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Predictors of Pain Management Strategies in Adults with Low-Back Pain: A Secondary Analysis of Amazon Mechanical Turk Survey Data

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Abstract

Objective: To evaluate the associations between baseline demographics, health conditions, pain management strategies, and health-related quality-of-life (HRQoL) measures with pain management strategies at 3-month follow-up in respondents reporting current low-back pain (LBP).

Study design: Cohort study of survey data collected from adults with LBP sampled from Amazon Mechanical Turk crowdsourcing panel.

Methods: Demographics, health conditions, and the Patient-Reported Outcomes Measurement Information System (PROMIS)-10 were included in the baseline survey. Respondents reporting LBP completed a more comprehensive survey inquiring about pain management strategies and several HRQoL measures. Bivariate then multivariate logistic regression estimated odds ratios (ORs) with 95% confidence intervals (CIs) for the association between baseline characteristics and pain management utilization at 3-month follow-up. Model fit statistics were evaluated to assess the predictive value.

Results: The final cohort included 717 respondents with completed surveys. The most prevalent pain management strategy at follow-up was other care ($n=474$), followed by no care ($n=94$), conservative care only ($n=76$), medical care only ($n=51$), and medical and conservative care combined ($n=22$). The conservative care only group had higher (better) mental and physical health PROMIS-10 scores as opposed to the medical care only and combination care groups, which had lower (worse) physical health scores. In multivariate models, estimated ORs (95% CIs) for the association between baseline and follow-up pain management ranged from 4.6 (2.7–7.8) for conservative care only to 16.8 (6.9–40.7) for medical care only. Additional significant baseline predictors included age, income, education, workman's compensation claim, Oswestry Disability Index score, and Global Chronic Pain Scale grade.

Conclusions: This study provides important information regarding the association between patient characteristics, HRQoL measures, and LBP-related pain management utilization.

Keywords: low-back pain, pain management, surveys and questionnaires, crowdsourcing, complementary therapies

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Introduction

Low-back pain (LBP) has been the leading cause of global disability for more than two decades, ranking higher than stroke and most forms of cancer.[1] In the United States, LBP is the most common site for pain, with a 3-month prevalence of 39% and a slightly higher rate in women (41%) than in men (37%).[2] The mean inflation-adjusted expenditure on LBP-related medical care increased by 95% from 1999 to 2008,[3] with total costs representing 2.5% of the U.S. gross domestic product.[4]

The majority of cases of LBP do not result from serious underlying pathology,[5,6] and treatment guidelines suggest conservative treatment including education (reassurance of good prognosis), self-management, exercise, and spinal manipulation.[5,7,8] Nonetheless, routine use of imaging studies, opioids, injection procedures, and surgery for the management of LBP have increased exponentially since 2000.[6,9–11]

While the majority of back pain management occur from a physician (MD) in primary care, patients also seek care from chiropractors (DC), physical therapists (PT), surgeons, massage therapists, and acupuncturists.[12] Identifying patient characteristics associated with different LBP management strategies is essential for researchers and clinicians to promote patient-centered care, influence policy, and guide clinical research on care pathways.[13]

A recent systematic review[13] found that the following factors were significant predictors of self-reported health care utilization for neck and/or LBP: Age (younger vs. older differed based on study); Gender (male for DC, female for PT, female for any of 16 types of complementary and alternative medicine providers evaluated); Health status (worse general health for MD, lower comorbid condition count for DC); Insurance type (workers' compensation and auto insurance lower for MD, higher for PT); Geography (large town for MD, small town for PT); Level of disability (Grade III or IV for MD, chronic duration for MD, better health for DC); Occupation (manual labor for DC, blue collar for PT); Higher disability scores, duration greater than 30 days, and pain in multiple locations (multiple providers).

This study expands upon this systematic review by analyzing data from a large U.S. sample of diverse participants completing baseline and 3-month follow-up surveys on the crowdsourcing platform Amazon Mechanical Turk (MTurk). The authors evaluated associations between baseline demographics, health conditions, pain management strategies, and health-related quality-of-life (HRQoL) measures with pain management strategies at 3-month follow-up in respondents reporting current LBP. The authors expected that baseline pain management would be a strong predictor of follow-up pain management, but also explored other potential influences.

Methods

The study was reviewed and approved by the RAND Human Subjects Protection Committee (2019-0651-AM02). Patient consent was not required due to de-identification. MTurk is the largest web-based crowdsourcing platform with more than 500,000 registered independent contractors (i.e., workers) who can be recruited and compensated to complete research-based activities such as completing surveys.[14] The characteristics, risks, and benefits of using MTurk for academic research have been reported on extensively.[14–19]

MTurk was used in the present study to recruit adult respondents to complete a general health survey that included demographics, health history, and the Patient-Reported Outcomes Measurement Information System (PROMIS®) Global-10 measure.[20] This study focuses on respondents who reported having LBP at baseline and 3-month follow-up based on the following question: ''Do you currently have back pain?'' This subset of the overall sample was asked to complete several HRQoL measures specific to back pain and report about their history of pain management strategies—''ever used'' at baseline and ''used in the previous 3 months'' at follow-up.

Several quality control measures were implemented to address potential data quality concerns.[17] Studies have shown that including MTurk participants with a 95% completion rate on at least 500 previous jobs improves response quality and sample representativeness, so this threshold was included as a requirement for respondents in the present study.[18] Additional quality control measures included: (1) Participants were not told that this study was targeting individuals with LBP; (2) Small batches of surveys were deployed hourly over several weeks to reduce selection bias; and (3) two fake conditions were inserted in the health conditions checklist (Syndomitis and Chekalism)—those endorsing either of these conditions were excluded from the study.[18,21,22]

Table 1 documents the included baseline variables. Pain management was categorized as follows: conservative care only (CCOnly—chiropractic, acupuncture, counseling, or massage therapy); medical care only (MMOnly—injections, non-opioid prescriptions, opioid prescriptions, and surgery); combination care (CCMM—conservative+medical); Other Care (supplements, tetrahydrocannabinol [THC], cannabidiol [CBD], or over-the-counter [OTC] medications only); No Care (no pain management selected). A geographic variable was created that consisted of five regions (Northeast, Southeast, Midwest, Southwest, West) based on the respondent's reported state of residence.

Income, education, and marital status were collapsed into more concise groups due to small cell counts with the original categorization. HRQoL measures included the PROMIS Global-10 surveys; PROMIS-29 v2.1; Oswestry Disability Index (ODI); Roland–Morris Disability Questionnaire (RMDQ); Pain Impact Stratification Score category (ISS); Pain, Enjoyment, and General Activity (PEG); and Graded Chronic Pain Scale (GCPS).[21] The Strengthening The Reporting of Observational studies in Epidemiology (STROBE) form for the study is provided as Supplementary File S1.

Data analysis

Data analyses were conducted using SAS version 9.4 (SAS Institute, Inc.). Several statistical modeling approaches were employed: (1) Chi-square (categorical variables) and independent samples *t*-tests (continuous variables) to evaluate mean differences in baseline variables; (2) Pearson's correlation coefficients to assess the

Table 1. Baseline Survey Variables

Variable	*Description*
Pain management categories	CCOnly = conservative care only (chiropractic, acupuncture, counseling, massage) MMOnly = medical care only (injection, opioid prescriptions, non-opioid prescriptions, surgery) CCMM = combination conservative+medical care Other Care = Supplements, tetrahydrocannabinol, cannabidiol, over-the-counter only No Care = no pain management
Gender	Female, male
Age	At the time of baseline survey completion
Race	Hispanic, non-Hispanic White, non-Hispanic Black, non-Hispanic Other
Education	<Bachelor's degree; bachelor's degree; >bachelor's degree
Income	<$20k; $20–39.9k; $40–59.9k; $60–79.9k; $80–99.9k; $100k+
Currently working full time	Yes or no
Not working for health reasons	Yes or no
Marital category	Married, not married
Geographic region	Northeast (ME, VT, NH, MA, NY, NJ, PA, RI, CT); Southeast (MD, DE, DC, VA, SW, KY, TN, NC, SC, GA, FL, AL, MS, LA, AR); Midwest (OH, IN, IL, MI, WI, MO, IA, MN, ND, SD, NE, KS); Southwest (TX, OK, NM, AZ); West (CO, UT, WY, MT, ID, NV, CA, OR, WA)
Comorbidities	Hypertension, heart attack, stroke, arthritis, anxiety, depression, neck pain, sciatica, insomnia
Health-related quality-of-life measures	Oswestry Disability Index (ODI); Roland–Morris Disability Questionnaire (RMDQ); Pain Impact Stratification Score (ISS); Pain, Enjoyment, and General Activity (PEG); Graded Chronic Pain Scale (GCPS); Patient-Reported Outcomes Measurement Information System (PROMIS)-29 scores, and GLOBAL-10 (mental and physical)

magnitude and direction of associations between baseline HRQoL measures and follow-up pain management; (3) Bivariate logistic regression models to estimate odds ratios (ORs) with 95% confidence intervals (95% CIs) for each follow-up pain management category using baseline predictor variables; and (4) multivariate logistic regression models including significant variables from the bivariate models. Model fit statistics (Akaike information criteria [AIC] and concordance statistic [C]) were used to compare different models. When comparing two models, the one with a lower AIC value and a higher C value is the better performing model.[23]

Results

Complete baseline and 3-month follow-up data were available for 717 respondents with LBP. Table 2 reports the baseline characteristics for respondents in each pain management category.

Significant differences among baseline variables included: Age (lower for CCOnly, higher for MMOnly); Marital status (higher prevalence for CCOnly, lower for Other Care); non-Hispanic White (lower prevalence for CCOnly and No Care, higher for Other Care); non-Hispanic Other (higher prevalence for CCOnly and No Care, lower for Other Care); Education (higher prevalence of less than a bachelor's [BS] degree for MMOnly); Income (greater than $100k for CCOnly); workman's compensation case (higher prevalence for CCMM); HRQoL scores (CCOnly—lower ISS, ODI, higher PROMIS physical health; MMOnly—worse scores on all measures; CCMM worse scores on all measures; No Care—lower scores on all measures); Comorbid conditions (MMOnly—higher prevalence of hypertension and arthritis, CCMM—higher prevalence of hypertension and sciatica; No Care—lower prevalence of arthritis, depression, sciatica, neck pain and insomnia).

Table 3 shows the most common pain management strategies in each category at baseline and follow-up. Most respondents used two or fewer strategies within each pain management category, particularly in the conservative care group. Of those using one strategy at baseline, massage (CCOnly), non-opioid prescriptions (MMOnly, CCMM-medical), chiropractic (CCMM-conservative), and OTC only (Other Care) were the most common. This pattern was similar at follow-up, with massage replacing chiropractic as the most common therapy in the CCMM-conservative category. Pain management strategies most likely to be combined include massage with chiropractic, non-opioid prescriptions with opioid prescriptions, and OTC medications with supplements. A more detailed description of individual pain management strategies at baseline and 3-month follow-up is provided in Supplementary File S2.

Due to collinearity among HRQoL measures, Pearson's correlation coefficients were estimated to assess correlations among each measure and pain management category (Supplementary File S3). The measure with the strongest correlation coefficient among each pain management category was included in the modeling: PROMIS-29 physical health with CCOnly ($r = 0.13$); ODI with MMOnly ($r = 0.21$); PEG with CCMM ($r = 0.32$); and GCPS with Other Care ($r = 0.18$) and No Care ($r = -0.17$). All coefficients were significant at $p < 0.001$.

Results of the bivariate logistic regression models are presented in Table 4. Baseline pain management category had large and significant ORs for the same *follow-up* category (except for *No Care*), ranging from 4.61 for CCOnly to 9.83 for MMOnly.

Additional significant predictors for each follow-up pain management strategy include: *CCOnly*—baseline Other Care (negative association), younger age, higher PROMIS-10 physical and mental health scores, non-Hispanic White

Table 2. Baseline Respondent Characteristics for Each Follow-Up Pain Management Category

Percentage of respondents	*COOnly* n = *76*	*MMOnly* n = *51*	*CCMM* n = *22*	*Other Care* n = *474*	*No Care* n = *94*	*Overall* n = *717*
Hypertension	22	**45**	**50**	29	26	30
Heart attack	0	2	5	3	1	2
Arthritis	18	**43**	32	30	**15**	27
Anxiety	37	43	59	42	31	40
Depression	46	53	55	45	**35**	44
Sciatica	26	37	**45**	27	**14**	26
Neck pain	47	37	50	38	**27**	38
Insomnia	50	67	68	56	**46**	55
Female gender	51	**71**	50	57	**44**	55
Hispanic	4	8	9	7	4	6
Non-Hispanic White	**76**	92	73	**88**	**78**	85
Non-Hispanic Black	5	6	14	9	9	9
Non-Hispanic Other	**22**	6	9	**8**	**16**	10
Education (<BS)	41	**75**	45	48	48	49
Education (BS)	42	16	36	34	29	33
Education (>BS)	17	10	18	18	23	18
Geo. region (NE)	22	14	23	19	19	19
Geo. region (SE)	34	33	41	29	23	30
Geo. region (MW)	16	25	9	22	26	22
Geo. region (SW)	7	18	14	11	11	11
Geo. region (W)	21	10	14	18	21	18
Income (<$20k)	9	10	18	13	19	13
Income ($20–39k)	18	35	9	28	22	26
Income ($40–59k)	20	25	18	23	19	22
Income ($60–79k)	17	14	23	14	11	14
Income ($80–99k)	11	2	14	11	14	11
Income ($100k+)	**25**	14	18	11	15	13
Work full time	70	49	73	61	52	60
Not work health	5	**12**	5	6	3	6
Married	**72**	63	64	**53**	52	56
Work comp/PI	3	2	**18**	5	**0**	4
Mean age (SD)	**40 (10)**	**47 (12)**	48 (8)	44 (12)	43 (13)	44 (12)
Mean ISS (SD)	**17 (8)**	**25 (10)**	**26 (7)**	19 (8)	**17 (7)**	19 (9)
Mean ODI (SD)	**19 (14)**	**34 (10)**	**38 (16)**	22 (15)	**17 (14)**	22 (16)
Mean RMDQ (SD)	7 (6)	**11 (7)**	**13 (6)**	8 (6)	**5 (6)**	8 (6)
Mean PEG (SD)	3 (2)	**4 (2)**	**5 (2)**	4 (2)	**3 (2)**	4 (2)
Mean GCPS (SD)	2 (1)	**3 (1)**	**3 (1)**	2 (1)	**2 (1)**	2 (1)
Mean PROMIS-10 P	**47 (7)**	**41 (8)**	**41 (6)**	45 (7)	**47 (7)**	45 (7)
Mean PROMIS-10 M	44 (9)	44 (8)	44 (9)	43 (9)	44 (9)	43 (9)

Bold values indicate statistically significant difference ($p < 0.05$); COOnly = follow-up conservative care only (chiropractic, acupuncture, counseling, massage); MMOnly = follow-up medical care only (injection, opioid prescriptions, non-opioid prescriptions, surgery); CCMM = follow-up combination conservative+medical care; Other Care = follow-up other care (supplements, THC, CBD, OTC only); No Care = follow-up no care; Geo. region = geographic region (NE; SE; MW; SW; W); not work health = medical condition preventing respondent from working; work comp/PI = active workman's compensation or personal injury claim.

BS, bachelor's degree; GCPS, Graded Chronic Pain Scale; ISS, Pain Impact Stratification Score; MW, Midwest; NE, Northeast; ODI, Oswestry Disability Index; PEG, Pain, Enjoyment, and General Activity; PROMIS, Patient-Reported Outcomes Measurement Information System; RMDQ, Roland–Morris Disability Questionnaire; SE, Southeast; SW, Southwest; W, West.

(negative association) and non-Hispanic Other (positive association) ethnicity, and income >$100k; *MMOnly*—baseline CCMM (positive association), COOnly, and Other Care (negative associations), older age, arthritis diagnosis, female gender, PROMIS-10 physical (lower scores) and mental health (higher scores) scores, higher ODI score, income category (negative association with $80–99k), and lower education level; *CCMM*—baseline Other Care (negative association), older age, sciatica diagnosis, workers' compensation/personal injury case, lower PROMIS-10 physical health score, and higher PEG score; *Other Care*—baseline CCMM (negative association), non-Hispanic White (positive association), non-Hispanic Other (negative association), and income category (negative association with $100k); *No Care*—baseline COOnly (positive association), baseline Other Care (negative association), arthritis, anxiety, sciatica, neck pain, and/or insomnia diagnosis, female gender (negative association), non-Hispanic White (negative association), and higher PROMIS-10 physical health and GCPS scores.

Table 5 compares the model fit statistics between bivariate (baseline and 3-month follow-up pain management strategies) and multivariate (significant variables from Table 4) models. In each case, the multivariate model was a better fit as indicated by decreased AIC values and/or increased C statistic. The *MMOnly* multivariate model

Table 3. Most Common Therapies Utilized in Each Pain Management Category

	Used one therapy, n *(%)*	*Most common therapy*	*Used two or fewer therapies,* n *(%)*	*Second most common therapy*
Baseline				
CCOnly	60 (60)	Massage	95 (95)	Chiropractic
MMOnly	30 (56)	Prescription[a]	41 (67)	Opioid
CCMM (CC)	45 (51)	Chiropractic	70 (79)	Massage
CCMM (MM)	36 (41)	Prescription[a]	68 (68)	Opioid
Other Care	92 (20)	OTC Only	274 (60)	Supplements
Follow-Up				
CCOnly	60 (79)	Massage	71 (94)	Chiropractic
MMOnly	32 (63)	Prescription[a]	44 (87)	Opioid
CCMM (CC)	17 (77)	Massage	21 (95)	Chiropractic
CCMM (MM)	10 (45)	Prescription[a]	18 (81)	Opioid
Other Care	173 (37)	OTC Only	367 (78)	Supplements

CCOnly = conservative care only (chiropractic, acupuncture, counseling, massage); MMOnly = medical care only (injection, opioid prescriptions, non-opioid prescriptions, surgery); CCMM = combination conservative+medical care; Other Care = other care (supplements, THC, CBD, OTC only); OTC = over-the-counter medication.
[a]Prescription = non-opioids, opioid = narcotics.

performed best, as it was able to successfully classify 88% of respondents by including baseline MMOnly and CCMM, ODI score, PROMIS-10 mental health score, income, and education. Large and significant OR estimates remained in the multivariate models for the association between baseline and follow-up pain management strategies (except for *No Care*).

Baseline predictors from bivariate models that remained significant in the multivariate models include age (*CCOnly*, *CCMM*), income category (*CCOnly*, *MMOnly*, *Other*), education category (*MMOnly*), workman's compensation/personal injury claim (*CCMM*), CCOnly and MMOnly (*Other Care*), CCMM (*MMOnly*), and Other Care (*No Care*). Two HRQoL measures remained significant; GCPS [(*No Care*, OR 0.6; 95% CI 0.5–0.9) (*Other Care* OR 0.85; 95% CI 0.72–1.0)] and ODI score (*MMOnly*, OR 1.03; 95% CI 1.0–1.1).

Multivariate model results (Table 5) indicated that three pain management crossovers were likely (baseline to follow-up): (1) CCMM (OR 7.6, 95% CI 3.3–17.4) to MMOnly; (2) CCOnly (OR 4.0, 95% CI 1.1–14.0) to Other Care; and (3) MMOnly (OR 5.1, 95% CI 1.3–19.6) to Other Care. One pain management crossover was unlikely: Other Care (OR 0.3, 95% CI 0.2–0.6) to No Care.

Discussion

As hypothesized, baseline and 3-month follow-up pain management were strongly associated after adjusting for a variety of baseline variables. Wide 95% CIs for estimated associations reflect some small subgroup sample sizes.[24] This finding is consistent with another study,[25] which evaluated a large cohort of adults with LBP ($n = 8244$) using the Medical Expenditures Panel Survey. The authors found that ~80% of individuals exhibit the same treatment pattern across recurring back pain episodes. In the sample, 50% of respondents using Other Care at baseline continued at follow-up, 45% for CCMM, 37% for CCOnly, and 35% for MMOnly. There were no crossovers between CCOnly and MMOnly (or *vice versa*), suggesting that some respondents had a clear preference for either conservative or medical care.

Crossover to self-management strategies (Other Care) was common for respondents utilizing CCOnly or MMOnly at baseline. Among several possible explanations, these individuals may have experienced inadequate responses to other pain management options, or alternatively, had partial responses requiring a lower level of care. The latter is more likely for respondents crossing over from MMOnly, as mean HRQoL measures indicate lower pain and disability levels in the Other Care group.

The rationale for grouping pain management strategies was based on whether they were administered by the patient or a provider. Potential barriers exist for provider-administered therapies, such as cost, health insurance coverage, provider access, dedicated time for appointments, and frequency of visits.[26,27] With the exception of cost, these factors are not relevant for patient-administered therapies such as THC, CBD, OTC medications, and supplements, which may help explain the large number of respondents in this category.

The existing literature on determinants of care seeking in patients with LBP largely focuses on medical care (primary care or medical specialists), chiropractic care, and/or physical therapy.[13,28–32] In their systematic review, Talty et al.[13] identified male gender, greater than high school education, higher income, fewer comorbid conditions, better physical functioning, >60 years old, and against taking prescription medications as significant predictors of self-reported chiropractic use. Some of these predictors were observed in the CCOnly group, including higher income, lower disability levels (lower ISS and ODI scores), and better HRQoL (higher PROMIS-10 physical health scores). The same authors[13] identified age (mixed results regarding specific age category), other marital status, less than university education, Black race, the presence of chronic back pain and/or sciatica, higher (worse) ODI scores, and worse physical and mental health to be significant predictors of self-reported medical care. Some of these characteristics were found in respondents utilizing MMOnly in this study, including older age, worse HRQoL scores, and a high percentage without a bachelor's degree.

Wolsko et al.[33] evaluated the factors associated with the use of complementary and alternative medicine therapies

Table 4. Bivariate Logistic Regression Estimates

	Follow-up pain management categories				
	CCOnly	*MMOnly*	*CCMM*	*Other Care*	*No Care*
CCOnly	**4.61 (2.72–7.81)**	**0.12 (0.02–0.84)**	*	1.05 (0.75–1.46)	**2.47 (1.46–4.16)**
MMOnly	0.15 (0.02–1.11)	**9.83 (5.04–19.17)**	1.26 (0.29–5.56)	1.36 (0.10–2.27)	0.52 (0.18–1.48)
CCMM	1.73 (0.92–3.24)	**3.77 (1.99–7.15)**	**6.59 (2.76–15.76)**	**0.32 (0.22–0.45)**	0.83 (0.41–1.67)
Other Care	**0.40 (0.25–0.65)**	**0.24 (0.13–0.44)**	**0.39 (0.17–0.93)**	**4.75 (3.16–7.15)**	**0.34 (0.22–0.53)**
No Care	2.59 (0.93–7.22)	*	*	0.61 (0.26–1.42)	2.00 (0.72–5.56)
Arthritis	0.57 (0.31–1.04)	**2.13 (1.19–3.80)**	1.24 (0.50–3.09)	1.37 (0.96–1.95)	**0.42 (0.23–0.76)**
Anxiety	0.84 (0.52–1.38)	1.13 (0.63–2.00)	2.18 (0.92–5.17)	1.18 (0.86–1.62)	**0.62 (0.39–0.99)**
Depression	1.08 (0.67–1.74)	1.45 (0.82–2.57)	1.53 (0.65–3.58)	1.02 (0.75–1.39)	0.64 (0.41–1.01)
Sciatica	1.01 (0.59–1.73)	1.75 (0.96–3.16)	**2.42 (1.03–5.70)**	1.06 (0.74–1.50)	**0.41 (0.22–0.76)**
Neck Pain	1.57 (0.97–2.53)	0.98 (0.55–1.77)	1.68 (0.72–3.94)	1.01 (0.74–1.40)	**0.56 (0.34–0.91)**
Insomnia	0.79 (0.49–1.27)	1.68 (0.92–3.07)	1.77 (0.71–4.39)	1.11 (0.82–1.52)	**0.65 (0.42–1.00)**
Age	**0.97 (0.95–0.99)**	**1.03 (1.00–1.05)**	**1.03 (0.99–1.06)**	1.00 (0.99–1.02)	0.99 (0.97–1.01)
Gender	0.84 (0.52–1.35)	**2.04 (1.10–3.80)**	0.81 (0.34–1.88)	1.20 (0.88–1.64)	**0.58 (0.38–0.90)**
PROMIS-10 P	**1.05 (1.01–1.08)**	**0.93 (0.90–0.97)**	**0.93 (0.88–0.98)**	0.99 (0.97–1.02)	**1.04 (1.01–1.07)**
PROMIS-10 M	**1.02 (0.99–1.04)**	**1.01 (0.97–1.04)**	1.05 (0.96–1.06)	0.99 (0.97–1.01)	1.0 (0.98–1.03)
Non-Hispanic White	**0.52 (0.29–0.92)**	2.15 (0.76–6.10)	0.45 (0.17–1.19)	**1.81 (1.19–2.75)**	**0.56 (0.33–0.95)**
Non-Hispanic Black	0.57 (0.20–1.62)	0.66 (0.20–2.17)	1.73 (0.50–6.03)	1.25 (0.70–2.21)	1.00 (0.46–2.18)
Non-Hispanic Other	**2.95 (1.61–5.40)**	0.52 (0.16–1.73)	0.87 (0.20–3.78)	**0.47 (0.29–0.77)**	1.82 (0.98–3.35)
Hispanic	0.60 (0.18–1.99)	1.33 (0.46–3.88)	1.56 (0.35–6.88)	1.24 (0.64–2.41)	0.65 (0.23–1.85)
Education BS	1.62 (0.96–2.74)	**0.29 (0.13–0.63)**	1.20 (0.47–3.08)	1.17 (0.83–1.67)	0.88 (0.53–1.46)
Education >BS	1.15 (0.58–2.27)	**0.33 (0.13–0.86)**	1.08 (0.33–3.51)	1.07 (0.70–1.63)	1.39 (0.80–2.41)
Income <20k	0.97 (0.38–2.48)	0.51 (0.18–1.43)	4.00 (0.72–22.24)	0.77 (0.45–1.29)	1.81 (0.91–3.60)
Income 40–59k	1.26 (0.59–2.70)	0.82 (0.39–1.73)	2.34 (0.42–12.97)	0.93 (0.59–1.48)	0.99 (0.51–1.93)
Income 60–79k	1.80 (0.81–3.98)	0.69 (0.28–1.71)	4.74 (0.90–24.90)	0.80 (0.48–1.35)	0.85 (0.39–1.89)
Income 80–99k	1.45 (0.58–3.60)	**0.13 (0.02–0.95)**	3.78 (0.62–23.09)	0.86 (0.48–1.52)	1.62 (0.77–3.43)
Income 100k+	**3.03 (1.45–6.36)**	0.73 (0.30–1.82)	4.00 (0.72–22.24)	**0.50 (0.30–0.83)**	1.34 (0.65–2.77)
Not work health	0.91 (0.31–2.62)	2.41 (0.96–6.02)	0.78 (0.10–5.95)	0.99 (0.51–1.92)	0.51 (0.15–1.68)
Work full time	1.60 (0.96–2.68)	0.62 (0.35–1.09)	1.80 (0.70–4.65)	1.08 (0.79–1.48)	0.69 (0.44–1.06)
Work comp/PI	0.59 (0.14–2.53)	0.44 (0.06–3.29)	**5.72 (1.81–18.10)**	1.72 (0.73–4.06)	*
Geo. region NE	1.01 (0.53–1.94)	0.62 (0.25–1.53)	0.85 (0.28–2.60)	1.03 (0.66–1.62)	1.30 (0.67–2.53)
Geo. region MW	0.60 (0.29–1.22)	1.04 (0.49–2.21)	0.29 (0.06–1.37)	1.11 (0.72–1.71)	1.57 (0.84–2.91)
Geo. region SW	0.49 (0.18–1.31)	1.48 (0.63–3.48)	0.90 (0.24–3.39)	1.03 (0.60–1.77)	1.26 (0.57–2.79)
Geo. region W	1.01 (0.52–1.96)	0.46 (0.17–1.28)	0.54 (0.14–2.02)	1.04 (0.66–1.65)	1.58 (0.82–3.02)
HRQoL measure	**1.04 (1.01–1.07)[a]**	**1.04 (1.03–1.06)[b]**	**1.37 (1.13–1.65)[c]**	1.09 (0.95–1.25)[d]	**0.58 (0.45–0.74)[d]**

Bold values indicate statistically significant odds ratio estimates ($p < 0.05$). Reference groups: education (<bachelor's), income (20–39k), gender (male), geographic region (southeast). CCOnly = conservative care only (chiropractic, acupuncture, counseling, massage); MMOnly = medical care only (injection, opioid prescriptions, non-opioid prescriptions, surgery); CCMM = combination conservative+ medical care; Other care = other care (supplements, THC, CBD, OTC only); No care = no pain management documented; PROMIS-10 = Patient-Reported Outcomes Measurement Information System global health (mental and physical); Not work health = medical condition preventing respondent from working; Work comp/PI = active workman's compensation or personal injury claim; Geo. region = geographic region (NE; SE; MW; SW; W).

HRQoL measure: health-related quality of life: [a]PROMIS-29 physical health, [b]ODI, [c]Pain, Enjoyment, and General Activity, [d]Graded Chronic Pain Scale.

*<0.001 (<0.001, >999.999).

BS, bachelor's degree; MW, Midwest; NE, Northeast; SE, Southeast; SW, Southwest; W, West.

(i.e., chiropractic, massage, acupuncture, vitamins) in a subset of survey participants with LBP ($n = 242$). Adjusted models indicated that pain at more than one location, age 40–49 years, and female gender were significant factors. CCOnly respondents in the study had a nonsignificant higher prevalence of co-occurring neck pain (47% vs. 38% overall), a significantly lower mean age (40 vs. 44 overall), and a nonsignificant lower prevalence of female gender (51% vs. 55% overall).

An unmeasured variable that may have influenced care seeking is satisfaction with previous pain management. When compared with medical providers, patient satisfaction with LBP-related treatment from chiropractors and/or PT is consistently higher,[30,34–39] with one study showing no difference.[40] Baseline and follow-up CCOnly has a comparatively low OR estimate, and chiropractic and massage therapy decreased in prevalence from baseline to follow-up; both of these findings question the relevance of provider satisfaction in this study.

Limitations

Humphreys[41] argues that article and grant reviewers should be skeptical if authors do not explicitly acknowledge the challenge of generalizability due to potentially unrepresentative samples. The sample included more female subjects with higher education and income levels, lower Hispanic and higher non-Hispanic White ethnicities, and greater anxiety, depression, asthma, back and neck pain comorbidities than nationally representative samples.[18]

Table 5. Comparing Bivariate with Multivariate Logistic Regression Estimates

	CCOnly, OR (95% CI)	*AIC (c)*[a]	*AIC (c)*[b]
Baseline CCOnly[a]	**4.6 (2.7–7.8)**	460 (0.63)	
Age	**0.97 (0.94–0.99)**		461 (0.73)
Non-Hispanic White	1.1 (0.5–2.5)		
Non-Hispanic Other	1.9 (0.8–4.7)		
Baseline CCOnly	**3.0 (1.5–6.2)**		
Baseline Other Care	0.7 (0.4–1.4)		
Income <$20k	0.9 (0.4–2.5)		
Income $40–59k	1.2 (0.5–2.6)		
Income $60–79k	1.5 (0.6–3.4)		
Income $80–99k	1.1 (0.4–2.8)		
Income $100k+	**2.4 (1.1–5.3)**		
PROMIS-29 physical	1.01 (0.9–1.1)		
PROMIS-10 physical	1.02 (0.9–1.3)		
PROMIS-10 mental	0.99 (0.9–1.03)		
	MMOnly, OR (95% CI)	*AIC (c)*[a]	*AIC (c)*[b]
Baseline MMOnly[a]	**9.8 (5.0–19.2)**	334 (0.65)	
Age	1.0 (1.0–1.0)		290 (0.88)
Female gender	1.4 (0.7–3.1)		
Baseline CCOnly	0.4 (0.1–3.4)		
Baseline MMOnly	**16.8 (6.9–40.7)**		
Baseline CCMM	**7.6 (3.3–17.4)**		
Arthritis	1.1 (0.5–2.4)		
Income <$20k	**0.2 (0.1–0.7)**		
Income $40–59k	0.9 (0.4–1.9)		
Income $60–79k	1.3 (0.4–3.7)		
Income $80–99k	0.2 (0.0–1.5)		
Income $100k+	1.9 (0.6–5.6)		
Education BS	**0.2 (0.1–0.5)**		
Education >BS	**0.3 (0.1–0.8)**		
ODI score	**1.03 (1.0–1.1)**		
PROMIS-10 physical	0.9 (0.8–1.1)		
PROMIS-10 mental	**1.03 (1.0–1.1)**		
	CCMM, OR (95% CI)	*AIC (c)*[a]	*AIC (c)*[b]
Baseline CCMM[a]	**6.6 (2.8–15.7)**	185 (0.67)	
Age	**1.02 (1.0–1.1)**		180 (0.81)
Baseline CCMM	**5.3 (1.3–21.0)**		
Baseline Other Care	0.9 (0.2–3.3)		
Sciatica	1.4 (0.6–3.7)		
Work comp/PI	**4.6 (1.2–17.4)**		
PEG score	1.2 (0.94–1.6)		
PROMIS-10 physical	0.96 (0.9–1.03)		
	Other Care, OR (95% CI)	*AIC (c)*[a]	*AIC (c)*[b]
Baseline Other Care[a]	**4.75 (3.2–7.2)**	858 (0.62)	
Non-Hispanic White	1.5 (0.8–2.8)		844 (0.71)
Non-Hispanic Other	0.8 (0.4–1.5)		
Baseline CCOnly	**4.0 (1.1–14.0)**		
Baseline MMOnly	**5.1 (1.3–19.6)**		
Baseline CCMM	1.9 (0.5–6.8)		
Baseline Other Care	**12.4 (3.4–44.7)**		
Income <$20k	**1.7 (1.0–3.0)**		
Income $40–59k	1.1 (0.7–1.8)		
Income $60–79k	0.9 (0.6–1.7)		
Income $80–99k	1.1 (0.6–2.0)		
Income $100k+	0.9 (0.5–1.7)		
GCPS score	**0.85 (0.72–1.0)**		
	No Care, OR (95% CI)	*AIC (c)*[a]	*AIC (c)*[b]
Baseline No Care[a]	2.0 (0.7–5.6)	559 (0.51)	
Female gender	0.70 (0.44–1.11)		525 (0.73)
Baseline CCOnly	0.9 (0.5–1.7)		
Baseline Other Care	**0.3 (0.2–0.6)**		
Arthritis	0.6 (0.3–1.2)		
Anxiety	1.0 (0.6–1.6)		
Neck pain	0.7 (0.4–1.3)		
Sciatica	0.6 (0.3–1.2)		
Insomnia	0.8 (0.5–1.4)		
PROMIS-10 physical	0.98 (0.9–1.02)		
GCPS score	**0.6 (0.5–0.9)**		

Bold values indicate statistically significant odds ratio estimates ($p < 0.05$).

CCOnly = conservative care only (chiropractic, acupuncture, counseling, massage); MMOnly = medical care only (injection, opioid prescriptions, non-opioid prescriptions, surgery); CCMM = combination conservative+medical care; Other = Other Care (supplements, THC, CBD, OTC only); No Care = no pain management documented; BS = bachelor's degree; Work comp/PI = active workman's compensation or personal injury claim. PROMIS = Patient-Reported Outcomes Measurement Information System Global Health-Global Health-10, PROMIS-29.

[a]Bivariate.

[b]Multivariate.

AIC, Akaike information criteria; c, concordance statistic; CI, confidence interval; OR, odds ratio; OTC, over-the-counter medication.

Concerns about MTurk data quality have been raised in the literature.[14,16] Due to minimal financial reward, MTurk participants may attempt to complete tasks as quickly as possible without adequate attention to detail.

However, a screening step was included for the sample to reduce these inattentive respondents. Despite these limitations, a review article[14] including 35 studies highlighted statistical similarities when comparing MTurk with data collected from other samples. Recall and nonresponse are potential sources of bias in the data set.[42] Self-reporting of pain management strategies and medical conditions can be subject to recall bias, with longer recall periods being more susceptible.[42] In this study, this source of bias is most likely regarding baseline reporting of pain management (… ever used) versus follow-up (… used in the past 3 months). Certain types of respondents may be underrepresented due to nonresponse; this type of bias ''is the rule rather than the exception'' in survey research (p2).[43]

Limitations of the methods and analysis should also be mentioned. Alternative pain management grouping strategies could have produced different outcomes. Although participants were questioned specifically about LBP-related pain management, strategy the ''Other'' category (THC/CBD, supplements, OTC medications) is frequently used for reasons unrelated to LBP. Finally, the possibility of unmeasured confounding variables (e.g., health insurance coverage), which may have influenced the outcome, is important to acknowledge.

Conclusions

This study provides important insights regarding the associations among patient characteristics, HRQoL measures, and LBP-related pain management utilization. The authors

confirmed that baseline pain management strongly predicted 3-month pain management and that demographic characteristics such as age, income, and education are important covariates. Given the consistent recommendations across LBP treatment guidelines, additional studies evaluating predictors of conservative care utilization are warranted.

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Authors' Contributions

B.R.A.: Conceptualization, methodology, software, validation, formal analysis, resources, data curation, writing—original draft, writing—review and editing, visualization. P.M.H. and R.D.H.: Conceptualization, methodology, writing—review and editing, supervision, project administration, funding acquisition.

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Supplementary Material

Supplementary File S1
Supplementary File S2
Supplementary File S3

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