



# HHS Public Access

Author manuscript

*Support Care Cancer*. Author manuscript; available in PMC 2022 January 01.

Published in final edited form as:

*Support Care Cancer*. 2021 January ; 29(1): 427–435. doi:10.1007/s00520-020-05504-y.

## Fear of Analgesic Side Effects Predicts Preference for Acupuncture: A Cross-Sectional Study of Cancer Patients with Pain in the United States

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### Abstract

**Purpose:** Approximately one in two cancer patients globally are under-treated for pain. Opioids and other analgesics represent the mainstay of cancer pain management; however, barriers to their use are well-documented. We evaluated whether acupuncture would be a preferable treatment option among cancer patients with attitudinal barriers to pharmacological pain management.

**Methods:** We conducted a cross-sectional survey of cancer patients at a tertiary urban cancer center and eleven suburban/rural hospitals in the northeastern United States. We assessed attitudinal barriers to pharmacological pain management with the Barriers Questionnaire (BQ-13). The BQ-13 consists of two subscales: pain management beliefs and analgesic side effects. We also asked patients whether they prefer acupuncture, analgesics, or have no preference between these two modalities for pain management. Covariates included sociodemographics, clinical

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#### COMPLIANCE WITH ETHICAL STANDARDS

##### Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. Dr. Jun J. Mao has full control of all primary data and agrees to allow the journal to review the data if requested.

##### Ethical 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.

##### Informed Consent

Informed consent was obtained from all individual participants included in the study.

characteristics, and attitudes/beliefs about acupuncture. We used logistic regression to examine the association between attitudinal barriers and acupuncture preference.

**Results:** Among 628 patients, 197 (31.4%) preferred acupuncture for pain management, 146 (23.3%) preferred analgesics, and 285 (45.4%) had no preference. The highest reported attitudinal barriers were fear of addiction and fear of analgesic-associated constipation and nausea. Adjusting for covariates, we found that attitudinal barriers related to fear of analgesic side effects were significantly associated with acupuncture preference (adjusted odds ratio [AOR] 1.45, 95% confidence interval [CI] 1.17–1.81), but barriers related to pain management beliefs were not (AOR 1.17, 95% CI 0.91–1.51). Attitudes/beliefs about acupuncture (i.e. greater expected benefits, fewer perceived barriers, and more positive social norms) and female gender also predicted acupuncture preference, whereas race and educational status did not.

**Conclusion:** Acupuncture may be a preferable treatment option among cancer patients at risk of inadequately controlled pain due to fear of analgesic side effects. Evidence-based integration of acupuncture and analgesics, guided by patient treatment preferences, represents an essential aspect of patient-centered care and has potential to address unmet cancer pain management needs.

### Keywords

cancer; pain management; barriers; preference; acupuncture; analgesics; opioids

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## INTRODUCTION

Under-treatment of pain is prevalent among patients with cancer and contributes to poor quality of life, impaired physical functioning, and potentially worse cancer-related outcomes and overall survival [1]. In a review of 26 studies from Europe, Asia, Middle East, Africa, and the United States, an estimated 47% of cancer patients globally were inadequately treated for pain, though rates of under-treatment varied across cancer types, stages, and care settings [2]. Opioids and other analgesics represent the mainstay of cancer pain management [3]; however, patient-reported barriers to medication use (e.g. fear of addiction, concerns about side effects) have been associated with inadequate control of pain symptoms [4,5]. These attitudinal barriers have been exacerbated by the increasing rates of morbidity and mortality associated with opioid use and misuse around the world [6–8]. To date, patient-based educational interventions targeting attitudinal pain management barriers have yielded mixed results [9–11], highlighting the need to investigate other strategies for addressing under-treatment of cancer pain.

The American Society of Clinical Oncology (ASCO) and other cancer organizations recently updated their clinical guidelines to recommend acupuncture as a non-pharmacologic therapy for cancer pain [12–14]. Despite its availability at cancer centers [15–17] and its growing evidence base for pain management [18–21], acupuncture remains relatively under-utilized among cancer patients with estimated usage rates of approximately 10% [22]. Studies have identified several factors (e.g. high costs, lack of insurance coverage, fear of needling discomfort, extensive time commitment) that may hinder patients' willingness to use acupuncture [23–25]. However, the majority of research on attitudinal barriers to pain management have focused on obstacles to using opioids

and other analgesics [4,26]; thus, it remains unclear whether these attitudinal barriers to pharmacologic pain management present similar obstacles to using acupuncture or instead drive patients to seek acupuncture as a non-pharmacologic alternative.

To address this gap, we conducted a cross-sectional study of cancer patients with pain from diverse care settings to examine the association between attitudinal barriers to pharmacological pain management and acupuncture preference. Patient preference plays an important role in treatment acceptability, adherence, and outcomes, and others have argued that it is an essential factor to consider in evidence-based clinical practice [27,28]. With this in mind, our study aimed to determine whether acupuncture is a preferable treatment option among cancer patients with attitudinal barriers to using opioids or other analgesics for pain relief. The findings will help to inform patient-centered approaches to addressing under-treatment of pain in oncology, particularly during this era of heightened concerns surrounding opioid use and misuse.

## **METHODS**

### **Study Design, Setting, and Population**

From September 2014 through September 2015, we conducted a cross-sectional survey of cancer patients at Abramson Cancer Center (ACC) at the University of Pennsylvania and eleven ACC-affiliated suburban/rural hospitals in Pennsylvania and New Jersey. Patients were eligible if they were 18 years of age or older, understood written English, had a primary cancer diagnosis of any type, were ambulatory with Karnofsky performance score  $\geq 60$ , and reported non-zero pain severity on a scale of 0 to 10 in the past seven days. Research staff met with patients at their oncology appointments, obtained written informed consent, and administered paper surveys. The institutional review board of the University of Pennsylvania and the ACC Clinical Trials Scientific Review and Monitoring Committee reviewed and approved the study.

### **Preference for Acupuncture (Dependent Variable)**

We assessed pain management preferences by asking patients, "Since there are effective pain medications to manage pain, what is your preference for taking a pain medication vs. getting acupuncture to manage your pain?" The following were the response options: "Very much prefer acupuncture," "Much prefer acupuncture," "Slightly prefer acupuncture," "No preference," "Slightly prefer medication," "Much prefer medication," or "Very much prefer medication."

### **Attitudinal Barriers to Pharmacologic Pain Management (Independent Variable)**

We used the Barriers Questionnaire (BQ-13) to evaluate patients' attitudes/beliefs that may present obstacles to pharmacological pain management. The BQ-13 has been validated in the outpatient oncology population (13 items, Cronbach's  $\alpha = 0.83$ ) and consists of two subscales: pain management beliefs (7 items, Cronbach's  $\alpha = 0.66$ ) and analgesic side effects (6 items, Cronbach's  $\alpha = 0.90$ ) [29].

The pain management beliefs subscale asks patients to rate on a 6-point Likert scale (0 = Do not agree at all; 5 = Agree very much) how much they agree with the following statements: “People get addicted to pain medication easily”; “If you take pain medicine when you have some pain, then it might not work as well if the pain becomes worse”; “Pain medication cannot really control pain”; “It is important to be strong by not talking about pain”; “It is more important for the doctor to focus on curing illness than to put time into controlling pain”; “Having pain means the disease is getting worse”; and “I do not like having shots.” In Table 2, we abbreviated the above questionnaire items as “Addiction,” “Tolerance,” “Fatalism,” “Good Patient,” “Distraction to Doctor,” “Disease Progression,” and “Fear of Injections,” respectively.

Using the same 6-point Likert scale, the analgesic side effects subscale asks patients to rate how much they agree with the following statements: “Drowsiness from pain medication is really a bother”; “Confusion from pain medication is really a bother”; “Nausea from pain medication is really a bother”; “Pain medication often makes you say or do embarrassing things”; “Constipation from pain medicine is really upsetting”; and “It is easier to put up with pain than with the side effects that come from pain medicine.” In Table 2, we abbreviated the above questionnaire items as “Drowsiness,” “Confusion,” “Nausea,” “Embarrassing,” “Constipation,” and “General Side Effects,” respectively.

Total and subscale mean scores are calculated from individual item scores with higher scores (range 0–5) indicating greater attitudinal barriers to pharmacologic pain management.

## Covariates

Given that socio-demographic disparities in pain management barriers are well-documented in the literature [30,31], we asked patients to provide information on their age, gender, race, and education level. To better characterize our study population, we collected data on cancer-related variables (i.e. type, stage, treatment history) by medical chart abstraction. We also asked patients about their pain medication use and pain severity to provide a clinical context for understanding pain management barriers and preferences. To assess pain medication use, we asked patients to select which pain medications they had used in the past 7 days with the following response options: “NSAIDS (e.g. Motrin/Ibuprofen, Aleve/Naproxen, Celebrex/Celecoxib),” “Tylenol (e.g. Acetaminophen),” “Nerve pain pills (e.g. Neurontin/Gabapentin, Pregabalin, Lyrica),” “Anti-depressants (e.g. Cymbalta/Duloxetine, Effexor/Venlafaxine, Elavil/Amitriptyline),” “Muscle relaxants (e.g. Flexeril/Cyclobenzaprine, Baclofen, Skelaxin/Metaxalone),” “Narcotics/Opioids (e.g. Percocet/oxycodone, Dilaudid/hydromorphone, Fentanyl, Morphine),” “Others—specify,” and “I am not taking any pain medications.” To evaluate pain severity, we asked patients which number (i.e. 0 [no pain] to 10 [worst pain imaginable]) best describes their worst pain severity in the past 7 days.

To evaluate other attitudinal factors that may influence preferences for acupuncture, we used the Attitudes and Beliefs about Complementary and Alternative Medicine (ABCAM) instrument [32]. The ABCAM instrument was developed by our group and validated in the outpatient oncology population to evaluate attitudinal predictors of complementary alternative medicine (CAM) use. For this study, we modified ABCAM to focus specifically

on acupuncture rather than CAM in general. The modified ABCAM instrument consists of three subscales: expected benefits (4 items; Cronbach's  $\alpha = 0.91$ ); perceived barriers (10 items; Cronbach's  $\alpha = 0.76$ ); and subjective norms (6 items; Cronbach's  $\alpha = 0.75$ ) [32].

The expected benefit subscale asks patients to rate on a 5-point Likert scale (1 = Not at all; 5 = Completely) how much they agree with the following statements about their expectations of acupuncture: "My pain will improve a lot"; "I will be able to cope with my pain better"; "The symptoms of my pain will disappear"; and "My energy level will increase."

The perceived barriers subscale asks patients to rate on a 5-point Likert scale (1 = Strongly disagree; 5 = Strongly agree) how much they agree that they are unlikely or hesitant about using acupuncture because: "Acupuncture treatments are not based on scientific research"; "It may interfere with the conventional cancer treatments"; "Acupuncture treatments may have side effects"; "Acupuncture needling is too painful"; "Acupuncture treatments cost too much money"; "It is hard to find good acupuncturists"; "I don't have time to go to acupuncture treatments"; "I don't have knowledge about acupuncture treatments"; "Acupuncture treatments are not covered by my insurance"; and "I don't have transportation to acupuncture treatments."

The subjective norms subscale asks patients to rate on a 5-point Likert scale (1 = Strongly disagree; 5 = Strongly agree) how much they agree with the following statements: "My family encourages me to use acupuncture"; "My health care providers (e.g. doctors, nurses, etc.) encourage me to use acupuncture"; "My health care providers (e.g. doctors, nurses, etc.) are open to my use of acupuncture"; "Other cancer patients think I should use acupuncture"; "My online support group encourages me to use acupuncture"; and "My friends ask me to try acupuncture."

A total score was calculated for each subscale with higher scores (range 0 to 100) indicating greater expectation of benefit from acupuncture, greater barriers to acupuncture use, and more positive subjective norms regarding acupuncture, respectively.

### Statistical Analysis

All statistical analyses were conducted using STATA (Windows version 12.0, StataCorp LLC, College Station, TX). Descriptive statistics were presented as frequencies and means. To ease data interpretation, we dichotomized the dependent variable as "Prefer Acupuncture" (i.e. "Very much prefer acupuncture," "Much prefer acupuncture," or "Slightly prefer acupuncture") or "Do Not Prefer Acupuncture" (i.e. "No preference," "Slightly prefer medication," "Much prefer medication," or "Very much prefer medication"). The independent variable of interest (i.e. BQ-13 scores) was analyzed as a continuous variable. For socio-demographics, we dichotomized age as "65 or older" or "less than 65," gender as "male" or "female," race as "white" or "non-white," and education as "graduated college" or "did not graduate college." Pain medication use was categorized as "none," "non-opioid," and "opioid." Mixed formulations containing both opioid and non-opioid components were coded as "opioid." Pain severity was categorized as "mild" (1 to 3), "moderate" (4 to 6), or "severe" (7 to 10). ABCAM subscale scores were analyzed as continuous variables.

We used bivariate analyses and multivariable logistic regression models to evaluate whether attitudinal barriers to pharmacological pain management and other covariates were associated with acupuncture preference. Covariates that demonstrated a P value of less than 0.10 in the bivariate analyses were included in the multivariable regression models. All analyses were two-sided with a P value of less than 0.05 indicating statistical significance.

## RESULTS

We approached 706 patients with cancer diagnoses and enrolled 668 (94.6%). Of the 668 patients, 6 withdrew from the study prior to completing the survey due to change of mind (N=4), time constraints (N=1), and health issues (N=1). Of the 662 who completed the survey, 34 did not provide a response for the primary outcome (i.e. acupuncture preference), leaving 628 (94.0% of overall enrolled sample) included in the analyses.

### Baseline Characteristics

The mean age of patients was 60.3 (SD 11.7) years. Sixty-six percent of patients were female, 82% were white, and 60% did not graduate college. Fifty-two percent of patients were seen in suburban/rural hospitals. The most common cancer types were breast (32%), thoracic/lung (15%), and hematologic (15%), and 54% of patients had a non-metastatic cancer diagnosis. Seventy-four percent of patients were receiving active cancer treatment. The most commonly reported cancer treatments received were chemotherapy (88%), surgery (53%), and radiation (53%). Other baseline characteristics are displayed in Table 1.

### Pain Management Preferences and Barriers

Among 628 patients, 197 (31%) preferred acupuncture for pain management, 146 (23%) preferred medication, and 285 (45%) had no preference. In the overall sample, the highest reported attitudinal barriers were fear of analgesic-associated constipation, fear of addiction, and fear of analgesic-associated nausea. Among patients who prefer acupuncture, the highest reported attitudinal barriers were all related to feared analgesic side effects, i.e. nausea, constipation, and confusion. Patients with acupuncture preference reported significantly greater attitudinal barriers to pharmacologic pain management than those who did not prefer acupuncture (BQ-13 mean total score, 2.62 vs. 2.39,  $P<0.001$ ). Specifically, patients who prefer acupuncture held a stronger belief that pain medications cannot control pain ( $P<0.001$ ) and reported greater fears about analgesic side effects (all  $P<0.05$ ). Table 2 summarizes the attitudinal barriers reported by our study population.

### Attitudinal Barriers and Other Factors Associated with Acupuncture Preference

In bivariate analyses, higher barrier scores in the feared analgesic side effect subscale was significantly associated with acupuncture preference (unadjusted odds ratio [un-AOR], 1.66, 95% confidence interval [CI] 1.40–1.97), but barrier scores in the pain management beliefs subscale were not (un-AOR 1.14, 95% CI 0.94–1.37). Additionally, all ABCAM subscale scores, i.e. greater expected benefits (un-AOR 1.04, 95% CI 1.03–1.05), fewer perceived barriers (un-AOR 0.94, 95% CI 0.93–0.96), and more positive social norms (un-AOR 1.04, 95% CI 1.03–1.05), were significantly associated with acupuncture preference. Female patients were significantly more likely to prefer acupuncture (un-AOR 2.16, 95%

CI 1.47–3.17), whereas non-college graduates (un-AOR 0.64, 95% CI 0.46–0.91) and opioid users (un-AOR 0.58, 95% CI 0.35–0.95) were significantly less likely. The other clinical covariates were not significantly associated with acupuncture preference. The results of bivariate analyses are summarized in Table 3.

After adjusting for covariates in multivariable analyses, attitudinal barriers related to analgesic side effects remained significantly associated with acupuncture preference (adjusted odds ratio [AOR] 1.45, 95% CI 1.17–1.81). Attitudes/beliefs about acupuncture, i.e. greater expected benefits (AOR 1.03, 95% CI 1.02–1.04), fewer perceived barriers (AOR 0.95, 95% CI 0.94–0.97), and more positive social norms (AOR 1.02, 95% CI 1.004–1.03), all remained significantly associated with acupuncture preference. Female gender also remained significantly associated with acupuncture preference (AOR 1.82, 95% CI 1.15–2.87), whereas racial and educational associations were attenuated and not significant. The negative association between opioid use and acupuncture preference was no longer significant after adjusting for covariates. This multivariable logistic regression model explained 22% of the variance in acupuncture preference (Pseudo- $R^2 = 0.22$ ). The results of multivariable analyses are summarized in Table 4.

## DISCUSSION

In this cross-sectional study of 628 American cancer patients with pain, approximately a third of patients preferred to use acupuncture for pain management. Patients who reported greater attitudinal barriers to pharmacological pain management, particularly those who fear the side effects of opioids and other analgesics, were significantly more likely to prefer acupuncture. These findings are highly relevant in the context of a growing international opioid epidemic that has intensified public concern about the potential risks associated with opioid use and misuse [4,7,8].

In a recent pilot study of 125 patients undergoing cancer treatment, over 60% of patients on opioids reported stigma related to opioid use, including fear of addiction [6]. Prior research has shown that these types of attitudinal barriers contribute to the under-treatment of pain [4,5]. In the pilot study above, a fifth of patients on opioids reported taking inadequate doses for pain control due to this opioid-related stigma [6]. This type of under-treated cancer population may be amenable to using acupuncture to achieve better pain control. Indeed, our findings suggest that acupuncture is a preferable treatment option among cancer patients with pain who are hesitant to use opioids or other analgesics due to their feared side effects.

Acupuncture has a well-established evidence base for chronic non-malignant musculoskeletal pain [18,20], and there is growing research on its role in pain management within oncology [33], particularly with regards to aromatase inhibitor associated arthralgias [21]. However, acupuncture may not be effective for all types of cancer- or treatment-related pain [34,35]. Furthermore, there are important safety considerations regarding its use in the oncology setting [36,37]. There is also a paucity of studies that have evaluated the comparative effectiveness of acupuncture versus other modalities for treating cancer-related pain. Although acupuncture was viewed as a preferable treatment option by a large

proportion of our study population, additional research is warranted to guide the safe, effective use of acupuncture in comprehensive cancer pain management.

In our study, female gender was the only sociodemographic factor significantly associated with acupuncture preference after adjusting for relevant covariates. This is consistent with other research demonstrating greater acceptability of acupuncture among female patients [38,39]. Importantly, substantial research has shown that women typically experience greater pain burden and higher levels of pain-related distress [40,41]; women also tend to have lower rates of adherence to analgesics [42] and poorer satisfaction with pain control [43]. Based on our findings, acupuncture is viewed as a preferable treatment option by female cancer patients and should be considered in this population with relatively higher risk of being under-treated for pain.

In contrast to gender, race and educational status were not significantly associated with acupuncture preference in our study. To date, the scientific literature has been mixed regarding the relationship between race, education, and attitudes towards acupuncture. Some studies found that non-white and less educated patients were less likely to use acupuncture [38,39]. Other studies have demonstrated relatively high levels of acceptability among these sociodemographic groups, particularly when efforts were made to address structural barriers (e.g. treatment costs) through group-based delivery models in community settings [44–46]. In our prior study [47], acupuncture acceptability differed by race and educational status; the educational differences were driven by ABCAM-specific attitudinal factors, whereas racial differences were likely influenced by other factors (e.g. views toward insurance systems) that were not assessed in our prior study. Additional research is needed to elucidate the diverse factors that shape the views of cancer patients towards acupuncture. This type of research is critical to better understand the potential role of acupuncture in addressing cancer pain management disparities that disproportionately affect racial minorities and those who are less educated [30,31,48,49].

Although approximately a third of our study population reported a preference for acupuncture, nearly half reported no clear preferences when asked to choose between acupuncture or pain medications. Given the specific aims of our study, we did not evaluate the wide range of other pain management options available to cancer patients, including but not limited to exercise [50], mind-body approaches (e.g. meditation, cognitive-behavioral therapy) [51], or interventional techniques (e.g. nerve blocks) [52]. As non-pharmacologic modalities are increasingly integrated into comprehensive cancer pain management [53–55], future studies should examine cancer patients' attitudes and beliefs towards other options besides acupuncture and medications to ensure that treatment approaches remain aligned with patient preferences.

Our findings should be considered in the context of several limitations. The use of patient-reported outcomes raises the possibility of social desirability bias because some medications may be viewed as a less acceptable in the context of the international opioid epidemic [6]. Our primary outcome measure assessed patients' treatment preferences at the time of the study and thus did not necessarily reflect their prior/current use of acupuncture/analgesics or their future intention to use these two modalities. Furthermore, our primary outcome



measure presented a binary choice between analgesics and acupuncture and thus did not capture all available pain management modalities; future studies should evaluate a broader array of options to provide a more comprehensive understanding of patient treatment preferences. We also dichotomized several outcomes with the goal of easing interpretation of study findings, but this may have led to loss of sensitivity and/or precision in the analyses. Additionally, our research approach may have led to the exclusion of potentially relevant variables in the regression models; as such, the possibility of residual confounding must be considered. Future research should include an evaluation of other patient-related factors (e.g. household income, insurance status) as well as physician- or system-related barriers that may contribute to under-treatment of pain among cancer patients [56]. Finally, even though we enrolled patients from diverse care settings, the majority of our study population was white, English-speaking, and well-educated; thus, the results may not be generalizable to the larger cancer population.

Despite these limitations, this large, cross-sectional study of cancer patients from diverse care settings in the northeastern United States demonstrates that acupuncture could potentially address the unmet pain management needs of those who are reluctant to use opioids or other analgesics due to feared side effects. The evidence-based integration of acupuncture, medications, and other modalities, guided by careful consideration of patient treatment preferences, represents an essential aspect of patient-centered cancer pain management [28].

## ACKNOWLEDGEMENTS

The authors would like to thank the patients, oncologists, nurses, and clinical staff at all study sites for their contributions to this study.

## FUNDING AND RESEARCH SUPPORT:

Research related to the development of this paper was supported in part by the National Cancer Institute grants to the University of Pennsylvania Abramson Cancer Center (2P30CA016520-40) and the Memorial Sloan Kettering Cancer Center (3P30CA008748-50), the Byrne Fund, and the Translational and Integrative Medicine Research Fund at Memorial Sloan Kettering Cancer Center. The content is solely the responsibility of the authors and does not necessarily represent official views of the National Institutes of Health.

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**Table 1.**

Patient Baseline Characteristics (N = 628).

Characteristic	N (%)
Age, mean (SD), years	60.3 (11.7)
65 years	237 (37.74)
<65 years	391 (62.26)
Gender	
Female	415 (66.08)
Male	213 (33.92)
Race	
White	518 (82.48)
Non-White <sup>a</sup>	110 (17.52)
Education	
Graduated college	249 (40.03)
Did not graduate college	373 (59.97)
Cancer Type	
Breast	200 (31.85)
Thoracic/Lung	94 (14.97)
Hematologic	94 (14.97)
Gastrointestinal	80 (12.74)
Head/Neck	53 (8.44)
Gynecologic	47 (7.48)
Genito-urinary	35 (5.57)
Other <sup>b</sup>	25 (3.98)
Cancer Stage	
I	67 (11.65)
II	104 (18.09)
III	138 (24.00)
IV	266 (46.26)
Cancer Treatment	
Chemotherapy	550 (87.58)
Radiation	334 (53.18)
Surgery	333 (53.03)
Pain Medication	
None	90 (14.35)
Non-Opioid	232 (37.00)
Opioid	305 (48.64)
Worst Pain Severity (0–10 scale)	
Mild (1–3)	115 (18.43)
Moderate (4–6)	201 (32.21)
Severe (7–10)	308 (49.36)

Note: Due to missing data, some variables do not add up to 628.

<sup>a</sup>Non-white, N (%): Black, 76 (12.10); Hispanic, 11 (1.75); Asian, 17 (2.71), Other, 6 (0.96).

<sup>b</sup>Other cancer types include but are not limited to sarcoma and skin.

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**Table 2.**

Attitudinal Barriers to Pharmacological Pain Management.

<b>BQ-13 Barriers<sup>a</sup></b>	<b>Overall (N=628) Mean score ± SD</b>	<b>Prefer Acupuncture (N=197) Mean score ± SD</b>	<b>P value</b>
BQ-13 Total Score	2.39 (0.84)	2.62 (0.78)	<0.001
Pain Management Beliefs Subscale Score	2.02 (0.90)	2.09 (1.62)	0.18
Addiction	3.31 (1.36)	3.45 (1.38)	0.09
Tolerance	2.48 (1.52)	2.57 (1.50)	0.31
Fatalism	1.43 (1.45)	1.80 (1.59)	<0.001
Good Patient	1.31 (1.48)	1.39 (1.51)	0.35
Distraction to Doctor	1.64 (1.57)	1.64 (1.62)	0.89
Disease Progression	1.65 (1.48)	1.62 (1.45)	0.68
Fear of Injections	2.38 (1.83)	2.25 (1.82)	0.27
Analgesic Side Effects Subscale Score	2.75 (1.12)	3.14 (0.95)	<0.001
Drowsiness	3.03 (1.52)	3.43 (1.38)	<0.001
Confusion	3.11 (1.59)	3.53 (1.42)	<0.001
Nausea	3.23 (1.62)	3.67 (1.39)	<0.001
Embarrassing	1.69 (1.56)	1.98 (1.60)	<0.05
Constipation	3.33 (1.54)	3.60 (1.41)	<0.05
General Side Effects	2.13 (1.62)	2.66 (1.62)	<0.001

BQ-13 = Barriers Questionnaire

<sup>a</sup>BQ-13 scores range from 0 to 5 with higher scores indicating greater attitudinal barriers to pharmacological pain management.



**Table 3**

. Bivariate Analyses of Patient Characteristics Associated with Acupuncture Preference.

Characteristic	Un-AOR	95% CI	P value
Pharmacological Pain Management Barriers (BQ-13)			
Pain Management Beliefs Subscale	1.14	0.94–1.37	0.18
Analgesic Side Effects Subscale	1.66	1.40–1.97	<0.001
Age			
65 (reference)	--	--	
<65	1.14	0.81–1.63	0.44
Gender			
Male (reference)	--	--	
Female	2.16	1.47–3.17	<0.001
Race			
White (reference)	--	--	
Non-White	0.63	0.39–1.01	0.06
Education			
Graduated college (reference)	--	--	
Did not graduate college	0.64	0.46–0.91	0.01
Pain Medication			
None (reference)	--	--	
Non-Opioid	0.83	0.50–1.37	0.46
Opioid	0.58	0.35–0.95	0.03
Worst Pain Severity			
Mild (reference)	--	--	
Moderate	0.86	0.53–1.37	0.52
Severe	0.80	0.53–1.19	0.26
Acupuncture Attitudes/Beliefs (ABCAM)			
Expected Benefits Subscale	1.04	1.03–1.05	<0.001
Perceived Barriers Subscale	0.94	0.93–0.96	<0.001
Social Norms Subscale	1.04	1.03–1.05	<0.001

Un-AOR = unadjusted odds ratio

CI = confidence interval

BQ-13 = Barriers Questionnaire

ABCAM = Attitudes and Beliefs about Complementary and Alternative Medicine instrument

**Table 4.**Multivariable Analyses of Patient Characteristics Associated with Acupuncture Preference.<sup>a</sup>

Characteristic	AOR	95% CI	P value
Pharmacological Pain Management Barriers (BQ-13)			
Pain Management Beliefs Subscale	1.17	0.91–1.51	0.21
Analgesic Side Effects Subscale	1.45	1.17–1.81	0.001
Gender			
Male (reference)	--	--	
Female	1.82	1.15–2.87	0.01
Race			
White (reference)	--	--	
Non-White	0.66	0.37–1.17	0.15
Education			
Graduated college (reference)	--	--	
Did not graduate college	1.00	0.65–1.54	0.998
Pain Medication			
None (reference)	--	--	
Non-Opioid	0.62	0.34–1.14	0.13
Opioid	0.71	0.39–1.31	0.28
Acupuncture Attitudes/Beliefs (ABCAM)			
Expected Benefits Subscale	1.03	1.02–1.04	<0.001
Perceived Barriers Subscale	0.95	0.94–0.97	<0.001
Social Norms Subscale	1.02	1.004–1.03	0.01

AOR = adjusted odds ratio

CI = confidence interval

BQ-13 = Barriers Questionnaire

ABCAM = Attitudes and Beliefs about Complementary and Alternative Medicine instrument

<sup>a</sup>The logistic regression model was adjusted for all variables shown in the table. The pseudo-R<sup>2</sup> value of the regression model was 0.22.