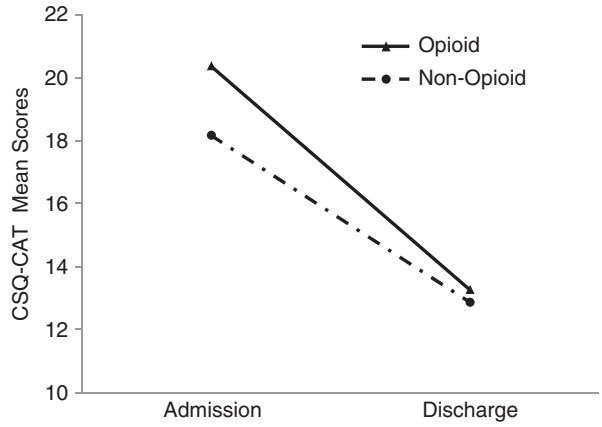

FIGURE 4. Coping Strategies Questionnaire-Catastrophizing (CSQ-CAT) mean scores by group.

Medications

MED Dose and Pain NRS

Pearson product-moment correlations were used to examine the degree of relationship between the initial taper dose and admission and discharge pain intensity ratings. The correlations obtained were small and nonsignificant for both admission NRS scores ($r = -0.040$) and discharge scores ($r = -0.12$).

Discharge Pain Medications

To determine whether groups differed in the number or classes of pain medications used during the latter phase of treatment, we compared the total number of discharge medications and the number of medications within relevant classes prescribed to OP and NOP patients at discharge using 1-way ANOVAs. Classes of pain medications were identified and grouped by the pain team pharmacist and included NSAIDs and/or APAP, tricyclic antidepressants (eg, amitriptyline), dual-acting antidepressants (eg, duloxetine), topical creams (eg, capsaicin), anticonvulsants (eg, gabapentin), anxiolytics (eg, clonazepam), muscle relaxants (eg, baclofen), sleep medications (eg, diphenhydramine), and medications typically used in the treatment of headaches (eg, zolmitriptan). Analysis of total medications prescribed revealed no difference between groups, $F_{1,598} = 1.18$, NS (OP, $M = 4.91$; NOP, $M = 4.76$). Analysis of the number of medications within each of the identified classes yielded significant differences between groups for NSAID/APAP, $F_{1,598} = 4.91$, $P = 0.027$, tricyclic antidepressants, $F_{1,598} = 6.39$, $P = 0.012$, anxiolytics, $F_{1,598} = 4.07$, $P = 0.044$, and sleep medications, $F_{1,598} = 7.16$, $P = 0.008$. Examination of the group means revealed that OP patients were prescribed fewer NSAIDS/APAP (OP, $M = 0.88$; NOP, $M = 1.02$) than NOP patients, but more tricyclic antidepressants (OP, $M = 0.18$; NOP $M = 0.11$), anxiolytics (OP, $M = 0.20$; NOP, $M = 0.13$), and sleep medications (OP, $M = 0.78$; NOP, $M = 0.61$). No other differences approached significance. Discharge medications are presented in Table 3.

TABLE 3. Means and SDs of Medication Use at Discharge for Opioid (OP) and Nonopioid (NOP) Groups

Medication Class	OP (n = 221) Mean (SD)	NOP (n = 339) Mean (SD)
NSAIDs/APAP*	0.88 (0.64)	1.02 (0.75)
Muscle relaxants	0.02 (0.15)	0.02 (0.15)
Anticonvulsants	0.92 (0.49)	0.88 (0.55)
SNRI antidepressants	0.16 (0.37)	0.14 (0.35)
Tricyclic antidepressants*	0.18 (0.39)	0.11 (0.31)
Anxiolytics*	0.20 (0.42)	0.13 (0.35)
Sleep medications*	0.78 (0.79)	0.61 (0.72)
Headache medications	0.11 (0.32)	0.15 (0.38)
Topical creams	1.32 (0.93)	1.34 (0.83)

*$P < 0.05$.

NSAIDs/APAP indicates nonsteroidal anti-inflammatory drugs/acetaminophen; SNRI, serotonin norepinephrine reuptake inhibitor.

DISCUSSION

The results of this study support our hypothesis that individuals with CNP treated in an IPP that includes cessation of all opioid analgesics would exhibit treatment-related outcomes improvements regardless of opioid status at admission. Individuals in both the OP and NOP groups experienced significant improvements in all areas of treatment outcomes over time including pain severity, ADLs, mobility, negative affect, vitality, pain-related fear, pain-symptom amplification, coping skills, catastrophizing, and sleep. Furthermore, improvements by OP patients exceeded those exhibited by NOP participants on 4 of the assessed outcome measures. These results replicate and extend the findings of the previous Mayo Clinic study to a sample that was mostly males reporting chronic low back pain as their primary problem. Furthermore, the strength of the results supports the benefit of IPPs for CNP and suggests that opioid analgesic cessation for those with very chronic pain conditions and high levels of impairment may occur without negatively impacting treatment efficacy. In fact, in some domains of function efficacy may be enhanced.

There are several possible explanations that could account for these results. One possibility is that individuals willing to undergo treatment that included opioid cessation were not experiencing significant opioid-related pain relief at treatment onset. If this were the case, opioid cessation might not be expected to affect treatment outcomes. However, the fact that patients in the OP group reported that their prescribed opioids provided moderate pain relief ($M = 5.24$ on a 0 to 10 scale) before IPP treatment strongly suggests otherwise. Cessation of these analgesics had no discernible negative impact on treatment outcomes, including discharge pain intensity scores. One might argue that the absence of any negative impact of opioid cessation may have been due to inadequate opioid dosing; that is to say, despite patients' beliefs regarding their perceived pain relief from opioids, perhaps the doses utilized were too small to reduce pain intensity or enhance function. In response, we would point out that the 61.14 mg/d mean MED prescribed to OP patients fell within the therapeutic daily dosing used in the treatment of CNP, and that the range extended to a high of 360 mg/d. In addition, if dosing was a key factor, we expected to observe a significant association between taper dose (which was based on preadmission opioid intake) and admission pain intensity scores; however, the correlation between these 2 values approximated 0. Although opioid cessation was not associated with less desirable treatment outcomes in this study, individuals in the OP group did report higher levels of negative affect and sleep disturbance, lower task persistence, and more impairment in ADLs and mobility than NOP patients at CPRP admission. As these

impediments to daily function also are characteristic of individuals with CPS, it is possible that CPS was more intense in the OP group members than in members of the NOP group, leading to an increased likelihood of opioid prescriptions for these individuals. It is also possible that treating these individuals with opioids increased the severity of CPS. In either case, if members of the OP group were likely to have more severe CPS, this might account for the small but significant differences noted in discharge medications where OP patients were prescribed fewer nonopioid analgesics but more tricyclic antidepressants, anxiolytics, and sleep medications. Unfortunately, data from the current study do not directly address this issue and we can only speculate as to possible associations between opioid analgesic use and CPS development or severity.

There are several limitations in this study. First, this was a retrospective clinical study. As a result, causation cannot be established. Second, those who did not complete the program were not included in the final sample, as their discharge outcomes information was not obtained. However, the absence of significant outcome measures differences between early noncompliance discharges and program completers mitigates the potential impact of this data loss on overall study results. Third, the generalizability of this sample to other CNP populations may be restricted. For example, although African American and Hispanic individuals were well represented in the sample at 22.9% and 10.0%, respectively, participants were 80% male and all were either military veterans or active duty service members. In addition, as all participants had to be motivated to engage in this voluntary program and those taking opioid analgesics had to agree to discontinuation, a participant selection bias was in operation. Fourth, we did not examine admission medications because it was not possible to accurately assess pharmaceuticals prescribed from providers outside of the VA system. Therefore, there may have been differences in preadmission medications other than opioids that we did not detect. However, because we monitored medication and other substance use closely during treatment by means of repeated UDSs, we are confident that there was good compliance with medications prescribed during treatment and that discharge medication profiles accurately reflected patients' final adjusted medication regimens. Fifth, treatment occurred in an inpatient setting, which is quite rare in today's health care system; however, interdisciplinary outpatient programs exist that provide similar treatment modalities and thus, also may provide similar benefits. Last, the study sample was comprised of individuals with very chronic pain conditions and high levels of impairment and distress. Therefore, the positive outcomes associated with IPP treatment, despite opioid analgesic cessation, may not apply to less chronic or impaired individuals. Nevertheless, as the highly symptomatic patients in this sample demonstrated significant improvements, it is reasonable to speculate that at least similar gains would be anticipated among less severely impaired groups. Regardless, it should be noted that IPPs were developed as a treatment alternative primarily for very chronic and disabled individuals, and the improvements noted after treatment attest to the viability of IPP when targeting those with CPS.

Prospective RCTs that contrast IPP with and without the use of opioid analgesic medications are needed to more clearly define any potential benefits associated with opioid analgesic use in the treatment of moderate to severe CNP accompanied by significant affective distress and functional impairment. In addition, longitudinal studies investigating opioid analgesic relapse rates and associated rehabilitation outcomes are needed to define relationships between opioid cessation and long-term treatment efficacy better. Finally, although the small number of active duty military participants in this study precluded meaningful comparisons between veterans and military service members, exploration of potential differences in opioid analgesic use and treatment outcomes may be of interest.

To treat CNP successfully, an interdisciplinary approach often is needed that includes physical therapy, medication management, and cognitive-behavioral interventions. This study confirms the importance of IPPs and extends previously established benefits by showing that treatment gains apply to individuals who discontinue opioid analgesics as part of IPP treatment. In this study, gradual tapering from opioid analgesics during treatment, even for those who perceived opioids as being beneficial, did not negatively impact treatment outcomes and was associated with similar or enhanced improvement after treatment. Although opioid therapy may be appropriate for some individuals with CNP, long-term use of these medications should be considered cautiously in the absence of data supporting their long-term effectiveness, particularly when providing care to those with CPS.

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