Anxiety and Fear Avoidance Beliefs and Behavior May Be Significant Risk Factors for Chronic Opioid Analgesic Therapy Reliance for Patients with Chronic Pain—Results from a Preliminary Study

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Abstract

Objective. To describe differences between patients with chronic, non-cancer pain (CNCP) who were successfully able to cease full mu agonist chronic opioid analgesic therapy (COAT), and those who exhibited refractory COAT reliance, among those who participated in a multidisciplinary program designed for COAT cessation. Design. A retrospective review of electronic medical records (EMR) data was organized for preliminary analysis. Setting. A multicenter private practice specializing in CNCP, which received patient referrals from the surrounding geographical area of primary and specialty care offices in Northern California. Subjects. Data from 109 patients with CNCP who participated in a multidisciplinary program to cease COAT between the dates of October 2017 to December 2019 were examined. Methods. EMR data, pre-COAT cessation, of oral morphine milligram equivalence (MME) and validated questionnaire responses assessing anxiety and fear-based beliefs and behavior, as well as opioid misuse, were extracted and compared between those who successfully ceased COAT and those who did not. Results. Patients who were unsuccessful at COAT cessation reported significantly higher Fear Avoidance Beliefs Questionnaire (FAB) scores. No significant differences were found based on incoming MME amounts, Current Opioid Misuse Measure (COMM) or Tampa Scale of Kinesiophobia (TSK) scores. Pain Catastrophizing Scale (PCS) scores showed a split pattern with unclear significance. Conclusions. Results suggest that fear avoidance beliefs and behavior, as measured by the FAB, play a significant role in refractory COAT reliance for patients with CNCP.

Introduction

The Negative Sequelae of Chronic Opioid Analgesic Therapy (COAT)

The practice of using full mu agonist chronic opioid analgesic therapy (COAT) in the setting of CNCP has had detrimental impacts on an individual as well as a societal level in The United States [1–3]. Even when used as prescribed, COAT use is associated with significant negative clinical outcomes for the individual patient. Long-term side effects include hypogonadism [4] and immunocompromise [5]. A myriad of adverse immediate effects are also common [6], such as constipation, dry mouth, urinary retention, emotional blunting and cognitive impairment. COAT can also lead to overdose-related mortality, even in patients who use it exactly as prescribed, in times of physiological stress or unfortunate medication interaction. On the societal level, COAT is a significant contributor to the concerningly high levels of mortality and morbidity imparted by the opioid epidemic—due to compliant use as well as diverted
prescription drug misuse—which has decreased the average American lifespan in recent years compared to other developed countries [1, 3, 7].

In terms of a comprehensive treatment approach, the practice of using COAT for CNCP has been correlated to worsened outcomes. COAT has been shown to impede vocational and social return to function and increase length of disability in injured workers [8]. It is also associated with increased systemic inefficiencies and healthcare utilization as well as medical-legal actions [9]. In one study of over 1,300 participants with chronic disabling occupational spinal disorders, patients dependent upon opioids had a significantly greater length of disability (24.54 vs 17.08 months), were 2.5 times as likely to have had surgery and were 1.5 times more likely to be represented by an attorney when compared to case controlled patients with similar pathology who were not dependent upon opioids [9].

Called to action by the 2016 guidelines from The Centers for Disease Control and Prevention [1], the medical community has been discussing best-practice approaches to decrease the use of COAT for CNCP. Differing approaches have been met with varying levels of success of opiate cessation [10–40]. Despite these efforts, a definitive best-practice treatment approach to the conundrum of COAT reliance in CNCP remains elusive. This may be related to the fact that still little is known about the variables that influence refractory COAT reliance in the first place.

Anxiety and Fear-Based Beliefs and Behavior
Anxiety and fear-based beliefs and behavior have been strongly implicated in certain aspects of the negative chronicity experienced by those who suffer from CNCP. Such beliefs and behavior have been associated with increased disability [19, 43–48], pain intensity, emotional distress [43], and absenteeism [19]. Studies have shown, and replicated, that fear of movement and reinjury is a better predictor of self-reported disability than biomedi cal findings or pain intensity levels [49, 50]. Anxiety and fear-based beliefs and behavior have also been documented to affect opioid use in terms of prolonging post-operative use, increasing opioid craving, and contributing to general misuse [51–54]. These behavioral trends drew researchers for this present study to question whether COAT reliance in CNCP is similarly sustained by anxiety and fear-based beliefs and behavior.

Clinically similar schematics between COAT reliance and the negative chronicity of CNCP further support the hypothesis that both phenomena have a foundation in anxiety and fear-based beliefs and behavior. First, fear avoidance of pain, from the stance of learning theory, is a self-perpetuating dynamic in which anticipated consequences require little reinforcement to create long-term habitual behavior [55]. Expectations of pain hinder physical activity, regardless of actual pain, and this expectation is rarely confronted, so is not disproved, leading to deconditioning and further disability [44, 56, 57]. This self-perpetuating, learned dynamic is also applicable in the context of COAT, as many patients associate the action of taking a scheduled opioid with that of prophylactically avoiding or escaping pain, and thus rarely confront the unadulterated experience of their physical pain, spiraling deeper into the habit and resulting sequela of COAT use. This dynamic is even more entrenched in the case of opiate use, as it is reinforced by dopaminergic incentivization and abrupt abstinence syndrome disincentivation [58]. Second, fear-based avoidance of physical activity may be initially adaptive, but becomes maladaptive when applied chronically, as it leads to deconditioning, further injury, increased pain, social withdrawal, and even depression [59]. Similarly, opioid therapy is initially adaptive in the contexts of acute injury and peri-operative pain management, but the sequela of COAT inflict those who do not cease use. Third, despite the fact that many experience an acute low back pain episode at least once during a lifetime, only a small minority develop a chronic low back pain problem [60]. Likewise, many people may utilize a short course of opiate analgesics for an acute injury, but do not go on to require COAT, regardless of the severity of injury.

The Fear Avoidance Beliefs Questionnaire (FAB), Pain Catastrophizing Scale (PCS), and Tampa Scale for Kinesiophobia (TSK) are frequently employed to assess anxiety and fear-based belief and behavior. While these tools assess similar phenomena, their interchangeability has been negated in investigative comparisons [50, 61–64], posing the possibility that they each may have specific applications within the realm of anxiety and fear-based beliefs and behavior assessment. Some have also been proposed to be pragmatic tools to investigate and improve treatment model efficacy. Targeted psychosocial therapy to improve PCS scores has been shown to be efficacious in expediting return to work after a period of disability [61]. FAB analysis may help determine which clinical interventions will have an increased probability of a successful outcome for patients with CNCP [44, 65, 66].

The Fear Avoidance Model
There are so many similarities between the classic fear avoidance model of CNCP [44, 67–69] and the clinical course of COAT, that the fear avoidance model can be coopted to illustrate the different paths for patients who rely upon COAT versus those who don’t (Figure 1). The basic tenet of the model is that the way in which pain is interpreted leads to two potential pathways. When pain is perceived as no or low threat, patients are likely to only use a short course of opiates. In contrast, a vicious circle may be initiated when the pain is catastrophically misinterpreted, giving rise to pain-related fear, and associated avoidance/escape (opioid use) and hypervigilance. In both models, uncertainty about a diagnosis leads to increased
fear avoidance beliefs, regardless of the pathological severity or anatomical patterns of pain [44]. While the avoidance route can be adaptive in the acute pain stage, it paradoxically entrenches and strengthens the reliance upon COAT in the subacute and chronic stages of pain, which invites negative chronicity. Eventually, the long-term consequences, such as disability [8] and morbidity [1, 3] and depression [51, 70–73], further decrease the ability to access resilience-building, non-COAT pain coping mechanisms.

Study Objectives
The above similarities prompted an exploration of anxiety and fear-based beliefs and behavior in relation to COAT use in the clinical setting. The inquiry undertaken by the researchers was: if it is so that disability and negative chronicity in the setting of CNCP is strongly motivated by anxiety and fear-based beliefs and behavior [44, 47], could it also be that COAT reliance in the setting of CNCP is similarly motivated? To further that inquiry, the present study was undertaken with the objective to examine the variables associated with COAT cessation outcomes among patients with CNCP who participated in a multidisciplinary program designed for COAT cessation.

Methods
Study Design
Data were collected via a retrospective review of the electronic medical records (EMR)—decoupled from individually identifying features—comparing the incoming measures of 109 patients with CNCP who participated in a multidisciplinary program [73] designed to promote COAT cessation. Standardized and previously validated psychological questionnaires were given to each patient at orientation (pretreatment and pre-COAT cessation). Comparisons were made between the pretreatment questionnaire scores, incoming MME, and gender of those who successfully ceased COAT use and those who did not. Data were analyzed for participants in the programs that ran between the dates of October 2017 to December 2019. Measures from every patient who started the program were included in the study. As measures were taken from the first day of the program, no data was lost from program incompletion. Those who did not graduate from, or complete, the program or who failed to cease COAT were considered unsuccessful and were included in the data as such. Unsuccessful patients have been labeled as being refractorily reliant upon COAT for the purposes of this paper.

The multidisciplinary program commenced as a circumscribed, higher acuity treatment entity under the auspices of a multicenter private practice specializing in CNCP, which received patient referrals from the surrounding geographical area of primary and specialty care offices in Northern California. These referral sources were diverse and included Federally Qualified Health Care Centers, unaffiliated private practices, hospital-affiliated clinics, occupational medicine providers and workers compensation entities. Two centers and two different clinical teams participated in administering the program. Funding for the program occurred via routine medical fee-for-service billing for treated patients. The researchers analyzed the data presented here through the course of program-related quality assurance measures. No other funding was present for this study. This study

Figure 1  Fear avoidance visual model of COAT reliance. (Adapted from Leeuw [69], Lethem [67], Vlaeyen [68], and Waddell [44].)
was reviewed by a private IRB and was determined exempt from full review.

Participants
By default, the subjects of the present study met the inclusion criteria of the clinical program—adults who consented (as opposed to were mandated) to a group program for the purpose of COAT cessation and carried a diagnosis of CNCP from any etiology; had used daily COAT at the time of admission or had struggled to maintain recent opioid cessation; had tried and failed or plateued on an opioid wean previously; and were failing to meet realistic functional and analgesic goals, despite participation in traditional outpatient COAT for CNCP treatment, as determined by the individual patients and/or their primary care teams. COAT used by participants at program initiation were any form of commercially available oral or transdermal long and short-acting preparations obtained while under the care of a physician. Program participation was determined via a semi-structured, motivational interviewing style evaluation between each participant and one of the qualified program clinicians.

Exclusion criteria from the program were candidates who:

- Did not carry a diagnosis of CNCP
- Were actively engaging in opioid diversion
- Had an active substance use disorder, or comorbidity, of significant acuity to be appropriate for higher than Level 1 (outpatient) services as defined by The American Society of Addiction Medicine (ASAM) [77], including: a biomedical or psychological comorbidity of moderate intensity or higher (ASAM Dimensions 2 and 3, respectively; Level 2 or higher intensity) [77] during the proposed time of program participation.
- Had a neurocognitive or neurodegenerative disorder that precluded the ability to actively participate in care-planning decisions and/or reliably follow written instructions.

Intervention
The group multidisciplinary program was built around a standardized curriculum designed to transition patients with CNCP off COAT. The treatment occurred over a week in a 6-hour session for 10 weeks. The curriculum entailed group cognitive behavioral therapy (CBT) emphasizing pain coping skills and mood regulation, complementary care modalities delivered in a group setting (such as biofeedback, mindfulness, acupuncture and gentle motion), and individualized medication management. Every activity was led by a licensed or credentialed expert in that field—such as a physician, nurse practitioner, psychologist, licensed acupuncturist, and physical therapy assistant. Extended panel urine drug screen was mandated at every meeting to corroborate participant compliance. Participants were determined to have successfully graduated from the program if COAT cessation was achieved in one of four ways: a complete transition to buprenorphine, an abstinence without transitional medication assistance, a maintenance of recent COAT abstinence in the context of reported struggle with craving or coping, or a reduction of incoming buprenorphine dose by over 50% in incoming patients not using full mu agonist opioids for analgesia. For the purposes of this paper, graduation and COAT cessation, as defined by the pathways above, are synonymous.

Measures
Pain Catastrophizing Scale
The PCS determines patients’ levels of pain catastrophizing [43]. Catastrophic thinking has been implicated as a risk factor for increased disability length, pain intensity and emotional distress, as well as prolonged time out of work after a physical injury [43]. Several studies have supported the reliability and the validity of the PCS among patients with chronic pain [46, 51, 53, 69]. A score of 30 or more has been declared clinically relevant [43], however, lower scores have been associated with chronicity of prolonged recovery and delayed return to work [62].

Fear Avoidance Beliefs Questionnaire—Work and Physical Activity
The FAB consists of two subscales: The Work subscale (FAB-W) and The Physical Activity subscale (FAB-PA). Several studies have supported the validity and reliability of the FAB for the assessment of fear avoidance among patients with CNCP [49, 68, 69, 75, 79]. The optimal cut off for determining a significant FAB score in relation to negative chronicity in CNCP has been studied in several contexts and varies accordingly [44, 68, 75, 77-80]. A higher FAB score been shown to correlate with an increased probability of current and future work loss and disability [19, 44, 47] as well as social withdrawal [48]. Of note, some of the utility of the FAB-W has been shown to differ between privately and industrially insured patients [66].

Tampa Scale of Kinesiophobia
The TSK is a measure of fear of movement, injury or reinjury. It is reliable with a Cronbach alpha of 0.77 [49]. A score of 37 or over is considered a score for clinically significant Kinesiophobia [49], though different score percentiles have been validated for backpain versus fibromyalgia [49, 81, 82]. TSK scoring is interconnected with decreased physical performance and increased pain intensity, depressive symptoms, pain-related anxiety, and perceived disability [45].

Current Opioid Misuse Measure
The COMM is a self-report questionnaire that was developed to identify patients prescribed COAT for CNCP who are exhibiting aberrant and/or opioid misuse behavior [83]. The COMM was designed to help clinicians stratify levels of monitoring or specialty referrals for
patients with CNCP using COAT. A score of 9 or greater identifies a patient who is at high risk of opioid misuse or abuse with a 77% sensitivity and 66% specificity [83]. The COMM screens for problematic behavior that may increase opioid misuse risk but does not differentiate between the causes of behavior (i.e., mood disorders, general non-adherence, addiction, etc.), and thus, positive scores may warrant different clinical responses [84].

Data Analysis

Fisher’s Exact Test and Probability Plot

The Fisher’s exact test [85–87] was conducted to determine whether incoming MME (Table 1) was related to COAT cessation, as it amends the potentially invalidating issue of a low cell count of categorical variables, when compared to \( \chi^2 \) statistics. Originally, incoming MME was a continuously-scaled variable; however, the distribution was skewed. To rectify the situation, incoming MME was converted into an ordinal variable using the value of 90 as the cutoff; 90 MME was chosen because it is the generally recognized cutoff for high dose opiates, as the 2016 CDC guidelines suggest clinicians should avoid increasing dosage beyond it [1].

Penalized Regression

Penalized regression, also known as generalized regression [88], was utilized to identify the potential predictors of the failed COAT cessation based on psychological questionnaires (Table 2). In traditional ordinal logistic regression, the variable selection process is subject to the order of entering the potential predictors. Thus, usually there is no unique solution and the model may be unstable across different samples. In penalized regression when different predictors enter the model, a penalty is imposed on the model in order to avoid complexity. There are different types of penalized regression and in this study elastic net, which integrates LASSO and ridge regression, was chosen. In LASSO the regression coefficients of unimportant variables were assigned as zero while in ridge regression the regression coefficients of those predictors were shrank towards zero. The term “elastic net” is so named because different paths to the solution were explored in order to identify the best model.

Linking and Brushing

After significant predictors of the outcome were identified by penalized regression analysis, linking and brushing (Figure 2) [89], which is a data visualization technique, was employed to examine the relationships between the outcome and the predictors. In this dynamic visualization approach, the distributions of the dependent and independent variables are displayed in interconnected panels. When certain observations are shaded in one panel, the corresponding observations are also shaded so that the inter-relationships between variables can be revealed.

Decision Tree

The decision tree approach, also known as the partition tree or the classification tree [90, 91] was employed to determine the threshold of FAB-PA and FAB-W scores that conferred risk of failed opiate cessation (Figure 3A and B). The partition process in the decision tree is built upon information theory with the goal of achieving homogeneity of the partitioned group. In the process the decisive split-point was found so that observations that are similar in terms of the dependent outcome can be grouped together.

Results

Descriptive Statistics and Gross Observations

Descriptive statistics were derived from the retrospective data found in the demographic and prescription sections of the EMR. A 90% success rate of participant COAT cessation by the time of graduation was revealed across all participants. Participants ranged in age from 27 to 88 years old; 69% were identified as female. There were only two unsuccessful male participants, making the association between gender and COAT cessation indeterminate, due to the small sample size.

Inferences can be made about the socioeconomics of the studied population based on the program design and the EMR report of patients’ insurance payers: approximately 30% of participants were insured by Medicare, 25% by industrial insurers, 10% by Medicaid, <1% participated without insurance, and the remainder had commercial insurance (approximately 44%). Program participation occurred during customary business hours, making it only available to participants who had flexible work schedules, were not working due to retirement or disability, or were employed part-time.

MME via Fisher’s Exact Test

Table 1 is the crosstab of COAT cessation success by incoming MME. Fisher’s exact test amends the issue of low cell counts and indicates a nonsignificant P value: .7069.

Psychological Assessments Scores via Penalized Regression

The result of penalized regression, as shown in Table 2, reveal that the scores of PCS, FAB-PA, and FAB-W were found to be significant indicators of unsuccessful COAT cessation. The regression coefficients of COMM and TSK were shrank to zero, meaning that these two variables were not significant.

Linking and Brushing between Outcomes

The relationship between the outcome and the predictors were further investigated by linking and brushing. The
top panel of Figure 2 indicates that all patients who were unsuccessful to cease COAT have high FAB-PA and FAB-W pretest scores. However, in the same observations the PCS pretest scores were both high and low. Hence, while there is an association between high FAB-PA&W scores and unsuccessful COAT cessation, the relationship between PCS and lack of success is not clear. The bottom panel of Figure 2 shows that there is no discernable pattern among patients who were successfully able to cease COAT in relation to the significant predictors. To be specific, this regression model has no predictive power for successful COAT cessation, only potentially for refractory COAT reliance.

Table 1. Incoming MME by ultimate outcome of unsuccessful vs successful COAT cessation

| Count | Successful | Total |
|-------|------------|-------|
| Col % |            |       |
| Row % |            |       |
| Low (90 MME or less) | 9 | 75 | 84 |
| 81.82 | 76.53 |
| 10.71 | 89.29 |
| High (> 90 MME) | 2 | 23 | 25 |
| 18.18 | 23.47 |
| 8.00 | 92.00 |
| Total | 11 | 98 | 109 |

COAT = chronic opioid analgesic therapy; MME = morphine milligram equivalence.

Table 2. Psychological assessment indicators of unsuccessful coat cessation via the penalized regression model

| Variable | Estimate | Std. Error | Wald $\chi^2$ | $P$-value | Lower 95% CI | Upper 95% CI |
|----------|----------|------------|---------------|-----------|--------------|--------------|
| Pretesting: PCS | 0.8043529 | 0.0945233 | 72.41278 | $<$0.0001* | 0.6190906 | 0.9896152 |
| Pretesting: FAB-PA | 7.2716044 | 0.9384139 | 60.044282 | $<$0.0001* | 5.432347 | 9.1108618 |
| Pretesting: FAB-W | 1.545901 | 0.2034496 | 57.736388 | $<$0.0001* | 1.944655 | 1.147147 |
| Pretesting: COMM | 0 | 0 | 0 | 1.0000 | 0 | 0 |
| Pretesting: TSK | 0 | 0 | 0 | 1.0000 | 0 | 0 |

COMM = Current Opioid Misuse Measure; FAB-PA = Fear Avoidance Behavior Physical Activity; FAB-W = Fear Avoidance Behavior Work; PCS = Pain Catastrophizing Scale; TSK = Tampa Scale of Kinesiophobia.
FAB Threshold via Decision Tree

The decision tree approach, also known as the partition tree or the classification tree [90, 91] was employed to determine the decisive split-point, or cut off, for FAB scores that correlate with unsuccessful COAT cessation. In Figure 3A and B, the grey bar represents the observations with unsuccessful COAT cessation, whereas the black bar denotes those with successful COAT cessation. According to the left node of the decision trees, when FAB-PA is less than 12, and the FAB-W is less than 24, only a few participants are unsuccessful. It is crucial to emphasize that the threshold for risk of unsuccessful COAT cessation was determined by the algorithm, not the analyst.

Discussion

The present findings give strength the theory that elevated anxiety and fear-based beliefs and behavior support COAT reliance, much as they support disability and the negative chronicity of CNCP [69], as measured by the FAB. The consistently elevated FAB-PA score for patients unable to cease COAT use suggests that fear avoidance of physical activity is a significant factor for refractory COAT reliance. Though the FAB-PA value of 12—suggested here as a threshold for risk—is low, relative to previous studies [44, 77], it is consistent with the phenomena that differing FAB scores have been reported to be significant amongst different populations for differing purposes [75, 77, 80]. These findings suggest a potentially novel application for the FAB-PA, which has historically been less well correlated with specific outcomes when compared to the FAB-W [44, 75, 77]. The present results for the FAB-W hold up less well to external validation, as this questionnaire was originally validated for patients who are currently, or were recently, working [44, 75, 77], and validity was shown to change based on insurance payer type [66, 78]. As the current study did not separate participants who identified as disabled or retired, nor did it control for insurance type, the significance of the FAB-W results is uncertain in this study.

It is notable that the PCS and TSK did not uniformly trend with the FAB-PA in relation to refractory COAT reliance. The consideration must be entertained that the FAB-PA results could be a red herring and should be confirmed with repeated or larger studies. However, while the TSK, FAB, and PCS all measure anxiety and fear-based beliefs and behavior around pain, previous investigations into their instrumental interchangeability have frequently failed to show cross-over reliability without reducing contributory revelations [50, 61–64]. The present study is consistent with previous studies that lacked interchangeability, suggesting that COAT cessation may be an additional area in which applicability of these assessment instruments differs. This phenomenon supports previous calls for the research and development of more specific assessment tools for targeted biopsychosocial screening [68], which could potentially be used to direct more efficient risk identification tools and interventions for refractory COAT reliance.

Also remarkable in this study is the data pertaining to COMM scores, in that there was no correlation between higher scores and refractory COAT cessation. It has been warned in previous COMM validations that this test is vulnerable to respondent manipulation and false report [92], which could affect the generalizability of our findings. However, the potential that refractory COAT reliance in the setting of CNCP is more strongly correlated to anxiety and fear-based beliefs and behavior than to aberrant opioid-related behavior, would unveil nuances underlying this reliance, which is frequently misunderstood as a phenomenon bordering opiate use disorder as defined by the DSM-5 [93]. The current findings may help better define and distinguish different motivations that manifest in similar displays of opioid reliance, thus setting the stage for more refined avenues of assessment and treatment for similarly presenting opioid-related behaviors.

Finally, the noncontribution of incoming COAT MME is a noteworthy finding. Anecdotally, clinicians frequently assume that patients using COAT with a higher MME are more likely to be refractory to

Figure 3 (A., B) Decision tree of FAB score cut off with reference to unsuccessful COAT cessation. (A, B), Light gray bar represents the observations with unsuccessful COAT cessation, whereas the black bar denotes those with successful COAT cessation. According to the left node of the decision trees, when FAB-PA is less than 12, and the FAB-W is less than 24, only a few participants are unsuccessful.
This article discusses the impact of fear avoidance on beliefs and clinical outcomes, focusing on patients with chronic non-mechanical pain (CNCP) and opioid analgesia reliance. The data presented here may inform the effort within the medical field toward continuing to establish efficient and effective best-practice approaches for the treatment of patients with CNCP who rely upon COAT. It has been documented that targeted educational campaigns matching specific treatment to certain patient characteristics can have a positive effect on beliefs and clinical outcomes. Specifically, studies have utilized trends in psychological assessments related to anxiety and fear-based beliefs and behavior to affect positive change in disability related to CNCP. One study found that successfully lowering fear avoidance scores in patients with chronic back pain, through an educational campaign, resulted in subsequently decreased reports of disability in the same patients, despite no improvement in pain.

The present results suggest that fear avoidance beliefs and behavior, as measured by the FAB-PA, play a significant role in refractory COAT reliance for patients with CNCP and that incoming MME and COMM scores are noncontributory. While reproducibility of these preliminary results in larger and more varied settings will be key to better understanding the relationship between COAT cessation and anxiety and fear-based beliefs and behavior, this study builds upon an ongoing discussion within the medical community aiming to identify and address factors relating to refractory COAT reliance. The investigators are hopeful that insights gained from this report will help researchers and clinicians narrow the scope of inquiry around useful assessments and interventions for best-practice approaches to COAT cessation in the population with CNCP.

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References

1. Dowell D, Haegerich TM, Chou R. CDC guideline for prescribing opioids for chronic pain—United States, 2016. MMWR Recomm Rep 2016;65(1):1–49.
2. Rudd RA. Increases in drug and opioid-involved overdose deaths—United States, 2010–2015. MMWR Morb Mortal Wkly Rep 2016;65:1445–1452.
3. Xu J, Murphy SL, Kowal KE, Arias E. Mortality in the United States, 2018. NCHS Data Brief 2020;(355):1–8.
4. Antony T, Alzaharani SY, El-Ghaishe SH. Opioid-induced hypogonadism: Pathophysiology, clinical and therapeutics review. Clin Exp Pharmacol Physiol 2020;47(5):741–50.
5. Eisenstein TK, Rogers TJ. Drugs of Abuse. In: Ikezu T, Gendelman HE, eds. Neuroimmune Pharmacology. Switzerland: Springer International Publishing; 2017:661–78.
6. Abuse NI on D. Prescription Opioids DrugFacts. National Institute on Drug Abuse. Published May 27, 2020. https://www.drugabuse.gov/publications/drugfacts/prescription-opioids.(accessed October 2020)
7. Silva MJ, Kelly Z. The escalation of the opioid epidemic due to COVID-19 and resulting lessons about treatment alternatives. Am J Manag Care 2020;26(7):e202–4.
8. Savych B, Neumark D, Lea R. Do opioids help injured workers recover and get back to work? The impact of opioid prescriptions on duration of temporary disability. Ind Relat J Econ Soc 2019;58(4):549–90.
9. Dersh J, Mayer TG, Gatchel RJ, Polatin PB, Theodore BR, Mayer EAK. Prescription opioid dependence is associated with poorer outcomes in disabling spinal disorders. Spine 2008;33(20):2219–27.
10. Frank JW, Lovejoy TI, Becker WC, et al. Patient outcomes in dose reduction or discontinuation of long-term opioid therapy:
11. Flor H, Fydrich T, Turk DC. Efficacy of multidisciplinary pain treatment centers: A meta-analytic review. Pain 1992;49(2):221–30.

12. Gatchel RJ, McGearry DD, McGearry CA, Lippe B. Interdisciplinary chronic pain management: Past, present, and future. Am Psychol 2014;69(2):119–30.

13. Gatchel RJ, Okifuji A. Evidence-based scientific data documenting the treatment and cost-effectiveness of comprehensive pain programs for chronic nonmalignant pain. J Pain 2006;7(11):779–93.

14. Gatchel RJ, Peng YB, Peters ML, Fuchs PN, Turk DC. The biopsychosocial approach to chronic pain: Scientific advances and future directions. Psychol Bull 2007;133(4):581–624.

15. Harden P, Ahmed S, Ang K, Wieder D. Clinical implications of tapering chronic opioids in a veteran population. Pain Med 2015;16(10):1975–81.

16. Heise S, Lönqvist I, Källmén H. Potential risk factors associated with risk for drop-out and relapse during and following withdrawal of opioid prescription medication. Eur J Pain 2011;15(9):966–70.

17. Hoffman BM, Papas RK, Chaffok DK, Kerns RD. Meta-analysis of psychological interventions for chronic low back pain. Health Psychol 2007;26(1):1–9.

18. Huffmann KL, Sweis GW, Gase A, Scheman J, Covington EC. Opioid use 12 months following interdisciplinary pain rehabilitation with weaning. Pain Med 2013;14(12):1908–17. doi:10.1111/pme.12201

19. Linton SJ, Shaw WS. Impact of psychological factors in the experience of pain. Phys Ther 2011;91(5):700–11.

20. Loggia ML, Mogil JS, Bushnell MC. Experimentally induced mood changes preferentially affect pain unpleasantness. J Pain 2008;9(9):784–91.

21. MacLaren J, Gross R, Sperry J, Boggess J. Impact of opioid use on outcomes of functional restoration. Clin J Pain 2006;22(4):392–8.

22. Malinoff HL, Barkin RL, Wilson G. Sublingual buprenorphine is effective in the treatment of chronic pain syndrome. Am J Ther 2005;12(5):379–84.

23. Martin BC, Fan M-Y, Edlund MJ, DeVries A, Braden JB, Sullivan MD. Long-term chronic opioid therapy discontinuation rates from the TROUP study. J Gen Intern Med 2011;26(12):1450–7.

24. Nilsen HK, Stiles TC, Landro NI, Fors EA, Kaasa S, Borgevink PC. Patients with problematic opioid use can be weaned from codeine without pain escalation. Acta Anaesthesiol Scand 2010;54(5):571–9.

25. Rome JD, Townsend CO, Bruce BK, Sletten CD, Luedtke CA, Hodgson JE. Chronic noncancer pain rehabilitation with opioid withdrawal: comparison of treatment outcomes based on opioid use status at admission. Mayo Clin Proc 2004;79(6):759–68.

26. Sanders SH, Harden RN, Vicente PJ. Evidence-based clinical practice guidelines for interdisciplinary rehabilitation of chronic nonmalignant pain syndrome patients. Pain Pract 2005;5(4):303–15.

27. Schneider, MD, PhD JP, Kirsh, PhD KL. Defining clinical issues around tolerance, hyperalgesia, and addiction: A quantitative and qualitative outcome study of long-term opioid dosing in a chronic pain practice. J Opioid Manag 2010;6(6):385–95.

28. Seal K, Becker W, Tighe J, Li Y, Rife T. Managing chronic pain in primary care: It really does take a village. J Gen Intern Med 2017;32(8):931–4.

29. Streltzer J, Davidson R, Goebert D. An observational study of buprenorphine treatment of the prescription opioid dependent pain patient: Treatment of the opioid dependent pain patient. Am J Addict 2015;24(4):357–61.

30. Townsend CO, Kerkvliet JL, Bruce BK, et al. A longitudinal study of the efficacy of a comprehensive pain rehabilitation program with opioid withdrawal: Comparison of treatment outcomes based on opioid use status at admission. Pain 2008;140(1):177–89.

31. Vanderlip ER, Sullivan MD, Edlund MJ, et al. National study of discontinuation of long-term opioid therapy among veterans. Pain 2014;155(12):2673–9.

32. Vines SW, Cox A, Nicoll L, Garrett S. Effects of a multimodal pain rehabilitation program: A pilot study. Rehabil Nurs Off J Assoc Rehabil Nurses 1996;21(1):25–30, 40.

33. Vowles KE, McCracken LM, O’Brien JZ. Acceptance and values-based action in chronic pain: A three-year follow-up analysis of treatment effectiveness and process. Behav Res Ther 2011;49(11):748–55.

34. Wakeham SE, Larochelle MR, Ameli O, et al. Comparative effectiveness of different treatment pathways for opioid use disorder. JAMA Netw Open 2020;3(2):e1920622.

35. Webster L, Gudin J, Raffa RB, et al. Understanding buprenorphine for use in chronic pain: Expert opinion. Pain Med 2020;21(4):714–23.

36. Weimer MB, Hartung DM, Ahmed S, Nicolaidis C. A chronic opioid therapy dose reduction policy in primary care. Subst Abuse 2016;37(1):141–7.

37. Whitten SK, Stanik-Hutt J. Group cognitive behavioral therapy to improve the quality of care to opioid-treated patients with chronic noncancer pain: A practice improvement project. J Am Assoc Nurse Pract 2013;25(7):368–76.

38. Kidner C, Mayer T, Gatchel R. Higher opioid doses predict poorer functional outcome in patients with chronic disabling occupational musculoskeletal disorders. J Bone Jt Surg 2009;91A(4):919–27.

39. Rosenblum A, Cruciani RA, Strain EC, et al. Sublingual buprenorphine/naloxone for chronic pain in at-risk patients: Development and pilot test of a clinical protocol. J Opioid Manag 2012;8(6):369–82.

40. Daith D, Daith J, Novinson D, Frey M, Mitnick C, Pergolizzi J. Conversion from high-dose full-opioid agonists to sublingual buprenorphine reduces pain scores and improves quality of life for chronic pain patients. Pain Med 2014;15(12):2087–94.

41. Crisostomo RA, Schmidt JE, Hooten WM, Kerkvliet JL, Townsend CO, Bruce BK. Withdrawal of analgesic medication for chronic non-cancer pain at an interdisciplinary pain rehabilitation program. Pain Med 2010;11(9):1352–64.

42. Silva et al. PCSManual_English.pdf. http://sullivan-painresearch.mcgill.ca/pdf/pcs/PCSManual_English.pdf (Accessed May 2020)

43. PCSManual_English.pdf. http://sullivan-painresearch.mcgill.ca/pdf/pcs/PCSManual_English.pdf (Accessed May 2020)

44. Waddell G, Newton M, Henderson I, Somerville D, Main CJ. A systematic review. Ann Intern Med 2017;167(3):181.doi:10.7326/M17-0598

45. Neblett R, Hartzell MM, Mayer TG, Bradford EM, Gatchel RJ. Interdisciplinary chronic pain management: Past, present, and future. Am Psychol 2014;69(2):119–30.

46. Vowles KE, McCracken LM, O’Brien JZ. Acceptance and values-based action in chronic pain: A three-year follow-up analysis of treatment effectiveness and process. Behav Res Ther 2011;49(11):748–55.

47. Wakeman SE, Larochelle MR, Ameli O, et al. Comparative effectiveness of different treatment pathways for opioid use disorder. JAMA Netw Open 2020;3(2):e1920622.

48. Webster L, Gudin J, Raffa RB, et al. Understanding buprenorphine for use in chronic pain: Expert opinion. Pain Med 2020;21(4):714–23.

49. Weimer MB, Hartung DM, Ahmed S, Nicolaidis C. A chronic opioid therapy dose reduction policy in primary care. Subst Abuse 2016;37(1):141–7.

50. Whitten SK, Stanik-Hutt J. Group cognitive behavioral therapy to improve the quality of care to opioid-treated patients with chronic noncancer pain: A practice improvement project. J Am Assoc Nurse Pract 2013;25(7):368–76.

51. Kidner C, Mayer T, Gatchel R. Higher opioid doses predict poorer functional outcome in patients with chronic disabling occupational musculoskeletal disorders. J Bone Jt Surg 2009;91A(4):919–27.

52. Rosenblum A, Cruciani RA, Strain EC, et al. Sublingual buprenorphine/naloxone for chronic pain in at-risk patients: Development and pilot test of a clinical protocol. J Opioid Manag 2012;8(6):369–82.

53. Crisostomo RA, Schmidt JE, Hooten WM, Kerkvliet JL, Townsend CO, Bruce BK. Withdrawal of analgesic medication for chronic non-cancer pain at an interdisciplinary pain rehabilitation program. Pain Med 2010;11(9):1352–64.

54. PCSManual_English.pdf. http://sullivan-painresearch.mcgill.ca/pdf/pcs/PCSManual_English.pdf (Accessed May 2020)

55. Waddell G, Newton M, Henderson I, Somerville D, Main CJ. A Fear-Avoidance Beliefs Questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability. Pain 1993;52(2):157–68.

56. Neblert R, Hartzell MM, Mayer TG, Bradford EM, Gatchel RJ. Establishing clinically meaningful severity levels for the Tampa Scale for Kinesiophobia (TSK-13). Eur J Pain 2016;20(5):701–10.

57. Sullivan MJL, Martel MO, Tripp D, Savard A, Crombez G. The relation between catastrophizing and the communication of pain experience. Pain 2006;122(3):282–8.

58. Waddell G, Somerville D, Henderson I, Newton M. Objective clinical evaluation of physical impairment in chronic low back pain. Spine 1992;17(6):617–28.

59. Phillips H, Jahanshahi M. The components of pain behaviour report. Behav Res Ther. Published Online 1986;24(12):117–123.
Vlaeyen JW, Kole-Snijders AM, Rotteveel AM, Ruesink R, Heuts PH. The role of fear of movement/reinjury in pain disability. J Occup Rehabil 1995;5(4):235–52.

Crombez G, Vlaeyen JW, Heuts PH, Lysens R. Pain-related fear is more disabling than pain itself: Evidence on the role of pain-related fear in chronic back pain disability. Pain 1999;80(1):329–39.

Helmerhorst GTT, Vranceanu A-M, Vrahass M, Smith M, Ring D. Risk factors for continued opioid use one to two months after surgery for musculoskeletal trauma. J Biomed Sci 2014;96(4):495–9.

Arteta J, Cobos B, Hu Y, Jordan K, Howard K. Evaluation of how depression and anxiety mediate the relationship between pain catastrophizing and prescription opioid misuse in a chronic pain population. Pain Med Malden Mass 2015;17(2):301–3.

Martel MO, Jamison RN, Wasan AD, Edwards RR. The association between catastrophizing and craving in patients with chronic pain prescribed opioid therapy: A preliminary analysis. Pain Med 2014;15(10):1757–64.

Martel MO, Wasan AD, Jamison RN, Edwards RR. Catastrophic thinking and increased risk for prescription opioid misuse in patients with chronic pain. Drug Alcohol Depend 2013;132(1-2):335–41.

Fordyce WE, Shelton JL, Dundore DE. The modification of avoidance learning pain behaviors. J Behav Med 1982;5(4):405–14.

Schmidt AJ. Cognitive factors in the performance level of chronic low back pain patients. J Psychosom Res 1985;29(2):183–9.

Rachman S, Lopatka C. Accurate and inaccurate predictions of pain. Behav Res Ther 1988;26(4):291–6.

Abuse NI on D. Impacts of drugs on neurotransmission. National Institute on Drug Abuse. Published March 9, 2017. https://www.drugabuse.gov/news-events/nida-notes/2017/03/impacts-drugs-neurotransmission(Accessed October 2020)

Philips HC. Avoidance behaviour and its role in sustaining chronic pain. Behav Res Ther 1987;25(4):273–9.

Waddell G. The biopsychosocial model. In: The Back Pain Revolution. Churchill Livingstone 2004; pp. 71-89.

Sullivan MJL, Adams H, Rhodenizer T, Stanish WD. A psychosocial risk factor–targeted intervention for the prevention of chronic pain and disability following whiplash injury. Phys Ther 2006;86(1):8–18.

Adams H, Ellis T, Stanish WD, Sullivan MJL. Psychosocial factors related to return to work following rehabilitation of whiplash injuries. J Occup Rehabil 2007;17(2):305–15.

Burton AK, Tillotson KM, Main CJ, Hollis S. Psychosocial predictors of outcome in acute and subchronic low back trouble. Spine 1995;20(6):772–8.

Calley DQ, Jackson S, Collins H, George SZ. Identifying patient fear-avoidance beliefs by physical therapists managing patients with low back pain. J Occup Rehabil 2007;17(2):305–15.

Burton AK, Tillotson KM, Main CJ, Hollis S. Predicting the outcome of chronic pain and disability following whiplash injury. Spine 2006;31(10):1–18.

Flynn T, Fritz J, Whitman J, et al. A clinical prediction rule for classifying patients with low back pain who demonstrate short-term improvement with spinal manipulation. Spine 2002;27(24):2835–43.

Cleland JA, Fritz JM, Brennan GP. Predictive validity of initial fear avoidance beliefs in patients with low back pain receiving physical therapy: Is the FABQ a useful screening tool for identifying patients at risk for a poor recovery? Eur Spine J 2008;17(1):70–9.

Lethem J, Slade PD, Troup J, Bentley G. Outline of a fear-avoidance model of exaggerated pain perception—I. Behaviour Research and Therapy 1983;21(4):401–8.

Vlaeyen JW, Linton SJ. Fear-avoidance and its consequences in chronic musculoskeletal pain: A state of the art. Pain 2000;85(3):317–32.

Leeuw M, Goossens MEJB, Linton SJ, Crombez G, Boersma K, Vlaeyen JWS. The fear-avoidance model of musculoskeletal pain: Current state of scientific evidence. J Behav Med 2007;30(1):77–94.

Grattan A, Sullivan MD, Saunders KW, Campbell CI, Von Korff MR. Depression and prescription opioid misuse among chronic opioid therapy recipients with no history of substance abuse. Ann Fam Med 2012;10(4):304–11.

Scherrer JF, Mahmadi B, Autio K, et al. The prescription opioids and depression pathways cohort study. J Psychiatry Brain Sci 2020;5:e200009.

Scherrer JF, Salas J, Schneider FD, et al. Characteristics of new depression diagnoses in patients with and without prior chronic opioid use. J Affect Disord 2017;210:125–9.

Silva MJ, Coffee Z, Yu CH. Prolonged cessation of chronic opioid analgesic therapy: a multidisciplinary intervention. Am J Manag Care. In press.

About the ASAM Criteria. https://www.asam.org/asam-criteria/about(Accessed December 2020)

Fritz JM, George SZ. Identifying psychosocial variables in patients with acute work-related low back pain: The importance of fear-avoidance beliefs. Phys Ther 2002;82(10):973–83.

George SZ, Fritz JM, Bialosky JE, Donald DA. The effect of a fear-avoidance-based physical therapy intervention for patients with acute low back pain: Results of a randomized clinical trial. Spine 2003;28(23):2551–60.

George SZ, Fritz JM, Childs JD. Investigation of elevated fear-avoidance beliefs for patients with low back pain: A secondary analysis involving patients enrolled in physical therapy clinical trials. J Orthop Sports Phys Ther 2008;38(2):50–8.

George SZ, Fritz JM, Erhard RE. A comparison of fear-avoidance beliefs in patients with lumbar spine pain and cervical spine pain. Spine 2001;26(19):2139–45.

George SZ, Fritz JM, McNeil DW. Fear-avoidance beliefs as measured by the fear-avoidance beliefs questionnaire: Change in fear-avoidance beliefs questionnaire is predictive of change in self-report of disability and pain intensity for patients with acute low back pain. Clin J Pain 2006;22(2):197–203.

Burton AK, Waddell G, Tillotson KM, Summerton N. Information and advice to patients with back pain can have a positive effect: A randomized controlled trial of a novel educational booklet in primary care. Spine 1999;24(23):2484–91.

Miller RP, Kori SH, Todd DD. The Tampa Scale: A Measure of Kinesiophobia. Clin J Pain 1991;7(1):51.

Ruelofs J, Goubert L, Peters M, Vlaeyen J, Crombez G. The Tampa Scale for Kinesiophobia: Further examination of psychometric properties in patients with chronic low back pain and fibromyalgia. Eur J Pain 2004;8(5):495–502.

Butler SF, Budman SH, Fernandez KC, et al. Development and validation of the current opioid misuse measure. Pain 2007;130(1):144–56.

Butler SF, Budman SH, Fanciullo GJ, Jamison RN. Cross validation of the current opioid misuse measure (comm) to monitor chronic pain patients on opioid therapy. Clin J Pain 2010;26(9):770–6.

Fisher RA. The Design of Experiments. 7th ed. New York: Hafner Pub; 1936.

Yu CH. Resampling: A Conceptual and Procedural Introduction. Jason Osborne. Sage Publications; 2017.

Yu CH. Resampling methods: Concepts, applications, and justification. Pract Assess Res Eval 2019;8(1):19.

Friedman J, Hastie T, Tibshirani R. Regularization paths for generalized linear models via coordinate descent. J Stat Softw 2010;33(1):1–22.
89. Yu CH. Dancing with the Data: The Art and Science of Data Visualization. Saarbrucken, Germany: LAP; 2014.
90. Breiman L, Friedman JH, Olshen RA, Stone CJ. Classification and Regression Trees. Belmont, CA: Wadsworth International Group; 1984.
91. Podgorelec V, Kokol P, Stiglic B, Rozman I. Decision trees: An overview and their use in medicine. J Med Syst 2002;26(5):445–63.
92. Opioid Risk Management | Pain Education for Clinicians. PainEDU. https://www.painedu.org/opioid-risk-management-2/(Accessed October 2020)
93. Module 5: Assessing and addressing Opioid Use Disorder (OUD). Published March 9, 2020. Accessed March 9, 2020. https://www.cdc.gov/drugoverdose/training/oud/accessible/index.html
94. Achenbach J, Bernstein L. Opioid crackdown forces pain patients to taper off drugs they say they need. Washington Post. https://www.washingtonpost.com/health/opioid-crackdown-forces-pain-patients-to-taper-off-drugs-they-say-they-need/2019/09/10/3920f220-c8da-11e9-a4f3-c081a126de70_story.html. (Accessed October 2020).
95. Vlaeyen JWS, Morley S. Cognitive-behavioral treatments for chronic pain: What works for whom? Clin J Pain 2005;21(1):1–8.
96. Jellema P, van der Horst HE, Vlaeyen JWS, Stalman WAB, Bouter LM, van der Windt DAWM. Predictors of outcome in patients with (sub) acute low back pain differ across treatment groups. Spine 2006;31(15):1699–705.