ORIGINAL RESEARCH

Factors Associated with Pain Treatment Satisfaction Among Patients with Chronic Non-Cancer Pain and Substance Use

Leslie W. Suen, MD, Vanessa M. McMahan, PhD, Christopher Rowe, PhD, Sumeet Bhardwaj, MD, Kelly Knight, PhD, Margot B. Kushel, MD, Glenn-Milo Santos, PhD, and Phillip Coffin, MD

Introduction: **A better understanding of pain treatment satisfaction in patients with chronic noncancer pain (CNCP) and substance use is needed, especially as opioid prescribing policies are changing. We sought to identify factors associated with pain treatment satisfaction in individuals with CNCP on recent opioid therapy and prior or active substance use.**

Methods: **An exploratory cross-sectional analysis using baseline data from a cohort study of 300 adults with CNCP receiving >20 morphine milligram equivalents of opioids for ≥3 of the preceding 12 months and prior or active substance use. Participants completed interviews, clinical assessments, urine drug screening, and medical chart review.**

Results: **Participants were predominantly middle-aged (mean age 57.5 years), Black (44%), and cisgender men (60%). One-third (33%) had high, 28% moderate, and 39% low pain treatment satisfaction. Post-traumatic stress disorder (PTSD), tobacco use, past-year opioid discontinuation, and higher average pain scores were associated with lower satisfaction. HIV and prescription cannabis use were associated with higher satisfaction.**

Conclusions: **The relationship between PTSD and tobacco use with lower satisfaction should be explored to augment pain outcomes. Higher satisfaction among individuals with HIV and prescription cannabis use presents potential research areas to guide CNCP management and reduce reliance on opioid therapies. (J Am Board Fam Med 2021;34:1082–1095.)**

Keywords: **Chronic Disease, Chronic Pain, Cross-Sectional Studies, Opioids, Patient Satisfaction, Policy, Primary Health Care, Prospective Studies**

Introduction

One in 5 adults in the US experiences chronic noncancer pain (CNCP), or noncancer pain persisting for at least 3 months.[1] It is one of the most common reasons for seeking primary care.[1,2] CNCP is challenging for primary care providers (PCPs), due to a lack of proven treatments, heterogeneity of pain conditions, and limited duration of treatment studies.[2,3] In safety-net settings, CNCP patients face a higher prevalence of comorbid conditions associated with worse pain

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From National Clinician Scholars Program, Philip R. Lee Institute of Health Policy Studies, University of California San Francisco, San Francisco, CA (LWS); San Francisco Veterans Affairs Medical Center, San Francisco, CA (LWS); San Francisco Department of Public Health, San Francisco, CA (VMM, CR, GS, PC); University of Toronto, Department of Family and Community Medicine, Toronto, ON, Canada (SB); Department of Humanities and Social Sciences, University of California San Francisco, San Francisco, CA (KK); Center for Vulnerable Populations, University of California San Francisco, San Francisco, CA (MBK); Department of Community Health Systems, University of California, San Francisco, San Francisco, CA (GS); Department of Medicine, University of California, San Francisco, San Francisco, CA (PC).

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Corresponding author: Leslie Suen, MD, UCSF National Clinician Scholars Program, Philip R. Lee Institute of Health Policy Studies, 490 Illinois St., Suite 7227, Box 0936, San Francisco, CA 94158 (E-mail: Leslie.Suen@ucsf.edu).

outcomes, including substance use disorders,[4–6] as well as barriers to accessing multimodal pain therapies and pain management resources.[5,7,8]

Among patients with CNCP, pain treatment satisfaction is a common indicator for quality of care for public health systems and can affect patient adherence to treatment.[9–11] Pain treatment satisfaction can be affected by multiple factors, including patient views of care providers, experiences and expectations with pain management, and pain outcomes.[12] Satisfaction is higher when patients are treated as informed partners in their pain treatment plans.[12,13] CNCP patients who use substances also usually have lower pain treatment satisfaction, potentially due to stigmatization in health settings, leading to strained relationships with providers.[5,9,14] In safety-net populations, patients dissatisfied with their pain treatment have lower care retention, lower adherence and engagement with treatment plans, and worse health outcomes.[9,11]

Opioids were previously considered a mainstay of CNCP treatment.[15,16] However, implementation of opioid-limiting policies has led prescriptions to decline nationally since 2012.[17,18] The national rate of high-dosage opioid prescriptions declined by 4 prescriptions per month from 2012 to 2016, and this decrease doubled after release of the Centers for Disease Control and Prevention (CDC) *Guideline for Prescribing Opioids for Chronic Pain*.[18] Changes in prescribing policies are salient in safety-net settings, where the high prevalence of co-occurring substance use raises safety concerns of increased overdose risk for patients on opioid therapy.[8,15,19,20] In 2016, the San Francisco Health Network (SFHN), the main primary care health system serving publicly insured and uninsured patients in San Francisco, implemented several county-wide policies to limit opioid prescribing.[21,22] From 2016 to 2019, the number of opioid prescriptions issued in San Francisco declined by 27%.[23]

Despite these changes to opioid prescribing for pain management in recent years, pain treatment satisfaction, especially among those with CNCP and substance use in safety-net settings, is poorly understood. PCPs and policy makers are compelled to balance patient safety in limiting excessive opioid prescriptions and patient-centered outcomes like satisfaction when developing and implementing interventions in marginalized populations. To better characterize factors associated with pain treatment satisfaction, we conducted an exploratory cross-sectional analysis to characterize pain treatment satisfaction and related factors in a cohort of patients with a history of illicit substance use on long-term opioids for CNCP. Understanding these factors can help PCPs and policy makers tailor pain management strategies and create patient-centered approaches to care.

Methods

Study Design and Population

We conducted an exploratory cross-sectional analysis using baseline data from the Cohort study of Opioids, Pain, and Safety IN an era of changinG policy (COPING), a longitudinal cohort study measuring changes in functional status, pain levels, and substance use during a period of changes in opioid prescribing guidelines. From March 2017 to March 2019, we enrolled 300 English-speaking adults receiving primary care through the SFHN who had CNCP, had been on chronic opioid therapy (defined as being prescribed >20 morphine milligram equivalents [MME] of opioid therapy daily for at least 3 of the preceding 12 months[24]), and had prior or active substance use (ie, use of nonmedical opioids, cocaine, or methamphetamine). The SFHN includes 12 adult, urban primary care clinics: 3 clinics are housed within a university-affiliated public hospital, and 9 are community-based clinics serving populations with varying demographics across San Francisco. We oversampled patients with HIV by ensuring we recruited at least 100 patients with HIV, as people living with HIV face unique pain conditions and high rates of substance use.[25] Each clinic has a registry of patients on opioid therapy for CNCP, which we reviewed to identify patients who had received opioid therapy for at least 3 of the past 12 months and to determine their HIV status. We then contacted primary care providers for permission to call potentially eligible patients to perform a prescreen interview, where we asked about lifetime or active illicit substance use. We invited eligible patients for an enrollment visit.

In the parent COPING study, participants completed a baseline and up to four subsequent, annual visits. Each annual visit included a computer-assisted personal interview (CAPI), clinical examination testing, and urine toxicology testing. We also queried participants' electronic medical records

for information on medical conditions and prescriptions. The present study includes only data from the baseline study visit and chart review. Participants provided written informed consent for study participation. This study was approved by the University of California, San Francisco Institutional Review Board (#15-18274).

Self-Reported Measures

Self-reported measures were collected by CAPI, where study staff read questions to the participant and recorded responses using a computer. CAPI interview measures included demographics; mental health comorbidities; characteristics of pain; pharmacologic and nonpharmacologic pain treatments received; past-year use of alcohol, tobacco, and other substances; and lifetime history of substance use treatment and overdose. We asked about cannabis use as a pain treatment rather than assessing as a recreational substance, as the majority of individuals with CNCP use cannabis to treat pain rather than for recreational purposes.[26]

We asked individuals for their gender and sex assigned at birth. Participants could select "Female," "Male," "Transgender," "Other," or "Decline to answer" for gender, and "Female," "Male," "Intersex," or "Decline to answer" for sex assigned at birth. Using the 2-step approach,[27] we categorized gender as cisgender male (assigned male at birth, male gender), cisgender female (assigned female at birth, female gender), or gender minority person (if gender response was transgender, another gender, or if gender response was female with assigned male at birth or gender response was male with assigned female at birth). We combined race/ethnicity into categories of non-Hispanic White, non-Hispanic Black, Hispanic/Latinx, or other race/ethnicity, and we collapsed education and income assessments due to small counts in some categories.

Participants screened positive for post-traumatic stress disorder (PTSD) if they answered "yes" to ≥3 Primary Care PTSD Screen questions.[28] Participants screened positive for depression if scores were ≥10 on the Patient Health Questionnaire-8 depression scale (PHQ-8).[29] The PHQ-8 has identical cut points to the 9-item version, the PHQ-9,[30] and is preferentially used over the PHQ-9 in clinical research studies.[30] We screened for psychological distress using the Brief Symptom Inventory (BSI-18).[31–33] BSI scores ≥63 for either the global or 2 or more of the BSI subscales were considered clinically significant for distress.[31–33] The BSI is validated only for cisgender populations, which did not describe all of our study population.

We asked about chronic pain severity and catastrophizing using (1) average pain in the past 3 months (both scored from 0 [no pain] to 10 [worst possible pain]) and (2) the Pain Catastrophizing Scale (PCS).[34] PCS is a validated assessment for pain catastrophizing, a cognitive-affective response to anticipated or realized pain associated with worse pain outcomes; we considered a score of ≥30 clinically significant.[35,36] We assessed for lifetime and past-year pain treatments, including pharmacologic (opioid and nonopioid medications) and nonpharmacologic (eg, local injections, chiropractic care, physical/occupational therapy, individual or group behavioral counseling, acupuncture, and massage therapy) treatments.

After assessing past-year pain treatments, we asked participants, "Think about all the treatment you have received for pain in the past year. How satisfied are you with the treatment that you received?" Participants responded on a 5-point Likert scale, and we grouped responses into low ("Not at all satisfied" or "Slightly satisfied"), moderate ("Moderately satisfied"), and high satisfaction ("Quite a bit satisfied" or "Extremely satisfied") based on the distribution of the sample. The measure was adopted from several longitudinal studies measuring opioid use and misuse among urban, safety-net primary care patients with CNCP and a history of substance use.[16,37,38]

Clinical Examination Measures

We used a cold pressor test (CPT) to measure participants' cold pain threshold and tolerance (in seconds). Cold pain threshold was defined as the amount of time until a participant reported pain after submerging a hand in a 2.0°C water bath, and cold pain tolerance was the total time before the participant felt the need to withdraw the hand.[39,40] We screened participants for neuropathic pain using a Douleur Neuropathique 4 (DN4) score of ≥4. The DN4 combined CAPI items with examination findings of numbness, allodynia, or hypoesthesia.[3] We used an adapted mini-physical performance test (mPPT) to assess for physical function,[41] a validated 4-item test evaluating ability to perform four physical tasks (ie, chair rise, picking an item up from the floor, 50-foot walk test, and standing balance).

Due to participants consistently being unable to pick up a penny, study staff adapted the measure to picking up a marker to increase the variation in functional status scores. Participants completed the mPPT twice during the baseline visit, and we interpreted the test as positive for functional impairment if the highest score was ≤11.[41]

Medical Chart Review

We reviewed medical charts to collect data on the presence of clinical comorbidities (ie, HIV and hepatitis C [HCV]). We collected data on HCV given frequent comorbidity with substance use and possible relationships to chronic pain conditions. We also collected data on any prescribed medications for CNCP, including opioids.[42] We did not include data on opioids (eg, buprenorphine or methadone) prescribed solely for opioid use disorder treatment as noted in the chart. We calculated prescribed MME at enrollment and categorized MME to align with CDC guidelines.[43,44] We defined opioid discontinuations (stopped for at least 3 months without reinitiation), decreases (≥30% reduction in MME without discontinuation), and increases (≥30% increase in MME) in the past year.[45] We recorded exposure to opioid stewardship measures, including controlled substance agreements, urine drug screen (UDS) completed in past year, and receipt of naloxone prescription. Within SFHN, it is advised that all participants receiving opioid therapy for any indication be prescribed naloxone.

Urine Drug Screen

Participants completed a UDS immunoassay at baseline; indeterminate results were rare and interpreted as negative (see Appendix 1 for list of detectable substances). Among participants with UDS positive for opioids, we further categorized polysubstance use with opioids (excluding cannabis) on UDS as opioids only (including methadone or buprenorphine), opioids with stimulants only (ie, cocaine or amphetamines), and opioids combined with other substances, which were grouped together due to small sample sizes across response categories. We examined whether UDS was consistent with being prescribed detectable opioid therapy, defined as being prescribed ≥20 MME of opioid therapy based on chart review (excluding fentanyl therapy, as fentanyl was not detectable on the UDS used). Participants who did not complete UDS were excluded from UDS analyses.

Statistical Analysis

We used descriptive statistics to summarize baseline demographics; comorbidities; alcohol, tobacco, and other substance use history; UDS; and pain severity, characteristics, and management. We compared characteristics across pain treatment satisfaction levels. We used ANOVA testing for normally distributed continuous variables and the Kruskal-Wallis test for skewed variables. For categorical variables, we used Pearson's chi-square test, and Fischer's exact test for expected cell counts less than five.

We assessed for factors associated with pain treatment satisfaction using a multivariable ordinal regression model including a priori defined independent variables (age and gender based on the 2-step gender assessment) and predictors from bivariate analyses with a P value of <0.05 (see Appendix 2 for details on data analysis). We did not include being prescribed hydromorphone or buprenorphine in the multivariable model due to small sample sizes. All analyses were done in Stata Version 16.0 (Stata Corp, College Station, TX).

Results

Participant Characteristics

We enrolled 300 individuals with a mean age of 57.5 (SD ± 8.1) years. The majority were cisgender men (60%), and nearly half were non-Hispanic Black (44%). Most (77%) had experienced homelessness at some point, 35% had HIV due to oversampling, and 50% had current or prior HCV infection. Most (78%) reported past-year substance use, most commonly tobacco (56%), alcohol (51%), cocaine (24%), methamphetamine (22%), and heroin (17%). About a fifth (19%) reported a history of prior opioid overdose (Table 1).

Pain and Pain Treatment Characteristics

The median score for "average pain in the past 3 months" was 7 (IQR 6 to 9). Most participants (83%) were being prescribed opioid therapy. A fifth of participants had a ≥30% opioid dose reduction in the past year (18%), and 14% had a past-year discontinuation. The majority (73%) reported being prescribed at least one nonopioid medication for CNCP, most commonly gabapentinoids (35%), acetaminophen or nonsteroidal anti-inflammatory drugs (NSAIDs) (31%), and/or cannabis (31%) (Table 2). Out of 299 participants who responded

Table 1. Demographic and Substance Use Characteristics of Safety-Net Patients on or Recently on Long-Term Opioid Therapy for Chronic Noncancer Pain, by Level of Satisfaction with Pain Treatment*

Characteristic, Median (IQR) or N (%)	All Participants (n = 300)	Low Satisfaction (n = 116)	Moderate Satisfaction (n = 85)	High Satisfaction (n = 98)	*P* Value
Age	57.5 (±8.1)	56.9 (9.1)	57.6 (7.9)	58.1 (7.2)	0.57
Gender					
Cisgender female	101 (34%)	52 (51%)	25 (25%)	24 (24%)	0.002
Cisgender male	182 (60%)	63 (35%)	54 (30%)	64 (35%)	
Gender minority person	17 (6%)	1 (6%)	6 (35%)	10 (59%)	
Race/ethnicity†					
Non-Hispanic White	95 (32%)	34 (36%)	28 (30%)	32 (34%)	0.26
Non-Hispanic Black	131 (44%)	55 (42.0%)	36 (28%)	40 (31%)	
Hispanic/Latinx	33 (11%)	17 (52%)	5 (15%)	11 (33%)	
Mixed or other	40 (13%)	10 (24%)	15 (38%)	15 (37%)	
Education					
Some high school or less	74 (25%)	27 (37%)	21 (29%)	25 (34%)	0.95
GED/some college	169 (56%)	66 (39%)	50 (30%)	53 (31%)	
Vocational training/college or higher	57 (19%)	23 (40%)	14 (25%)	20 (35%)	
Income†					
< $9999	56 (19%)	22 (39%)	18 (32%)	16 (29%)	0.93
$10,000-$19,999	193 (65%)	75 (39%)	52 (27%)	66 (34%)	
>$20,000	49 (16%)	18 (38%)	14 (29%)	16 (33%)	
Comorbidities					
Ever homeless	230 (77%)	93 (41%)	69 (30%)	67 (29%)	0.06
HIV positive	105 (35%)	32 (31%)	30 (29%)	43 (41%)	0.05
History of hepatitis C infection	151 (50%)	60 (40%)	46 (31%)	44 (29%)	0.42
Brief Symptom Inventory (BSI) score ≥63‡	83 (28%)	36 (43%)	29 (35%)	18 (22%)	0.006
Patient Health Questionnaire-8 (PHQ-8) Depression Scale ≥10	83 (28%)	38 (46%)	28 (34%)	17 (21%)	0.02
Post-traumatic stress disorder screen ≥3	99 (33%)	45 (46%)	31 (32%)	22 (23%)	0.03
Mini-physical performance test (mPPT) ≤11§	145 (52%)	60 (41%)	41 (28%)	44 (30%)	0.72
Self-reported substance use in past year‖					
No drugs, alcohol, or tobacco	66 (22%)	21 (32%)	16 (24%)	29 (44%)	0.09
Alcohol	154 (51%)	61 (40%)	48 (31%)	44 (29%)	0.27
Tobacco	169 (56%)	74 (44%)	50 (30%)	44 (26%)	0.02
Any illicit substances	121 (40%)	52 (43%)	34 (28%)	35 (29%)	0.40
- Heroin	51 (17%)	25 (49%)	12 (24%)	14 (28%)	0.26
- Methamphetamine or speed	66 (22%)	28 (42%)	21 (32%)	17 (26%)	0.39
- Cocaine or crack cocaine	72 (24%)	34 (47%)	21 (29%)	17 (24%)	0.12
- Other¶	18 (6%)	7 (39%)	5 (28%)	6 (33%)	0.99
History of substance use treatment	203 (68%)	79 (39%)	58 (29%)	65 (32%)	0.95
History of prior overdose	56 (19%)	27 (48%)	13 (23%)	16 (29%)	0.27

IQR, interquartile range.
*One participant did not respond to the pain treatment satisfaction question.
†One participant declined to state their race, and two participants declined to state their income.
‡BSI scores only interpretable for 282 cisgender participants and considered positive if either global score or two subscale scores were ≥63.
§mPPT scores were conducted in 277 participants at baseline. We used a cut-off score of 11 or lower as evidence of functional impairment.
‖Measure does not include cannabis use.
¶Other substances including inhalants or hallucinogens.

to the question about pain treatment satisfaction, 39% reported low, 28% moderate, and 33% high satisfaction.

Urine Drug Screen Results

Most participants (92%, n = 276) completed a UDS; 65% were positive for opioids. Forty-seven participants (17%) were prescribed opioid therapy that should have been detectable on UDS and screened opioid negative; 17 of whom were prescribed 90 MME or higher (Table 3).

Unadjusted Analyses of Factors Associated with Pain Treatment Satisfaction

In unadjusted analyses, factors with a higher proportion of low pain treatment satisfaction levels included cisgender female gender, tobacco use, past-year opioid discontinuation, not taking any medications for pain, and screening positive for depression, PTSD, and psychological distress on the BSI (Table 1). Participant factors with higher levels of treatment satisfaction were living with HIV (Table 1) and using cannabis for pain (Table 2). UDS being positive for cannabis was not associated with satisfaction, and only 60% (n = 64) of these individuals were being prescribed cannabis for pain. Buprenorphine detected on UDS and self-report of hydromorphone therapy did differ significantly though sample sizes were small. Satisfaction levels did not differ significantly by primary care clinic (data not shown).

Multivariable Analyses of Factors Associated with Pain Treatment Satisfaction

In multivariable analysis, living with HIV (adjusted odds ratio [AOR] 1.6, 95%, CI, 1.0–2.7) and using prescribed cannabis for pain (AOR 1.7, 95% CI, 1.0–2.7) were associated with higher satisfaction. Screening positive for PTSD (AOR 0.6, 95% CI, 0.3–0.9), higher average pain in the past 3 months (AOR 0.9, 95% CI, 0.8–1.0), tobacco use (AOR 0.6, 95% CI, 0.4–0.9), and past-year opioid discontinuation (AOR 0.4, 95% CI, 0.2–0.9) were associated with lower satisfaction (Table 4).

Discussion

Among patients with CNCP on recent opioid therapy and a history of illicit substance use recruited from an urban, safety-net health system, more than one third were not at all or only slightly satisfied with their pain treatment, and opioid discontinuations were associated with lower pain treatment satisfaction. Due to our cross-sectional design, it is unknown whether opioid discontinuations led to dissatisfaction, or if treatment dissatisfaction led to discontinuation. However, this finding aligns with growing concerns with consequences of discontinuing opioid therapy in patients with CNCP, especially in those with substance use.[46,47] Despite a lack of evidence supporting long-term opioid efficacy in CNCP treatment and some evidence suggesting improved pain scores with opioid tapering,[48,49] recent studies have cited potential harms of opioid discontinuations, including increased suicidal ideation from uncontrolled pain, return or initiation of illicit drug use leading to increased overdose risk and death, and increased emergency department visits and hospitalizations from adverse health events.[50–56]

While we do not know whether participants consented to opioid discontinuations, mounting pressure from regulators to curb opioid prescriptions suggests many were likely provider-directed.[18,21,24,45] Even as discontinuations likely had justifications in prioritizing safety, our finding highlights the need for providers and policy makers to further examine the potential negative impacts of opioid prescribing policy changes. Using thoughtful, patient-centered strategies during opioid discontinuations may also help alleviate some of these negative impacts, such as avoiding rapid or sudden discontinuations, engaging patients as much as possible in decision making, ensuring adequate access to comprehensive, multimodal treatment for both pain and co-occurring substance use disorders, and providing care with multidisciplinary teams to broadly address patient concerns.[6,57] Only about a third of patients at most were taking gabapentinoids or other neuropathic medications, which were increasingly recommended at the time of this study, and further research is needed to explore if increasing use of these medications contributes to treatment satisfaction.[58]

PTSD and tobacco use were associated with lower treatment satisfaction. PTSD and related mental health diagnoses are challenging to treat in primary care and are associated with increased risk of opioid use disorder and overdose.[1–34,59,60] Using trauma-informed approaches in CNCP treatment may help address quality of care and satisfaction. Including mental health professionals in care as

Table 2. Characteristics of Pain Treatment for Safety-Net Patients on or Recently on Long-Term Opioid Therapy for Chronic Noncancer Pain, by Level of Satisfaction with Pain Treatment*

Characteristic, Median (IQR) or n (%)	All Participants (n = 300)	Low Satisfaction (n = 116)	Moderate Satisfaction (n = 85)	High Satisfaction (n = 98)	*P* Value
Pain characteristics					
Pain on average in the past 3 months	7 (6 to 9)	8 (7 to 9)	7 (6 to 8)	7 (6 to 9)	0.015
Pain Catastrophizing Scale ≥ 30	96 (32%)	45 (47%)	27 (28%)	23 (24%)	0.06
Cold pressor threshold score	7.5 (5.1 to 11.5)	7.7 (5.2 to 11.6)	7.6 (5.3 to 11.7)	7.0 (4.3 to 11.0)	0.61
Cold pressor tolerance score	10.9 (7.0 to 17.7)	11.1 (6.9 to 17.7)	11.5 (7.5 to 17.7)	10.5 (6.6 to 18.6)	0.74
Douleur Neuropathique 4 (Neuropathic Pain Assessment) ≥4[†]	161 (56%)	66 (41%)	48 (30%)	46 (29%)	0.23
Prescribed opioid MME at baseline	60 (17.5 to 180)	43 (6 to 171)	60 (23 to 150)	60 (20 to 222)	0.22
0 MME	50 (17%)	27 (54%)	11 (22%)	12 (24%)	0.25
1 to 19 MME	25 (8%)	8 (32%)	6 (24%)	11 (44%)	
20 to 89 MME	102 (34%)	38 (37%)	33 (32%)	31 (31%)	
90 to 199 MME	57 (19%)	19 (33%)	20 (35%)	18 (32%)	
≥200 MME	66 (22%)	24 (37%)	15 (23%)	26 (40%)	
Max MME in past year	112.5 (36.0 to 246.3)	105 (40 to 270)	90 (36 to 216)	120 (30 to 270)	0.77
MME decreased >30% and not stopped in past year	53 (18%)	24 (45%)	11 (21%)	18 (34%)	0.36
MME increased >30% in past year	42 (14%)	13 (31%)	14 (33%)	15 (36%)	0.52
Opioid(s) discontinued in past year	43 (14%)	26 (61%)	9 (21%)	8 (19%)	0.006
Self-reported prescribed opioids					
Oxycodone, hydrocodone	167 (56%)	60 (36%)	46 (28%)	60 (36%)	0.36
Hydromorphone	6 (2%)	1 (16%)	0 (0%)	5 (83%)	0.03
Morphine	81 (27%)	25 (31%)	28 (35%)	27 (34%)	0.19
Methadone	54 (18%)	26 (48%)	16 (30%)	12 (22%)	0.15
Fentanyl	12 (4%)	3 (25%)	5 (42%)	4 (33%)	0.53
Codeine	21 (7%)	6 (29%)	7 (33%)	8 (38%)	0.61
Other opioid	6 (2%)	1 (17%)	4 (68%)	1 (17%)	0.11
No opioids	38 (13%)	22 (58%)	6 (16%)	10 (26%)	0.03
Self-reported nonopioid medications					
Acetaminophen or nonsteroidal anti-inflammatory drugs (NSAIDs)	94 (31%)	36 (39%)	29 (31%)	28 (30%)	0.72
Gabapentinoids (gabapentin, pregabalin)	105 (35%)	38 (37%)	36 (35%)	30 (29%)	0.21
Cannabis (prescribed)	93 (31%)	25 (27%)	30 (33%)	37 (40%)	0.02
Muscle relaxants	43 (14%)	10 (24%)	17 (41%)	15 (36%)	0.07
Other neuropathic medications[‡]	29 (10%)	10 (36%)	7 (25%)	11 (39%)	0.74
Topical medications (lidocaine, capsaicin)	28 (9%)	14 (50%)	4 (14%)	10 (36%)	0.20
Other medications or do not remember	12 (4%)	4 (33%)	4 (33%)	4 (33%)	0.93
No nonopioid medications	80 (27%)	36 (45%)	17 (21%)	27 (34%)	0.21

Continued

Table 2. Continued

Characteristic, Median (IQR) or n (%)	All Participants (n = 300)	Low Satisfaction (n = 116)	Moderate Satisfaction (n = 85)	High Satisfaction (n = 98)	*P* Value
Nonmedication treatments					
No medications	10 (3%)	8 (80%)	1 (10%)	1 (10%)	0.04
Local injections	55 (18%)	26 (47%)	15 (27%)	14 (26%)	0.30
Chiropractic care	24 (8%)	12 (52%)	4 (17%)	7 (30%)	0.34
Physical or occupational therapy	86 (29%)	35 (41%)	29 (34%)	22 (26%)	0.20
Acupuncture	49 (16%)	17 (35%)	12 (25%)	19 (40%)	0.55
Massage therapy	59 (20%)	20 (35%)	15 (26%)	23 (40%)	0.46
Group or individual behavioral counseling	53 (18%)	20 (38%)	18 (34%)	15 (28%)	0.58
Opioid stewardship interventions					
Pain agreement documented in chart	208 (69%)	80 (39%)	62 (30%)	66 (32%)	0.70
Naloxone prescribed in chart	182 (61%)	75 (41%)	52 (29%)	55 (30%)	0.44
Urine drug screen done in the past year	247 (82%)	100 (40%)	68 (28%)	79 (32%)	0.42

IQR, interquartile range; MME, Morphine milligram equivalents.
*One participant did not respond to the pain treatment satisfaction question.
†There were 14 participants who did not complete neuropathic pain assessment.
‡Other neuropathic medications including tricyclic antidepressants (amitriptyline, desipramine), serotonin-norepinephrine reuptake inhibitors (duloxetine, venlafaxine), migraine medications (sumatriptan, fioricet, midrin, ergotamine, topiramate), and antiseizure medications (valproic acid).

appropriate could be one way of incorporating trauma-informed approaches and increasing multidisciplinary collaboration. Our results for tobacco could be due to the pharmacologic effect of chronic tobacco use, leading to vascular disorders or other conditions that worsen chronic pain and thus treatment satisfaction.[61–63] Alternatively, tobacco use could represent a marker for structural factors associated with worse pain outcomes, such as socioeconomic instability and higher rates of mental and physical health comorbidities; tobacco use also could be a coping mechanism in the face of all of these factors.[63,64] Both PTSD and tobacco use may indicate a need for more targeted efforts to improve pain treatment and other quality-of-care markers.

Higher pain treatment satisfaction among participants living with HIV was surprising, given higher rates of comorbid mental health and substance use disorders in those living with HIV and difficult-to-treat pain syndromes such as HIV-related neuropathy.[13,25,65,66] Reasons are likely multifactorial: HIV care is more often provided in multidisciplinary teams with access to pharmacists, nurses, mental health providers, in addition to PCPs providing HIV care.[67] Care from multidisciplinary teams may lead to higher use of multimodal pain treatments that improve pain treatment satisfaction.[67,68] Although most multimodal pain treatments offered (eg, acupuncture, behavioral therapy) in our study were not significantly associated with satisfaction, the proportions of participants who accessed these therapies in this study were small. Prior studies exploring pain management in this population have, in fact, reported effectiveness of multimodal pain treatments in managing pain, suggesting these services may offer benefit if made more available to patients.[6,7,56]

Studies show HIV providers operate within the "HIV paradigm," prioritizing patient engagement, care retention, adherence to therapy, and viral suppression.[69,70] This paradigm may conflict with conservative opioid prescribing guidelines, and HIV providers may be more likely to continue opioid prescriptions or tolerate problematic substance use out of concern that opioid discontinuation may reduce care retention and worsen HIV outcomes.[69] HIV providers may also feel more comfortable treating substance use disorders, have longer-term relationships with patients, and be more likely to identify as patient allies or practice trauma-

Table 3. Results of Urine Drug Screen (UDS) at Study Enrollment for Safety-Net Patients on or Recently on Long-Term Opioid Therapy for Chronic Noncancer Pain (n = 276)*

Characteristic, Median (IQR) or n (%)	All Participants (n = 300)	Low Satisfaction (n = 116)	Moderate Satisfaction (n = 85)	High Satisfaction (n = 98)	*P* Value
Drugs detected on baseline UDS					
No drugs detected	41 (15%)	15 (37%)	12 (29%)	14 (34%)	0.93
Opioids (including methadone and buprenorphine)	178 (65%)	71 (40%)	50 (28%)	56 (32%)	0.79
Methadone	72 (26%)	33 (46%)	19 (26%)	20 (28%)	0.38
Buprenorphine	7 (3%)	0 (0%)	5 (71%)	2 (29%)	0.01
Benzodiazepines	17 (6%)	6 (35%)	4 (24%)	7 (41%)	0.76
Cocaine	58 (21%)	28 (48%)	18 (31%)	12 (21%)	0.07
Amphetamines/ methamphetamine	37 (13%)	37 (35%)	30 (28%)	40 (37%)	0.37
Tetrahydrocannabinol (THC)	107 (39%)	18 (49%)	12 (32%)	7 (19%)	0.14
Other drugs†	3 (1%)	0 (0%)	2 (67%)	1 (3%)	0.19
Opioids in combination with other drugs					
No opioids	98 (36%)	37 (38%)	26 (27%)	35 (36%)	0.13
Opioids only (including methadone and buprenorphine)	117 (42%)	42 (36%)	32 (28%)	42 (36%)	
Opioids and stimulants only (ie, cocaine or amphetamines)	49 (18%)	26 (53%)	15 (31%)	8 (16%)	
Opioids and other combination of drugs‡	12 (4%)	3 (25%)	3 (25%)	6 (50%)	
If UDS consistent with prescribing§					
UDS consistent with prescribing	201 (74%)	82 (41%)	54 (27%)	65 (32%)	0.58
UDS positive for opioids and not prescribed detectable opioid therapy	25 (9%)	12 (48%)	6 (24%)	7 (28%)	
UDS negative for opioids and prescribed detectable opioid therapy	47 (17%)	14 (30%)	14 (30%)	19 (40%)	
20 to 89 MME at baseline	30 (11)	11 (37%)	8 (27%)	11 (37%)	
90 to 199 MME at baseline	11 (4%)	1 (9%)	4 (36%)	6 (55%)	
≥200 MME at baseline	6 (2%)	2 (33%)	2 (33%)	2 (33%)	

IQR, interquartile range.
*Twenty-four participants did not complete a UDS at baseline.
†Other drugs detected include phencyclidine (PCP) or barbiturates.
‡Including opioids combined with benzodiazepines, PCP, barbiturates, with or without stimulants such as cocaine or methamphetamine.
§Detectable opioid therapy defined as milligram morphine equivalent (MME) of at least 20 and taking a full agonist or partial opioid excluding fentanyl, which would not return positive on UDS. Two participants were prescribed only fentanyl as their opioid therapy so were excluded from this measure.

informed care, potentially leading to higher pain treatment satisfaction.[70,71] Future studies should also explore what factors and lessons from HIV care can be extended to non-HIV settings to improve pain treatment satisfaction for all patients living with CNCP.

The association of cannabis use for pain treatment with higher satisfaction is intriguing, especially as UDS being positive for cannabis was not significantly associated with treatment satisfaction. Of those who tested positive for cannabis on UDS, only 60% were being prescribed cannabis for pain, potentially diluting pain treatment satisfaction response for cannabis. Although there is increasing attention toward cannabis as an opioid-sparing alternative in CNCP treatment, data are mixed. Studies have suggested using cannabis for CNCP is associated with reduced opioid use and improved

Table 4. Multivariable Analysis of Greater Pain Satisfaction among Safety-Net Patients on or Recently on Long-Term Opioid Therapy for Chronic Noncancer Pain (n = 299)*

Characteristic	Adjusted Odds Ratio (95% CI)	*P* Value
Age (per 10 years)	1.1 (0.8-1.5)	0.49
Gender		
Cisgender female	Ref	
Cisgender male	1.5 (0.9-2.4)	0.12
Gender minority person	30.8 (1.9 to 14.8)	0.20
HIV-positive	1.6 (1.0 to 2.7)	0.04
Depression	0.9 (0.5-1.7)	0.87
Brief Symptom Inventory (BSI) score ≥ 63	0.8 (0.5-1.5)	0.51
Post-traumatic stress disorder	0.6 (0.3-0.9)	0.02
Tobacco use	0.6 (0.4-0.9)	0.02
Average pain in past 3 months	0.9 (0.8-1.0)	0.007
Opioids discontinued	0.4 (0.2-0.9)	0.02
Medical cannabis use	1.7 (1.0 to 2.7)	0.03

CI, confidence interval.
*One participant did not respond answer the pain treatment satisfaction question.

pain treatment, while other studies found no improvements.[72–77] Qualitative research in safety-net settings found patients use cannabis for CNCP when opioid prescriptions are limited and express concerns about cannabis dosing and addictive potential, while providers desire more education on how to advise patients.[78] Long-term psychoactive effects of cannabis in this population with a high prevalence of mental health conditions are also understudied. Much work is needed to determine the efficacy and safety of medical cannabis use in the treatment of CNCP.[79]

Our study had several limitations. Generalizability of these results to other populations is also unclear, as San Francisco may be unique especially in regard to communities living with HIV, though it is also likely other safety-net populations with high rates of substance use also have higher prevalence of HIV. The parent COPING study is also one of few prospective studies examining the effects of changing opioid policy on safety-net patients, and this work provides an impetus for examinations of the impact of opioid prescribing policies. We also did not measure quality of CNCP care or barriers to care access. However, because all participants were SFHN patients who are publicly insured or covered by the local safety-net health care program, barriers to accessing care in this population were likely similar. Our study did not measure patient perceptions of specific pain treatment or the quality of interpersonal interactions with providers during treatment, and future qualitative studies could help explore these domains of pain treatment.

Conclusions

We found recent opioid discontinuations were associated with less pain treatment satisfaction, highlighting the need for patient-centered approaches balancing patient safety and treatment satisfaction. We identified factors associated with worse (eg, PTSD, tobacco use) and superior (eg, HIV, cannabis use) pain treatment satisfaction, representing potential targets for research and practice improvement as we attempt to safely reduce long-term opioid reliance for CNCP.

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Appendix 1. List of Detectable Substances on Urine Drug Screen

Amphetamines
Barbiturates
Benzodiazepines
Buprenorphine
Cocaine (detected as benzoylecgonine)
Methadone (detected as methadone and 2-ethylidene-1,5-dimethyl-3,3-diphenylpyrrolidine [EDDP])
Methamphetamine
Opioids
Oxycodone
Phencyclidine (PCP)
Tetrahydrocannabinol (THC)

Appendix 2. Data Analysis Supplement

In the multivariable ordinal regression model assessing factors associated with pain treatment satisfaction, we included a priori defined independent variables (age and gender) and predictors from bivariate analysis with a P value <0.05. When there were multiple variables with $P<.05$ in the bivariate analysis that were considered to measure a highly similar characteristic, we selected the variable thought most likely to influence pain treatment satisfaction. For example, we chose to include average pain score in the past 3 months in the multivariable analysis, rather than current pain, due to this measure having a larger relevance in clinical practice. We also considered taking no opioids and taking no medications for pain treatment to be highly similar with having opioids discontinued in the past year, as all individuals in the study had been on recent opioid therapy. Among these 3 measures, we included only opioid discontinuations in the final model, as it had the strongest association. Although reporting being on hydromorphone therapy and being positive for buprenorphine on the urine drug screen were also significantly associated with satisfaction in the bivariate analysis, we did not include these variables in the final model due to small sample sizes. We validated our multivariable ordinal logistic regression model by running the Brant test command, validating the proportional odds assumption, and running the linktest command, to detect any specification errors. The P value for the Brant test was 0.623, suggesting no violation of the proportional odds assumption. The P value for the _hatsq variable on the linktest command was 0.914, meaning no specification error was detected. We also checked for multicollinearity in the final model using the VIF command, and all VIF values were less than 10, suggesting lack of collinearity between variables in the final model.