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ORIGINAL PAPER

Strategies Used to Manage Chronic Pain in HIV-Disease: Comparing Persons Prescribed Opioids Versus Persons not Receiving Opioids

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Abstract

Chronic pain is common in people living with HIV (PLWH), causes substantial disability and is associated with limitations in daily activities. Opioids are commonly prescribed for pain treatment among PLWH, but evidence of sustained efficacy is mixed. There is little information available on how PLWH who have chronic pain use multimodal strategies in pain management. The current cross-sectional study examined background characteristics, self-reported pain, and the use of other pain treatments among 187 PLWH with chronic pain and depressive symptoms who were and were not prescribed opioids. Approximately 20.9% of participants reported using prescription opioids at the time of the study interview. These individuals were significantly more likely to report having engaged in physical therapy or stretching, strengthening or aerobic exercises in the previous 3 months, recent benzodiazepine use, and receiving disability payments. There were no significant differences in pain characteristics (pain-related interference, average pain severity, and worst pain severity) between the two groups. Those not prescribed opioids were more likely to report better concurrent physical functioning and general health, and fewer physical role limitations, but higher depression symptom severity. Our findings suggest that many PLWH with chronic pain and depressive symptoms express high levels of pain with deficits in physical function or quality of life despite their use of opioids. The high rate of co-use of opioids and benzodiazepines (30.8%) is a concern because it may increase risk of overdose. An integrated care approach that includes a variety of effective non-pharmacologic treatment strategies such as physical therapy may be beneficial in reducing the reliance on opioids for pain management.

Keywords HIV · Chronic Pain · Opioids · Treatment · Pain management · Disability

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Introduction

Chronic pain is common in the general population and has increased incidence in people living with HIV (PLWH) [1–3]. Chronic pain affects 25–83% of PLWH [3–5] who experience HIV-associated neuropathy and ART-toxic neuropathy [6], and pain from headaches, lower back pain and other musculoskeletal causes which are more common as this population ages [7, 8]. Additionally, depression and pain frequently co-occur; PLWH experience higher levels of depressive symptoms which have been documented to contribute to increases in pain [5, 9]. More importantly, pain among PLWH causes substantial disability and is associated with increased limitation in daily activities [10].

Because pain is a complex multidimensional construct influenced by both physiological and psychological factors, contributing factors for pain in PLWH may also include specific HIV-related biological factors, complex social challenges, and high degrees of medical and psychiatric concerns [11]. Pain can affect PLWH at any point in the course of their illness, with more severe illness and poorer health being associated with more pain [2]. Furthermore, even when PLWH obtain pharmaceutical pain treatment, they are still likely to report persistently high levels of pain, suggesting that current pain management strategies are inadequate in this population [6].

Opioids remain an essential element of pain treatment among PLWH [12] and are commonly prescribed [13–15], but introduce a complex set of issues and risks. Estimates of the proportion of PLWH prescribed opioids range from 31 to 53% [16, 17]. Long-term use of opioids is controversial because of concerns about sustained efficacy, and the potential for misuse and addiction [18]. Opioid use among PLWH has been associated with high risk of injection drug use [19], risk of overdose [15], and substance use disorders [20, 21]. Studies have documented attrition along the HIV care continuum among HIV-infected individuals who misuse opioids leading to poor outcomes, including suboptimal HIV testing, delayed entry into HIV care, delayed initiation of antiretroviral therapy, and lower rates of viral suppression [22–24]. At the same time, existing non-pharmacologic (e.g., physical therapy, massage, acupuncture) treatments for chronic pain among PLWH have not been widely used [25]. Successful management of pain among PLWH may require a combination of pharmacologic and non-pharmacologic therapies [12, 26].

Many clinicians remain convinced that long-term opioid use among non-HIV specific populations is not beneficial and may lead to a loss of functional capacity [27–29]. Despite the challenges in managing pain with opioids among PLWH and the unclear efficacy of long-term opioid treatment in PLWH for chronic pain [30], little is known about the differences in characteristics (pain, psychiatric, physical health well-being, and substance use) between PLWH with depressive symptoms who are prescribed opioids to manage their chronic pain and PLWH not using prescription opioids. Furthermore, the literature is limited regarding what types of strategies other than prescription opioids or how many other strategies are used by PLWH with depressive symptoms to manage chronic pain. Identifying areas where interventions can be implemented to prevent unnecessary opioid use is important to help reduce the large burden of overdose that is leading to morbidity and mortality.

The present study examined self-reported pain and additional treatment strategies used, comparing PLWH and chronic pain prescribed opioids versus those not receiving prescription opioids. The objectives for this study were: (1) to determine how PLWH with chronic pain and depressive symptoms who are prescribed opioid users differ in both background and pain characteristics from those not prescribed opioids; and (2) to describe any other additional treatments used by both groups.

Methods

Participants

The current study was a cross-sectional analysis using all baseline data from a longitudinal intervention study of 187 HIV-infected patients with chronic pain and depressed mood.

Procedures

Between November 2016 to February 2020, participants were recruited from three HIV primary care clinics in different states (site 1 n = 116; site 2 n = 15; site 3 n = 56). Individuals were considered eligible for participation if they: (1) were HIV-positive, (2) were aged 18 or older; (3) had access to a telephone; (4) reported chronic pain (pain duration for at least six months with a mean score of 3.5 or higher on the Brief Pain Inventory [BPI] Pain Interference Scale) [31]; (5) had Pain severity ≥ 4 on a Numeric Rating Scale indicating "worst pain in the last week;" [32]; (6) had elevated depression symptoms (Quick Inventory of Depression Symptoms (QIDS) [33] score of ≥ 9 (depression severity); and (7) if taking antidepressant medications, those medication doses were stable for at least a month. Individuals were considered ineligible if they: (1) had pain due to cancer; (2) were engaged in psychotherapy more than one time per month or in a multidisciplinary pain management program; (3) had current mania as determined by the SCID-V [34]; (4) reported a history of psychotic symptoms in

the previous year as determined by the SCID-V [34]; (5) engaged in hazardous substance use (15 + days of cocaine or heroin/non-prescribed opioids or 4 + days of binge drinking in the previous month); (6) endorsed suicidality that required immediate clinical attention; (7) were pregnant; or (8) planned surgery in the next 6 months. Procedures were approved by the relevant Institutional Review Boards and identical across sites.

Eligible individuals were scheduled for a baseline visit that would occur just prior to a regularly scheduled appointment with their HIV care provider. The baseline visit was scheduled within two weeks of the eligibility screen and provides the data for the current study. After providing consent, participants met with research assistants in private spaces to complete baseline assessment questionnaires and were randomized into one of two interventions – a behavioral health intervention based on behavioral activation, or a health education control group.

Measures

Demographics. All participants were asked to provide their age, sex, race, ethnicity, marital status, employment status, disability status, and education and self-reported date of HIV diagnosis.

Depression. Severity of depressive symptoms was measured with the QIDS [33]. Nine domains were separately scored on a Likert scale representing severity from 0 to 3, with a total possible range of 0 to 27 (no depression to very severe depression). The overall Cronbach's α of this measure was 0.748.

Pain. The BPI measures pain severity and interference [31]. Both average pain severity and worst pain severity were measured on the same numerical rating scale from 0 (no pain) to 10 (pain as bad as you can imagine). To assess average pain severity, participants were asked "what number describes your pain on average?" and to assess worst pain severity, participants were asked "what number describes your pain at its worst?" [32]. The 7 interference items (sleep disturbance, general activity, mood, work, relations with others, walking, and enjoyment of life) were assessed on a 0 to 10 scale, with 0 being "pain did not interfere" and 10 being "pain completely interfered." The overall Cronbach's α for BPI interference was 0.872.

Quality of life. The SF-36 questionnaire, used to assess quality of life, is comprised of 36 items, grouped into eight scales: (1) physical functioning, (2) role limitations due to physical health problems, (3) role limitations due to personal or emotional problems, (4) emotional well-being, (5) energy/fatigue, (6) social functioning, (7) bodily pain, and (8) general health perceptions. Scores are coded, summed, and transformed onto a scale of 0 to 100, with higher scores indicating better self-assessed health and well-being [35, 36]. As a guide, a five-point difference between group scores is clinically and socially relevant [35]. The Cronbach's α for the SF-36 subscales were: (1) physical functioning (0.879), (2) role limitations due to physical health problems (0.781), (3) role limitations due to personal or emotional problems (0.710), (4) emotional well-being (0.634), (5) energy/fatigue (0.558), (6) social functioning (0.730), (7) bodily pain (0.650), and (8) general health perceptions (0.720).

Other pain management strategies. A pain treatment questionnaire was created to assess pain management strategies. Participants were asked if they had tried each of the following pain treatments in the last three months: (1) non-pharmacological professional treatments (massage, acupuncture/acupressure, physical therapy, spinal stimulator, osteopath/chiropractor, biofeedback with a provider); (2) non-pharmacological self-treatments (self-administered biofeedback, self-administered Transcutaneous Electrical Nerve Stimulation (TENS), heat/cold, rubs/trigger point massage); (3) mind-body treatments (exercise, mediation/relaxation, yoga); and (4) pain injections.

Outpatient mental health treatment. Participants were asked "How many times did you have an appointment with an outpatient counselor/psychologist for therapy for mental health concerns (30 minutes or more) in the last 3 months?" Participants were considered to have seen a mental health counselor if they had attended at least one 30-minute or more session with an outpatient counselor or psychologist.

Substance use. The rate of alcohol, benzodiazepine, marijuana, heroin, cocaine, and amphetamine use was each separately measured using the Addiction Severity Index – Lite Version (ASI-Lite) [37]. Participants reported the number of days they had used each substance in the past 30 days. The use of specific substances (alcohol, benzodiazepine, marijuana, heroin, cocaine, and amphetamine) was dichotomized into either 0 (no use) or 1 (used for at least one day).

Opioid use. As part of the ASI-Lite [37], participants were asked 1) "How many days in the past 30 have you used opioids/pills/painkillers?"; 2) "How many of these days of opioids/pills/painkillers use were prescribed?"; and 3) How many of these days of opioids/pills/painkillers use were NOT prescribed?" Participants were provided with a list of common brand names of prescription opioids (i.e., oxycontin, morphine, vicodin, percocet, demerol, dilaudid).

We stratified the sample. Those who reported having used any prescribed opioids (i.e., reported using prescribed opioids or using both prescribed and illicit opioids) were classified as opioid-prescribed users while persons not using prescription opioids were participants who reported zero prescription opioid use (i.e., reported no prescription and no illicit opioid use or reported illicit opioid use but no prescription opioid use).

Analytical Methods

Descriptive statistics were used to present summary information of the sample. Due to the exploratory nature of the current study and rigorous considerations of statistical power, we conducted univariate analyses to compare persons who were prescribed opioids with persons who were not prescribed. Internal consistency of the measures (QIDS, BPI Interference, SF-36 subscales) was evaluated using the Cronbach's α coefficient.

Pain treatments were grouped into four types: (1) non-pharmacological professional treatments; (2) non-pharmacological self-treatments; (3) mind-body treatments; and (4) pain injections. Data were analyzed using *t* tests for continuous data and chi-squared or Fisher's exact tests for categorical data depending on the number of observations in the table cells. Two-tailed p values < 0.05 were considered significant.

Results

All 187 participants were included in this analysis. Participants averaged 51.4 (± 10.2) years of age, 56.1% were male, 38.8% were White, 33.0% were Black, 28.6% identified other or mixed racial origins, and 13.4% were Latinx. 17.7% were married or living with a partner. 23.1% were employed full- or part-time, and 50% were on disability (Table 1). Educationally, 23.2% had not completed high-school, 29.2% had completed high school, 28.6% reported some college, and 17.3% reported completing college degrees.

Approximately 20.9% (n = 39) of participants reported currently using prescription opioids. Of the 39 participants reporting prescription opioid use, 2 participants reported using both prescription and illicit opioids. Of the 148 persons not using prescription opioids, 9 participants reported illicit opioid use while the remaining 139 participants reported neither prescription nor illicit opioid use. Due to the small sample size of participants reporting illicit opioid use, we did not further stratify the sample.

Persons who were prescribed opioids were significantly more likely to be in site 3 (43.6% vs. 26.4%; p = .026) and on disability (64.1% vs. 46.3%; p = .048) while persons not using prescription opioids were more likely to be Latinx (15.5% vs. 5.1%; p = .089). Persons not using prescription opioids reported significantly higher QIDS scores compared to persons who use prescription opioids (14.4 vs. 13.3; p = .030).

There were no significant differences in pain characteristics (interference, average pain severity, and worst pain

Table 1 Background Characteristics by Prescription Opioid Use. Cell entries are n (%) or Mean (± SD).

		USED PRESCRIPTION OPIOIDS?		
	Total (n = 187[a])	Yes (n = 39)	No (n = 148)	*p-value*
Clinic/Hospital				
Site 1	116 (62.0%)	22 (56.4%)	94 (63.5%)	0.026
Site 2	15 (8.0%)	0 (0.0%)	15 (10.1%)	
Site 3	56 (29.9%)	17 (43.6%)	39 (26.4%)	
Years Age	51.4 (± 10.2)	53.1 (± 8.1)	51.0 (± 10.7)	0.244
Sex (Male)	105 (56.1%)	23 (59.0%)	82 (55.4%)	0.689
Race				
White	71 (38.4%)	18 (46.2%)	53 (36.3%)	0.237
Black	61 (33.0%)	14 (35.9%)	47 (32.2%)	
Other/Multiple	53 (28.6%)	7 (17.9%)	46 (31.5%)	
Latinx (Yes)	25 (13.4%)	2 (5.1%)	23 (15.5%)	0.089
Married or w Partner (Yes)	33 (17.7%)	7 (17.9%)	26 (17.7%)	0.970
Employed Full/Part (Yes)	43 (23.1%)	6 (15.5%)	37 (25.2%)	0.198
On Disability (Yes)	93 (50.0%)	25 (64.1%)	68 (46.3%)	0.048
Education				
< 8th Grade	6 (3.2%)	2 (5.1%)	4 (2.7%)	0.294
< HS	37 (20.0%)	6 (15.4%)	31 (21.2%)	
HS	54 (29.2%)	7 (17.9%)	47 (32.2%)	
Some College	53 (28.6%)	16 (41.0%)	37 (25.3%)	
College Degree	32 (17.3%)	7 (17.9%)	25 (17.1%)	
MA+	3 (1.6%)	1 (2.6%)	2 (1.4%)	
Years HIV Positive	18.5 (± 8.94)	18.5 (± 9.04)	18.5 (± 8.94)	0.976
QIDS Total score	14.2 (± 2.99)	13.3 (± 2.68)	14.4 (± 3.03)	0.030

[a] Valid n varies slightly due to item specific missing data

Table 2 Pain Characteristics and Health Status by Prescription Opioid Use. Cell entries are Mean (±SD).

		USED PRESCRIPTION OPIOIDS?		
	Total (n = 187[a])	Yes (n = 39)	No (n = 148)	*p-value*
Brief Pain Interference Scale	6.30 (±2.07)	6.54 (±1.72)	6.24 (±2.15)	0.429
Average Pain Severity	6.43 (±1.87)	6.53 (±1.36)	6.40 (±1.93)	0.712
Worst Pain Severity	8.21 (±1.56)	8.33 (±1.63)	8.18 (±1.61)	0.583
SF-36 Physical Functioning	46.1 (±25.6)	36.2 (±23.2)	48.7 (±25.7)	0.007
SF-36 Physical Role Limitations	23.4 (±32.9)	8.3 (±21.7)	27.4 (±34.2)	0.001
SF-36 Emotional Well Being	51.2 (±16.7)	55.6 (±13.6)	50.0 (±17.2)	0.062
SF-36 Emotional Role Limitations	28.0 (±35.5)	28.2 (±36.3)	27.9 (±35.4)	0.966
SF-36 Energy/Fatigue	32.7 (±16.8)	29.5 (±15.7)	33.6 (±17.0)	0.180
SF-36 Social Functioning	43.2 (±24.1)	44.6 (±23.1)	42.8 (±24.4)	0.691
SF-36 Pain	31.9 (±17.9)	32.0 (±17.1)	31.8 (±18.1)	0.964
SF-36 General Health	41.5 (±20.1)	34.2 (±16.3)	43.5 (±21.5)	0.014

[a] Valid n varies slightly due to item specific missing data

Table 3 Use of Other Pain Treatments in the past 3 months, Mental health counseling, and substances used by Prescription Opioid Use. Cell entries are n (%).

		USED PRESCRIPTION OPIOIDS?		
	Total (n = 187)	Yes (n = 39)	No (n = 148)	*p-value*
Non-Pharmacological Professional Treatments				
Massage	19 (10.2%)	6 (15.4%)	13 (8.8%)	0.225
Acupuncture/acupressure	13 (7.0%)	1 (2.6%)	12 (8.1%)	0.238
Physical Therapy	26 (13.9%)	13 (33.3%)	13 (8.8%)	< 0.001
Spinal Stimulator	0 (0.0%)	0 (0.0%)	0 (0.0%)	N/A
Osteopathy/Chiropracty	11 (5.9%)	1 (2.6%)	10 (6.7%)	0.322
Biofeedback with Provider	1 (0.5%)	0 (0.0%)	1 (0.7%)	0.607
Mind-Body Treatments				
Stretch, Strength or Aerobic Exercise	91 (48.9%)	25 (64.1%)	66 (44.9%)	0.033
Meditation	44 (23.5%)	10 (25.6%)	34 (23.0%)	0.727
Yoga	16 (8.6%)	3 (7.7%)	13 (8.8%)	0.828
Non-Pharmacological Self-Administered Treatments				
Biofeedback	2 (1.1%)	0 (0.0%)	2 (1.4%)	0.536
Self-administered TENS	6 (3.2%)	1 (2.6%)	5 (3.4%)	0.797
Heat/Cold	96 (51.3%)	21 (53.8%)	75 (50.7%)	0.725
Rubs/Trigger Point Massage	62 (33.5%)	14 (36.8%)	48 (32.7%)	0.626
Pain Injections	16 (8.6%)	4 (10.3%)	12 (8.1%)	0.670
Saw Mental Health Counselor	38 (20.3%)	6 (15.4%)	32 (21.6%)	0.389
Recent Alcohol Use	77 (41.2%)	15 (38.5%)	62 (41.9%)	0.699
Recent Benzodiazepine Use	30 (16.1%)	12 (30.8%)	18 (12.2%)	0.005
Recent Marijuana Use	84 (45.2%)	17 (43.6%)	67 (45.6%)	0.824
Recent Heroin Use	2 (1.1%)	0 (0.0%)	2 (1.4%)	0.465
Recent Cocaine Use	20 (10.7%)	0 (0.0%)	20 (13.5%)	0.015
Recent Amphetamine Use	12 (6.4%)	1 (2.6%)	11 (7.4%)	0.270

severity) between the two groups (Table 2). However, SF-36 scores differed, with persons who were prescribed opioids reporting better outcomes in the emotional well-being scale (55.6 vs. 50.0; p = .062) and persons not using prescription opioids reporting significantly better outcomes in physical functioning (48.7 vs. 36.2; p = .007), physical role limitations (27.4 vs. 8.3; p = .001), and general health (43.5 vs. 34.2; p = .013).

Compared to persons not using prescription opioids, persons prescribed opioids tried more physical therapy (33.3% vs. 8.8%; p < .001) and more stretching, strengthening or aerobic exercises (64.1% vs. 44.9%; p = .033) (Table 3). There were no other significant differences in the other non-pharmacologic strategies between groups. A significantly greater portion of persons prescribed opioids reported recent benzodiazepine use compared to persons not using

prescription opioids (30.8% vs. 12.2%; p = .005). Mean days of benzodiazepine use for both persons who were prescribed opioids and not using prescription opioids were 7.8 (± 13.2) and 2.5 (± 8.0), respectively. Persons not using prescription opioids reported significantly more recent cocaine use compared to persons prescribed opioids (13.5% vs. 0%; p = .015). There were no significant differences in alcohol, marijuana, heroin, or amphetamine use between groups.

Discussion

In this study, we investigated the differences in pain characteristics, health status, and additional treatments used between PLWH with chronic pain and depressive symptoms who were prescribed opioids and those who were not. We found evidence of significant differences in receiving disability payments, depression scores, quality of life measures (physical functioning, physical role limitations, general health), use of non-pharmacologic strategies (physical therapy and stretch/strength exercises), and substance use rates (benzodiazepine, cocaine) between the two groups. This study provides a picture of the prevalence of chronic pain management strategies among PLWH with chronic pain and depressive symptoms.

The prevalence of prescription opioid use in this study (20.9%) was much lower than that seen for prescription opioid use among PLWH in Medicaid populations (41.6%) [38], but was concordant with two recent studies [39, 40] suggesting that 16–19% of PLWH and chronic pain use opioids for pain management. The significant differences between persons prescribed opioids and persons not using prescription opioids across the three clinic/hospital sites suggests different cultural contexts and practice styles among providers, which aligns with Medicaid trends in differential prescribing rates [38].

There was no significant difference in the levels of pain (interference, average pain severity, and worst pain severity) between persons prescribed opioids and persons not using prescription opioids. Our cross-sectional design limits the interpretation of this finding, but several explanations are possible. Persons prescribed opioids could have had higher levels of pain prior to medication initiation which has been mitigated with treatment [41]. Alternatively, persons who use prescription opioids may have varying physiological and/or psychological characteristics that lead to medication initiation but have little pain benefit [42].

Notably, persons who use prescription opioids were more likely to be receiving disability payment benefits. This finding is in line with other studies indicating that PLWH with prolonged opioid use experience poor health outcomes [43–45]. Relatedly, the use of opioids was also strongly related to lower quality of life as measured by the SF-36 here. In this regard, persons who use opioids perceived themselves to be more limited in physical functioning, to have more role limitations due to physical health problems, and to be in worse general health than persons not using prescription opioids. Although not statistically significant, persons receiving prescription opioids also scored higher than persons not using prescription opioids in role limitations due to personal or emotional well-being. The SF-36 results demonstrate the dual impact of opioid use on both physical and psychological health, with perhaps the greatest effect on mental health. Although persons prescribed opioids had lower depression scores than persons not using prescription opioids, scores for QIDS [33] suggests that both groups are "moderately depressed" (i.e., having a score of 11 to 15) and there was only modest variance in emotional well-being. Prior studies of chronic pain among HIV patients have found long-term opioid use to be associated with poorer functional outcomes [44]. These results provide evidence that the pain-opioid downward spiral hypothesis [28] may be extended to PLWH and chronic pain, suggesting that ongoing opioid use may produce significant negative effects on functioning and quality of life. However, directionality needs to be interpreted with caution in this cross-sectional analysis. Prescription opioids could contribute to greater disability and lower quality of life, or prescription opioids could be prescribed in response to medical/mental health conditions that produce higher degrees of disability.

The most common non-pharmacologic strategies used among the sample included heat/cold, stretch/strength, rubs, meditation, massage, and physical therapy. The use of these non-pharmacologic strategies is encouraging, given their effectiveness in improving chronic pain conditions in non-HIV populations [46, 47]. More persons prescribed opioids had tried physical therapy and stretch/strength exercises, which may indicate that persons prescribed opioids have been more diligent in seeking additional methods to alleviate their pain. Additionally, it may be possible that persons prescribed opioids may have better access to these additional therapies. Physical therapy has recently been found to be a feasible approach in mitigating both chronic pain and opioid use among PLWH [48]. Taken together, the results of the use of non-pharmacologic strategies, quality of life, and self-reported pain suggest that many PLWH with chronic pain and depressive symptoms still express high levels of pain with deficits in physical function or quality of life despite their use of prescription opioids.

Among persons who use prescription opioids in our sample, twelve (30.8%) reported also using benzodiazepines, indicating an issue of concern due to heightened overdose risk with co-use [49]. This finding is consistent with previous studies suggesting that co-prescription of opioids and

benzodiazepines is frequent among PLWH [50, 51]. Lastly, all twenty participants who reported recent cocaine use belonged to the group not using prescription opioids. Previous research has shown that although prescribed opioid use and polysubstance use including cocaine was common among a convenience sample of PLWH and chronic pain, substance use rates were higher among the group not using prescription opioids [52]. Perhaps some persons are using cocaine to manage pain; alternatively, perhaps clinician identification of a patient's cocaine use inhibits their prescription of opioids.

There are several limitations to the current study. First, our estimates relied solely on self-report, which is subject to recall bias and social desirability. However, self-report has shown to be a proven valid assessment technique of medication adherence among PLWH [53, 54]. Second, because our design was cross-sectional, the direction of associations between pain, opioid use, and the use of other pain treatments cannot be established. This was an exploratory study, and our results were descriptive and hypothesis-generating rather than hypothesis-testing. Future longitudinal studies are needed to understand how long-term use of prescription opioids affect PLWH's willingness to try non-pharmacologic pain treatments. Third, the current study enrolled patients with a pain severity score of at least 4 out of 10, which may have excluded persons for whom opioids were particularly helpful in mitigating pain. Similarly, our sample included only patients with elevated depressive symptoms. The inclusion criteria limit our ability to generalize the results to the greater PLWH population. Fourth, we were unable to determine availability of non-pharmacologic treatments across the three sites. Finally, we do not know the duration of opioid prescription or of chronic pain.

Finding other non-pharmacologic treatments to manage chronic pain in PLWH is crucial. Given how common chronic pain is in PLWH, HIV clinics may want to consider providing integrated care that includes a variety of effective non-pharmacologic treatment strategies such as physical therapy [48], which is associated with reduction in long-term use of prescription opioids in the general population [55]. Our results indicate that PLWH who are prescribed opioids are trying other pain treatments; it may be beneficial to use a hybrid approach in treatment to reduce the use of opioids. A holistic approach emphasizing both psychosocial and physical domains [12, 26] may be a better way to address chronic pain to improve the quality of life in PLWH.

Authors' Contributions JCY and MDS conceived of the presented idea. JCY developed the theory and took the lead in writing the manuscript. BJA contributed to the analysis of the results. LU, MMP, AB, AMA, and JB contributed to the design and implementation of the research. LU and MDS designed and directed the project, and supervised the findings of this work. All authors provided critical feedback and helped shape the research, analysis and manuscript.

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Code Availability Not applicable

Declarations

Conflict of interest Dr. Uebelacker's spouse is employed by Abbvie Pharmaceuticals. The remaining authors declare that they have no conflict of interest.

Ethics approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Consent to Participate Not applicable.

Consent for publication Not applicable

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