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Prevalence and Correlates of Low Pain Interference among Patients with High Pain Intensity who are Prescribed Long-Term Opioid Therapy

Melissa H. Adams, M.A.[1], **Steven K. Dobscha, MD**[1,2], **Ning X. Smith, PhD**[3], **Bobbi Jo Yarborough, PsyD**[3], **Richard A. Deyo, MD, MPH**[3,4], and **Benjamin J. Morasco, PhD**[1,2]

[1]Center to Improve Veteran Involvement in Care, VA Portland Health Care System

[2]Department of Psychiatry, Oregon Health & Science University

[3]Kaiser Permanente Northwest Center for Health Research

[4]Departments of Family Medicine, Internal Medicine, and the Oregon Institute for Occupational Health Sciences, Oregon Health & Science University

Abstract

The pain experience may vary greatly among individuals reporting equally high levels of pain. We sought to examine demographic and clinical characteristics associated with pain interference in patients with high pain intensity. Among patients with chronic musculoskeletal pain who were prescribed long-term opioid therapy (LTOT), who were recruited from two healthcare systems, we identified a subset who reported high pain intensity (n=189). All individuals completed self-report assessments of clinical and demographic factors. Analyses examined characteristics associated with pain interference. Within this group of patients with high reported pain intensity, 16.4% (n=31) had low pain interference, 39.2% (n=74) had moderate pain interference, and 44.4% (n=84) had high pain interference. In bivariate analyses, patients with lower pain interference had fewer symptoms of depression and anxiety, less pain catastrophizing, better quality of life, and greater self-efficacy for managing pain. In multivariate analyses, variables most strongly associated with low pain interference, relative to high interference, were depression severity

Correspondence regarding this manuscript should be addressed to: Benjamin Morasco, Ph.D., VA Portland Health Care System (R&D99), 3710 SW US Veterans Hospital Road, Portland, OR 97239, Telephone: 503-220-8262 x57625, Facsimile: 503-273-5367, benjamin.morasco@va.gov.

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(OR=0.90, 95% CI=0.82–0.99) and pain self-efficacy (OR=1.07, 95% CI=1.02–1.12). Study results suggest that chronic pain treatments that address symptoms of depression and enhance pain self-efficacy may be prioritized, particularly among patients who are prescribed long-term opioid therapy.

Keywords

Pain interference; Biopsychosocial model; Prescription opioids; Self-efficacy; Depression

Introduction

Chronic pain is a multifaceted experience that involves physiological, psychological, and situational components.[17] The experience of pain may vary widely among individuals; differences have been observed by gender,[51] ethnicity,[32,42] and even certain personality characteristics.[41] The pain experience may also vary greatly among individuals reporting equally high levels of pain; while one may function poorly in several areas, another may experience minimal pain-related interference. Although sophisticated diagnostic tools (e.g., imaging studies) can assess anatomic contributions to pain, these are not reliable predictors of the extent to which pain affects functioning, disability, or quality of life.[10,20,22,23,34] More data are needed about factors that influence pain-related function and quality of life among patients with high self-reported pain intensity.

A wealth of evidence indicates that psychological factors and coping strategies play a prominent role in the experience and response to chronic pain. Pain self-efficacy, or a person's belief in his or her ability to cope with pain, is a significant predictor of functional impairment.[21] The strength of this efficacy belief can determine how much effort will be exerted to perform a behavior and how persistent individuals will be in their attempts.[1] Higher levels of efficacy for managing pain have been linked to less functional impairment, affective distress and pain severity,[21] whereas lower levels are associated with more pain severity and worse physical function.[36]

Several other psychological factors, such as pain catastrophizing and fear avoidance, also contribute to pain-related outcomes. Pain catastrophizing is the interpretation of a painful experience in exaggerated and negative terms, magnifying the perception of threat from painful sensations.[31] Fear avoidance is characterized by the avoidance of movements, stimulation, or activities based on the fearful appraisal of a situation.[55,30] The utility of pain catastrophizing and fear avoidance to predict pain outcomes has been demonstrated in observational studies,[29.33,39,49,53] clinical trials,[18,19,44,54] and summarized in meta-analyses.[50,58]

The aim of the present study was to build on prior research by examining factors associated with pain interference among a subset of patients who, despite being prescribed long-term opioid therapy, still endorse high pain intensity. We focus on these patients, as they are at increased risk of opioid dose escalation,[24,35] which increases the likelihood of opioid-related harms.[6] Additionally, although psychological and behavioral factors such as pain self-efficacy, pain catastrophizing, and fear avoidance have demonstrated utility in predicting

impairments in pain-related function and quality of life among patients with chronic pain generally,[21,40,55] the extent to which these factors are significantly associated among patients prescribed LTOT and who continue to experience high pain intensity remains unclear. Identifying characteristics of patients with high pain severity but less pain-related interference may provide insight into coping strategies for chronic pain which result in lower functional impairment and a more optimal quality of life. As pain treatment guidelines are discouraging new initiations of LTOT, and there is greater focus on prescription opioid discontinuation, better understanding the factors that are associated with continued pain interference may help in designing interventions to better manage other patients with chronic pain.

Methods

The present findings focus on baseline data from an ongoing, multisite prospective cohort study; a more comprehensive description of the research methods has been previously detailed.[37]

Settings

Patients with chronic musculoskeletal pain receiving prescriptions for LTOT (n=517) were recruited from two health care systems: Kaiser Permanente Northwest (KPNW) and the VA Portland Health Care System (VAPORHCS). Both settings maintain a full range of medical, mental health and addiction treatment and provide patient care services spanning a total of five hospitals and more than 39 medical clinics throughout Oregon and southwest Washington.

Participants

Participants met criteria for study inclusion if they had at least one documented musculoskeletal pain diagnosis in their medical record within the past 12 months. Participants must also have been receiving a stable dose of prescription opioid therapy for at least 90 consecutive days at the time of enrollment. Dose stability was operationally defined as having no greater than a 10% fluctuation over the past 90 days in the daily morphine equivalent dose of their prescribed opioid(s). An additional inclusion criterion was the ability to read and write in English. Potential participants were excluded if they reported pending litigation or disability claim related to a pain condition, were younger than 18 years of age, received a cancer diagnosis in the last 12 months, were enrolled in an opioid substitution program in the last 12 months, did not have telephone access, or had a current opioid dose greater than 120 mg morphine equivalent. Participants whose only opioid prescriptions were for tramadol or buprenorphine were also excluded.

We identified 2,320 potentially eligible participants and mailed study recruitment materials. Among those identified, 1,814 (78.2%) were contacted to be screened for potential study inclusion, and 915 (50.4% of those contacted) declined. Of those patients who were contacted and expressed interest in participating, 315 (35.0%) were ineligible for the study and were excluded. A total of 517 (331 at KPNW and 186 at VAPORHCS) participants met criteria for eligibility and were enrolled in the study.

Participants were classified as having severe pain intensity if they scored a 70 or higher on the Chronic Pain Grade questionnaire (described in more detail below).[56] Within the enrolled sample, 36.6% of patients (n=189) endorsing severe pain intensity were identified and included in the current analyses. Relative to participants with low or moderate pain intensity, those with severe pain intensity were more likely to be of non-white race/ethnicity, have lower income, more symptoms of depression, anxiety, pain catastrophizing, and fear avoidance; they also reported lower pain self-efficacy.

Study Procedures

Potential study participants were identified based on their past-year ICD-9-CM diagnoses and current prescription opioid use. These data were collected from administrative databases at each respective institution. A personalized invitation providing study details, contact information, and a prepaid postcard to indicate or decline interest in participation was sent to each potential participant. Study staff followed up by phone to provide additional study details, answer questions, and conduct a brief screening. Individuals who met preliminary inclusion/exclusion criteria and indicated interest in participating were scheduled for a baseline assessment. Informed consent was obtained from all participants prior to study enrollment. All patients were administered a battery of well-validated measures assessing pain, mental health, and quality of life. Participants were compensated with a $50 store gift card for their participation. All study procedures were reviewed, approved, and monitored by the Institutional Review Boards of the respective institutions.

Measures

EMR-derived variables—Prescription opioid dose and pain-related diagnoses were extracted from the electronic medical record (EMR). Participants were considered to have a current pain diagnosis if they were diagnosed with the condition in a clinical setting one or more times in the prior year.

Self-report measures—Basic demographic characteristics were collected by self-report. Factors assessed included age, gender, race/ethnicity, marital status, socioeconomic status, and disability status. To verify the accuracy of EMR-extracted opioid dose, patients were asked to confirm their current opioid prescription. Participants were also asked about potential opioid prescriptions from outside sources.

The Chronic Pain Grade (CPG) questionnaire was used to assess pain intensity and pain-related function. The CPG is a commonly used, psychometrically sound measure that provides global scores of pain intensity and interference.[14,45,56] Pain intensity is calculated by the mean intensity ratings for reported current, worst, and average pain within the past three months. Pain-related interference is the mean rating for responses to questions about difficulty performing daily, social, or work-related tasks. Scores on these two subscales range from 0–100, where higher scores reflect greater pain intensity and disability.

The Pain Self-Efficacy Questionnaire (PSEQ) is a well-validated, highly reliable measure used to assess perceived efficacy to cope with chronic pain.[38] Using a 7-point Likert scale, participants rated confidence in ability to perform a range of activities while in pain. The

Pain Catastrophizing Scale (PCS) was used to evaluate catastrophizing.[47] The 13-item measure queries about the degree to which different thoughts or feelings are experienced when in pain. The PCS has high internal consistency and is an empirically-validated instrument.[47] The Fear-Avoidance Beliefs Questionnaire (FABQ) is a well-validated 16-item instrument designed to assess levels of fear and avoidance beliefs patients may have about physical activity and work;[57] the 5-item physical activity subscale was administered in this study.

The Patient Health Questionnaire (PHQ) was used to assess depressive symptoms.[26] The PHQ is a reliable and psychometrically valid measure used to screen for symptoms of depression.[27,46] The 8-item version (PHQ-8) was administered in this study. Anxiety symptoms were assessed using the Generalized Anxiety Disorder-7 Scale (GAD-7), a brief self-report measure designed to assess the severity of anxiety symptoms. This measure has been validated as a robust predictor of the various anxiety disorders.[28,46]

The 3-item Alcohol Use Disorder Identification Test (AUDIT-C) is a validated outcome measure used to screen for the presence of current hazardous alcohol use,[5] which was defined as scores ≥ 4 for men and ≥ 3 for women.[4,16] The Drug Abuse Screening Test-10 (DAST-10) is a highly reliable 10-item measure used to assess abuse of illicit substances.[43] A potential substance use disorder was defined as a DAST-10 score ≥ 2.[7]

Statistical Analyses

Using data from the CPG, participants were classified as having Low (scores of 0 – 39), Moderate (scores of 40 – 69), or Severe (scores of 70 – 100) pain interference, as recommend by the developers of the instrument[56]. To compare demographic characteristics and clinical factors among the three groups, one-way analysis of variance (ANOVA) was used for normally distributed continuous measures and Kruskal Wallis test for non-normal data distribution; chi-square tests were used for categorical measures and Fisher's exact tests were used when small cell counts were encountered. Bivariate analyses were used to test the association of each factor with pain interference. Factors with p-value < 0.20 in the bivariate analyses were considered for inclusion in the multivariate multinomial logistic modeling, which was conducted to examine variables significantly associated with low pain interference. Clinical site, age, race, and gender were included as covariates in the multivariate model as potential confounders. Opioid dose and pain intensity were retained as they have been demonstrated to be associated with pain outcomes in prior research. Non-significant clinical covariates were dropped from the final model after applying the step-wise selection process. Odds ratios and the corresponding 95% confidence intervals were calculated for all factors in the final model. In the multivariate model, we chose to group participants in categories, rather than using a continuous variable, in order to remain consistent with the three categorizations of pain interference and for ease of interpretation. As a sensitivity analysis, we re-ran the multinomial logistic model as a linear model and the results were similar to the logistic model. All data analyses were conducted using SAS version 9.4.

Results

Among patients prescribed LTOT with high self-reported pain intensity, 16.4% (n=31) had low pain interference, 39.2% (n=74) had moderate pain interference, and 44.4% (n=84) had high pain interference. There were no significant differences on demographic characteristics among the three groups. The average age of all participants was 59.7 (11.3) years, 58.2% were male, 76.7% were white/Caucasian, and 54.5% were married or living with a partner. Most participants were not working (32.3% retired, 34.4% disabled, and 7.4% unemployed). See Table 1 for a full comparison of demographic characteristics among the three groups.

Participants in the low pain interference group did not differ significantly in their average daily opioid dose (average dose for all participants was 39.1 [27.4] mg morphine equivalent dose) or likelihood of certain pain diagnoses, relative to participants in the moderate or high pain interference groups. Significant between group differences were evident on scores of depression severity, anxiety severity, pain catastrophizing, and pain self-efficacy. In post-hoc analyses, participants in the low or moderate pain interference groups had significantly lower scores of depression (7.8 and 10.4 versus 13.1, $p < 0.05$) and pain catastrophizing (13.5 and 16.9 versus 21.4, $p< 0.05$), and higher pain self-efficacy (39.4 and 34.6 versus 26.7, $p < 0.05$) than participants in the high pain interference group. Post-hoc tests were non-significant for between group differences on anxiety severity. There were no significant differences among groups on scores of fear avoidance, current hazardous alcohol use, or potential substance use disorder (Table 2).

A summary of correlations among the clinical variables is presented in Table 3. Variables significantly associated with pain interference were eligible to be included in the regression analysis. Table 4 presents results of the multivariate multinomial logistic regression analysis. There were no individual factors that significantly differentiated between the low interference and moderate interference groups. After adjusting for covariates (clinical site, age, gender, race, opioid dose, and pain intensity), depression severity and pain self-efficacy were significantly associated with low pain interference relative to severe interference. The odds of being in the low interference group, relative to the high interference group, were 0.90 (95% CI = 0.82 – 0.99) times lower with every one unit increase in depression score and 1.07 (95% CI = 1.02 – 1.12) times higher with every one unit increase in pain self-efficacy.

We conducted a sensitivity analysis of the multivariate model with pain interference as a linear continuous variable, rather than grouping participants based on interference. The overall model was significant ($F = 6.35$, $p \leq 0.001$), and depression severity and pain self-efficacy were significantly associated with pain interference (p-values ≤ 0.05).

Discussion

Of participants prescribed LTOT who reported current severe pain intensity, 16.4% (n=31) endorsed low pain interference. Consistent with prior research, variables that were significantly associated with pain interference were depression severity and self-efficacy for managing pain. Our results support further implementation of interventions for identifying

and treating depressive symptoms in patients with chronic pain. Interventions aimed at building patient self-efficacy to better manage chronic pain also deserve further evaluation in this context, as they may also mitigate opioid-related harms and functional impairment.

Depressive symptoms are common among patients who initiate[12,48] and are maintained on LTOT.[3,35] The optimal treatment for chronic pain addresses factors that precipitate and maintain pain and impairments in functioning and quality of life. Prior research demonstrates that collaborative care approaches can effectively treat patients who have co-occurring chronic pain and depressive symptoms.[11,25] This treatment model includes utilizing multimodal interventions, such as cognitive behavior therapy, and referrals to a specialty pain clinic, complementary and integrated health treatment options, mental health care, or substance use treatment program.

Study results also suggest that higher pain self-efficacy is significantly associated with low pain interference. This finding replicates other research and suggests that pain self-efficacy may be specifically targeted in chronic pain treatment.[21] For example, success has been found with a six-session pain self-management program targeting self-efficacy to manage symptoms of pain and depression.[8] However, the current study findings yielded small odds ratios with regards to pain self-efficacy, suggesting the impact of this variable on pain interference in the current sample may not be large.

Other psychological factors that have demonstrated significance in predicting pain treatment outcomes were not independently associated with pain interference in the current study. Pain catastrophizing was significantly associated with pain interference in bivariate analyses, but was non-significant in the multivariate analyses, and fear avoidance was also non-significant. While it remains unclear why these were non-significant in the regression analyses, self-efficacy for managing pain, which is highly correlated with pain catastrophizing and fear avoidance, was included and may have been more robustly associated with the outcome in the current sample. While pain self-efficacy is highly correlated with these variables[2,9] and may have impacted our ability to detect significant effects in the regression analyses, the findings may also suggest that self-efficacy for managing pain may be the psychological variable of principal interest, when examining variables most associated with pain-related outcomes in patients prescribed LTOT.

Several limitations should be considered in interpreting study results. The cross-sectional design of this study limits any causal inference about the relationships tested. However, this group is being followed prospectively, which will allow for further analyses about pain-related outcomes and functional impairment over time. An important limitation of our study is the absence of a comparison group of patients with chronic pain who are not prescribed LTOT. If such patients have important demographic, psychological, or clinical differences from those who receive LTOT, we would not be able to identify how pain interference may interact with such variables. Nonetheless, many patients with chronic pain do receive LTOT, and understanding differences between those with high or low pain interference may be clinically useful. Replication of these results in other samples and settings would increase confidence of the validity of study findings. We also had low statistical power for some

comparisons, as well as small odds ratios; thus, these results should be interpreted with caution.

As commonly-used medications for chronic pain often yield limited benefit in reducing pain intensity,[13,15,52] clinicians may increasingly consider treatments that affect pain-related function and quality of life. Study findings suggest that among patients prescribed LTOT, interventions that address pain self-efficacy and depressive symptoms may be valuable targets for study in enhancing pain treatment outcomes. Future research would benefit from prospective study designs, to better understand whether and how such interventions may improve pain-related function.

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Highlights

- We assessed pain interference among patients with high pain intensity.
- Those with lower pain interference had fewer mental health symptoms.
- Depressive symptoms and pain self-efficacy were associated with pain interference.
- Interventions targeting pain self-efficacy and depression are recommended.

Perspective

This article describes the prevalence and correlates of pain interference categories (low, medium, and high) among patients with high pain intensity who are prescribed long-term opioid therapy. Findings reveal that 16.4% of participants with high pain intensity had low impairment. Multivariate analyses indicate variables significantly associated with low pain interference were lower depression scores and higher pain self-efficacy.

Table 1

Comparison of Demographic Characteristics.

	Pain Interference			
	Low (n=31)	**Moderate (n=74)**	**High (n=84)**	***p*-value**
Age, mean (SD)	58.6 (14.6)	60.2 (11.5)	59.6 (9.8)	0.802
Male Gender, % (n)	54.8 (17)	58.1 (43)	59.5 (50)	0.903
Education, % (n)				0.535
High school or less	19.4 (6)	23.0 (17)	20.2 (17)	
Some college or technical school	64.5 (20)	52.7 (39)	48.8 (41)	
College graduate or more	16.1 (5)	24.3 (18)	31.0 (26)	
Race – White, % (n)	77.4 (24)	79.7 (59)	73.8 (62)	0.676
Marital Status, % (n)				0.442
Single/Never married	9.7 (3)	6.8 (5)	6.0 (5)	
Married/Living with partner	41.9 (13)	54.1 (40)	59.5 (50)	
Divorced/Separated	45.2 (14)	31.1 (23)	25.0 (21)	
Widowed	3.2 (1)	8.1 (6)	9.5 (8)	
Income, % (n)				0.676
Less than $30,000	41.9 (13)	37.8 (28)	32.1 (27)	
$30,000 – $69,999	32.3 (10)	36.5 (27)	44.1 (37)	
$70,000 or more	25.8 (8)	21.6 (16)	17.9 (15)	
Employment Status, % (n)				0.732
Working	29.0 (9)	31.1 (23)	20.2 (17)	
Unemployed	9.7 (3)	6.8 (5)	7.1 (6)	
Disabled	32.3 (10)	29.7 (22)	39.3 (33)	
Retired	29.0 (9)	32.4 (24)	33.3 (28)	

Note. Reported *p*-values are results of bivariate comparisons among the three pain interference groups.

Table 2

Comparison of Clinical Factors.

	Pain Interference			
	Low (n=31)	**Moderate (n=74)**	**High (n=84)**	***p*-value**
Opioid Dose	34.2 (26.2)	37.2 (27.3)	42.7 (27.8)	0.246
Back Pain	58.1 (18)	56.8 (42)	67.9 (57)	0.319
Arthritis	71.0 (22)	67.6 (50)	67.9 (57)	0.938
Neck/Joint	67.7 (21)	46.0 (34)	54.8 (46)	0.118
Depression Severity	7.8 (5.5)[a]	10.4 (5.1)[a]	13.1 (5.6)[b]	< 0.001
Anxiety Severity	6.8 (5.9)[a]	7.6 (5.1)[a]	9.5 (6.2)[a]	0.038
Pain Catastrophizing	13.5 (11.9)[a]	16.9 (11.3)[a]	21.4 (13.5)[b]	0.005
Fear Avoidance Beliefs	17.9 (6.8)	18.6 (6.6)	20.5 (6.8)	0.086
Pain Self-Efficacy	39.4 (16.6)[a]	34.6 (11.1)[a]	26.7 (11.9)[b]	< 0.001
Hazardous Alcohol Use	9.7% (n=3)	13.5% (n=10)	8.3% (n=7)	0.569
Potential Substance Use Disorder	12.9% (n=4)	13.5% (n=10)	13.1% (n=11)	1.000

Note. Numbers above represent mean scores and standard deviation for linear variables and % (n) for categorical variables. Reported *p*-values are results of bivariate comparisons among the three pain interference groups. Scores with different superscripts differed significantly in post-hoc testing. Pain diagnostic data were gathered from the electronic medical record. Depression severity was assessed using the PHQ; anxiety severity was assessed using the GAD-7. Pain catastrophizing, fear avoidance beliefs, and pain self-efficacy was measured by the PCS, FABQ, and PSEQ, respectively. Hazardous alcohol use was assessed with the AUDIT-C; potential substance use disorders were assessed using the DAST-10.

Table 3

Correlations among clinical variables.

	Pain Intensity	Pain Interference	Depression	Anxiety	Pain Catastrophizing	Fear Avoidance	Pain Self-Efficacy	Hazardous Alcohol Use	Substance use
Pain Intensity	--								
Pain Interference	0.23**	--							
Depression	0.31***	0.36***	--						
Anxiety	0.19**	0.20**	.074***	--					
Pain Catastrophizing	0.31***	0.27***	0.55***	0.60***	--				
Fear Avoidance	0.07	0.14	0.07	0.14	0.23**	--			
Pain self-efficacy	−0.12	−0.39***	−0.50***	−0.41***	−0.51***	−0.28***	--		
Hazardous Alcohol Use	−0.10	−0.01	0.01	−0.01	0.03	−0.04	0.08	--	
Substance use	0.11	−0.04	0.14	0.18*	0.26***	0.11	0.26***	0.12	--

Note:

* $p < 0.05$;

** $p < 0.01$;

*** $p < 0.001$.

Table 4

Multivariate test of factors associated with low pain interference.

Variable	Low Interference vs Moderate Interference		Low Interference vs Severe Interference	
	Odds Ratio	95% Confidence Interval	Odds Ratio	95% Confidence Interval
Kaiser Permanente Northwest	0.47	0.16 – 1.38	0.81	0.26 – 2.53
Age	0.98	0.95 – 1.02	0.98	0.94 – 1.02
Female gender	1.98	0.67 – 5.87	1.82	0.57 – 5.82
White race	1.13	0.38 – 3.36	1.03	0.34 – 3.12
Opioid dose	1.00	0.98 – 1.02	0.99	0.98 – 1.01
Pain intensity	1.04	0.96 – 1.13	0.95	0.87 – 1.02
Depression	0.92	0.83 – 1.01	0.90	0.82 – 0.99
Self-efficacy	1.02	0.98 – 1.06	1.07	1.02 – 1.12

Note. Odds ratios and 95% confidence intervals reflect variable results in the final model.