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Treatment Effectiveness and Medication Use Reduction for Older Adults in Interdisciplinary Pain Rehabilitation

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Abstract

Objective: To examine the effectiveness of an interdisciplinary pain rehabilitation program (IPRP) that incorporates medication tapering on improving pain-related and performance-based outcomes for older adults with chronic noncancer pain and determine the proportion who demonstrated reliable improvement in outcome.

Patients and Methods: This 2-year retrospective clinical cohort study examined treatment outcomes of 134 older adult patients 65 years or older with chronic noncancer pain who completed a 3-week IPRP with physician-supervised medication tapering between January 1, 2015, and December 31, 2017. Pain, pain catastrophizing, depressive symptoms, and quality of life were assessed at pretreatment, posttreatment, and follow-up. Physical performance and medication use were assessed pre- and posttreatment. Outcomes were examined using a series of repeated-measures analyses of variance, examining effect size and reliable change.

Results: Significant treatment effects ($P<.001$) with large effect sizes were observed for all self-report and physical performance outcome measures at posttreatment and 6-month follow-up (42.5% response rate). There were no significant differences in outcome based on opioid use status at admission. Reliable change analyses revealed that 76.9% (n=103 of 134) evidenced improvement in at least 1 pain-related outcome measure at posttreatment, and 87.7% (n=50 of 57), at follow-up. Patients also had significant reductions ($P<.01$) in medications at posttreatment (opioids, benzodiazepines, sedative-hypnotics, selective serotonin reuptake inhibitors, serotonin-norepinephrine reuptake inhibitors, tricyclic antidepressants, and anticonvulsants).

Conclusion: Older adults with chronic noncancer pain demonstrated improved pain-related outcomes, physical performance, and decreased medication use following IPRP treatment. Results support the effectiveness of IPRPs in enhancing the physical and emotional functioning of older adults with chronic pain while also facilitating the reduction of medications that place them at risk for adverse events.

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The prevalence of chronic pain for older adults (OAs) ranges from 51% to 83% across care settings.[1-5] OAs face unique barriers to effective pain management, including high rates of medical comorbid conditions, decreases in mobility, and medication sensitivities due to prolonged use and age-related reduction in renal function.[6] More than 66% of OAs reported using 3 or more prescription drugs in the past 30 days,[7] and the Centers for Disease Control and Prevention has identified OAs as at greater risk for harm due to opioids.[8] When not closely monitored, these medications increase the risk for falls, fractures, cognitive impairment, pneumonia, and mortality.[6,9-11] The American Geriatrics Society Beers Criteria[12] recommend that use of benzodiazepine (BZD) and other sedative-hypnotics, tricyclic antidepressants, muscle relaxants, and nonsteroidal anti-inflammatory drugs be avoided outside of palliative care and hospice settings.

Despite increasing recognition of the need for nonpharmacologic pain treatment approaches for OAs, a dearth of empirical examination of such treatments exists.[13] A meta-analytic review of cognitive and behavioral interventions for OAs with chronic pain

revealed that such approaches produced small effects on pain but no effect on depression, physical functioning, or medication use.[14] In a recently published randomized controlled trial, a cognitive behavioral therapy—based pain program that included structured exercise outperformed both exercise-attention control and wait list control groups on measures of disability, depressive symptoms, pain distress, and kinesiophobia at 1 year.[15] Unfortunately, the impact of the intervention on medication use was not reported.

The effectiveness of interdisciplinary pain rehabilitation programs (IPRPs) on OA functioning has also been explored. One study revealed significant effects of IPRP treatment across multiple domains of pain-related physical and emotional functioning, with 48% to 65% of OAs demonstrating clinically meaningful improvements at posttreatment.[16] Again, change in medication use was not discussed in this study. Another study examining the effectiveness of an IPRP that incorporated opioid treatment cessation with OAs demonstrated similar improvements along with opioid dose reductions.[17] Although these findings are compelling and provide support for IPRPs as an effective treatment option, both studies relied exclusively on patient self-report to assess outcomes.

This study aims to investigate both self-reported pain-related outcome and physical performance changes in the context of IPRP at posttreatment and follow-up. Additionally, the study investigated medication changes that occur while participating in IPRPs. This study expands outcome analyses of IPRPs for OAs with chronic noncancer pain (CNP) in important ways. First, we used reliable change analyses[18,19] and effect size to evaluate the effectiveness of a 3-week IPRP with physician-supervised opioid use tapering on self-report and performance-based outcomes. We hypothesized that all patients, irrespective of opioid use status, would experience significant functional improvements at posttreatment and that improvements would be sustained at the 6-month follow-up. We also hypothesized that the functional gains attained at posttreatment and follow-up would not be influenced by opioid tapering. Furthermore, we anticipated that results of effect size and reliable change analyses would further support the value of the intervention. Without specific hypotheses regarding other nonopioid Beers Criteria medications, exploratory analyses were conducted to evaluate whether meaningful pre- to posttreatment reductions in such medications are accomplished.

PATIENTS AND METHODS

Patients included consecutive referrals of those age 65 years or older with CNP enrolled in the Mayo Clinic Pain Rehabilitation Center (PRC) from January 1, 2015, to December 31, 2017. In total, 709 adult patients enrolled in the program during the study period. Of the 709 total adult patients, 151 (21.3%) were OAs, and 134 older adult patients age 65 years or older completed treatment and were included in study analyses. Inclusion and exclusion criteria have been previously described.[20] Inclusion criteria include pain in ±1 anatomical site as predominant clinical presentation, pain causing significant distress or impairment in functioning, and no evidence to suggest malingering of symptoms. Exclusion criteria included pain caused by cancer or other malignant condition, predominant substance use disorder symptoms that were moderate or severe, acute suicide risk, or psychotic or mood disorder symptoms that would require immediate psychiatric management at a higher level of care. Treatment outcomes for individuals, n=44 of 134 (32.8%), who received treatment between January 1, 2015, and December 31, of 2015, were used in a previous report investigating treatment improvements based on opioid status.[20]

Procedure

This study was approved by the Institutional Review Board at Mayo Clinic in Rochester, Minnesota. We conducted a retrospective review of medical records of patients who met eligibility criteria for the study, including completion of the 3-week PRC program questionnaires at pretreatment, posttreatment, and 6 months' posttreatment. Only medical records with research authorization were included. Patients who did not complete the 6-month follow-up questionnaire within 2 weeks were sent a reminder letter. The performance-based measures were assessed at pre- and posttreatment.

Treatment Intervention

The treatment intervention is a clinical program that has been previously described.[20] In brief, the PRC is an intensive 3-week outpatient IPRP focusing on functional restoration. The underlying treatment philosophy emphasizes that when meaningful pain reduction is not possible, treatment approaches must shift toward maximizing functionality. A cognitive behavioral therapy model serves as the basis for treatment. PRC entails concurrent treatment by multiple disciplines, including physicians, psychologists, nurses, clinical nurse specialists, licensed professional clinical counselors, physical/occupational therapists, and pharmacists.

Physician- and pharmacist-supervised opioid and BZD tapering is a core component of treatment. Additionally, use of sleep medications (ie, sedative-hypnotics) and nonopioid analgesic medication, including anticonvulsants, nonsteroidal anti-inflammatory drugs, and muscle relaxants, is reduced or treatment is discontinued based on a risk-benefit assessment, which has been previously described.[21]

Dependent Variables

Medication Use. Medication reconciliation was completed with OAs on admission. Current daily opioid dosing was calculated using information from medical records, medication bottles, patient report, and state prescription monitoring programs. Opioid intake was converted to oral morphine milligram equivalents (MMEs).[8] A BZD equivalent dose based on published conversion equivalent doses was used to quantify and compare BZD use and reduction for both groups.[22] All BZD daily doses were converted to oral diazepam equivalent doses.

Pain Severity and Pain Interference. The Pain Severity (PS) and Pain Interference (PI) subscales of the West Haven-Yale Multidimensional Pain Inventory[23] were used and have acceptable levels of reliability and validity.[24] Possible scores range from 0 to 6 for each subscale, with higher scores representing greater symptom severity and functional impairment, respectively. The internal consistency of both subscales was appropriate at pretreatment, posttreatment, and 6 months' posttreatment (pain severity = 0.77-0.85, and pain interference = 0.91-0.93).

Quality of Life. The Medical Outcomes Study 36-Item Short Form Health Survey[25] is a measure of 8 domains of health-related quality of life (QOL). The 8 domains can be combined into 2 subscale summary scores, mental health—related QOL and physical health—related QOL. These summary scores were used for this study. Items are rated on a Likert-type scale, which are then transformed into percentages (0%-100%). Lower scores reflect worse QOL. Research supports strong psychometric properties for the measure, including high convergence with clinical data.[26] Internal consistency in the current sample was high at all 3 time points (physical health = 0.89-0.93, and mental health = 0.87-0.93).

Depressive Symptoms. To evaluate the effect of treatment on change in depressive symptoms, standardized scores were generated for the depression measures given the program's transition from the use of the Center for Epidemiologic Studies Depression Scale (CES-D)[27] to the Patient Health Questionnaire-9 (PHQ-9)[28] in January 2016. Raw scores were transformed to z scores, with change in depressive symptom measure z score calculated relative to pretreatment. Research supports the internal consistency for both measures: α=0.90 for CES-D[28] and α=0.88 for PHQ-9.[29] For CES-D, possible scores range from 0 to 60 and possible scores on the PHQ-9 range from 0 to 27. For both measures, higher scores indicate greater depressive symptoms. Internal consistency in the current sample was high at all 3 time points for CES-D (0.91-0.93) and acceptable at all 3 time points for PHQ-9 (0.75-0.79).

Pain Catastrophizing. The Pain Catastrophizing Scale[30] measures rumination, magnification, and helplessness regarding pain. Scores range from 0 to 52, with higher scores reflecting greater levels of catastrophic thinking. Osman et al[31] provided support for the validity of Pain Catastrophizing Scale subscale scores by reporting significant correlations with measures of pain severity, pain interference, and negative affect. In the current

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sample, internal consistency was appropriate at all 3 time points (0.94-0.96).

Functional Capacity. The Simmonds Physical Performance Test Battery[32] is a battery of objective functional tests conducted by physical therapists, including 5-Minute Walk Test (measured in feet), 50-Foot Walk Test (seconds), Timed Up-and-Go Test (seconds), repeated Sit-To-Stand Test (seconds), repeated Trunk Flexion Test (seconds), and Loaded Reach Test (centimeters). Research supports the reliability, stability, and validity of the battery.[32]

Statistical Analyses

Before analyses, all variables were inspected for normality within each group. Outliers were defined as $z = \pm 3.29$ and were Winsorized to preserve data while reducing the influence of extreme values. Variables exceeding acceptable levels of skewness (± 1.96) included the following physical therapy variables: Timed Up-and-Go, Sit-to-Stand, and Loaded Trunk tests. A square root transformation was conducted on these variables, which successfully reduced skewness. However, there were no differences in significance or interpretation of results using transformed variables. Therefore, the original variables were used. There were no violations to homogeneity of variance or sphericity. Missing data were replaced with group mean values and doing so did not alter the significance or interpretation of the results.

Two sets of data were used for this study. One set of data included individuals with pre- and posttreatment data (which included 43 data points that were missing and imputed). The second data set included individuals who had pretreatment, posttreatment, and follow-up data (which included 6 data points missing and imputed). The use of mean imputation occurred in less than 1% of all data analyzed.

Between-groups comparisons (opioid use vs no opioid use, treatment completers vs noncompleters) of demographic and clinical characteristics were conducted using independent-samples t tests for continuous variables and χ^2 for categorical variables. Within-subjects analyses of variance (ANOVAs) were performed to confirm the effectiveness of treatment in improving patient functioning. ANOVAs were conducted with Bonferroni adjustments due to multiple comparisons. To compare treatment responsiveness between opioid and no-opioid-use groups, simple pre- to posttreatment change scores were then computed for all outcomes and served as dependent variables. Uncontrolled within-subjects effects sizes (Cohen d: 0.2 = small, 0.5 = medium, and 0.8 = large)[33] for pre- to posttreatment differences in entire sample and ANOVAs are reported as partial η squared for ANOVAs (0.01 = small, 0.06 = medium, and 0.14 = large). A series of 2 (group: opioid use or no opioid use) × 2 (period: pretreatment, posttreatment; posttreatment, 6 months posttreatment; or pretreatment, 6 months posttreatment) analyses of covariance (ANCOVAs) were performed for the simple change scores of each outcome variable. To determine significant changes in frequency of medication use within subjects from pre- to posttreatment, McNemar test was used. Pretreatment values of the outcome variable served as covariates, so adjusted means represented change that occurred during treatment and at follow-up uncontaminated by pretreatment values. Post hoc follow-up tests of simple main effects were used in which significant interactions were found. Analyses were conducted using IBM SPSS, version 24.0.[34]

Next, we assessed reliable change in pain-related outcomes between pre- to posttreatment and pretreatment to follow-up. Reliable change represents one aspect of clinically significant change and involves using temporal stability data (ie, test-retest reliability) to determine whether scores on an outcome measure change, in response to intervention, to an extent that exceeds change that could be accounted for by measurement error alone. Reliable change was calculated using established criteria from the literature and included calculating a standard error of the difference (S_{diff}) between pre- and posttreatment for 1 reliable change analysis and between pretreatment and follow-up for a second reliable change analysis.[18,19,35] The S_{diff} is then multiplied by 1.64 to determine the 90% CI of reliable improvement or reliable decline. If the magnitude of change (either reliably improved or reliably declined) exceeded the 90% CI, reliable change can be determined.

TABLE 1. OA Patient Characteristics[a,b]

	Total Study Sample (N=134)	OAs Taking Opioids (n =71)	OAs Not Taking Opioids (n =63)	*P*
Demographic characteristics				
Age (y), mean ± SD	71.00±4.65	71.00±4.23	70.99±5.11	.995
Sex, n				.201
Female	51	31	20	
Male	83	40	43	
Education (y), mean ± SD	15.58±3.22	15.33±2.93	15.87±3.52	.336
Race, n				.881
White	128	68	60	
Other	6	3	3	
Marital status, n				.073
Married	102	48	54	
Divorced	10	6	4	
Single	6	5	1	
Other	16	12	4	
Clinical characteristics				
Pain diagnosis, n				.246
Low back pain	55	32	23	
Generalized pain	35	18	17	
Fibromyalgia	14	4	10	
Other	30	17	13	
Duration of pain (y), mean ± SD	14.67±13.41	14.45±13.72	14.92±13.15	.843
Current opioid use, n %	71 (53.0)			
Morphine equivalent Dose (MME mg), mean ± SD		55.24±63.26		
BZD use, n (%)	47 (35.1)	26 (36.6)	21 (33.3)	.578
Daily valium equivalence (mg), mean ± SD	15.81±11.96	13.95±11.74	18.17±12.23	.314
Sedative hypnotic use, n (%)	36 (26.9)	25 (35.2)	11 (17.4).0	.023[c]
Selective serotonin reuptake inhibitor use, n (%)	32 (23.9)	20 (28.2)	12 (19.0)	.296
Serotonin-norepinephrine reuptake inhibitor use, n (%)	36 (26.9)	19 (26.8)	17 (27.0)	.811
Tricyclic antidepressant use, n (%)	17 (12.7)	9 (12.7)	8 (12.7)	.892
Anticonvulsant/antiepileptic use, n(%)	65 (48.5)	36 (50.7)	29 (46.0)	.838

[a]BZD = benzodiazepine; MME = morphine milligram equivalence; OA = older adult.
[b]Categorical comparisons conducted with χ^2; continuous variable comparisons conducted with independent-samples *t* tests.
[c]$P<.05$.

RESULTS

In total, 151 OAs began treatment. Of these, 17 (11.3%) did not complete the program and were excluded from final analyses. The most common reason for noncompletion was discrepant expectations with program goals (n=6), and rates of noncompletion were similar across the opioid- and nonopioid-use groups. There were no significant differences in measured variables among individuals who completed the treatment compared with those who did not complete treatment ($P>.05$). Our final sample consisted of 134 patients. A total of 71 (53.0%) patients were taking opioids at pretreatment. Descriptive information and pretreatment medication use were compared across individuals taking opioids at pretreatment and those not taking opioids at pretreatment and described in Table 1. Approximately forty-three percent (n=57 of

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134) of those who completed the program returned 6-month follow-up data.

Pre- to Posttreatment Changes in Outcome Measures

There were no significant differences between opioid and nonopioid users at pretreatment ($P>.05$). Significant treatment effects were detected for all self-report ($F[1, 133]>98.75$; P's$<.001$; $d>0.88$) and performance-based outcomes ($F[1, 89$ to $124]>18.30$; P's$<.001$; $d>0.48$) in directions suggesting that patients improved by posttreatment, irrespective of opioid use status (Table 2). All opioid-by-period interactions were nonsignificant with the exception of PS ($[1, 133]=5.08$; $P=.026$; $\eta_p^2=0.037$). Analyses revealed that nonopioid patients reported greater decreases in pain PS than opioid users. Potential difference in outcome was compared by opioid dosage, as well. Patients were stratified by sample median opioid dose (MME=30) into 3 groups: nonopioid users (n=63), opioid users with MME less than 30 (n=35), and opioid users with MME greater than 30 (n=36). The results also demonstrated that all opioid dosage group–by-period interactions were nonsignificant with the exception of PS ($F[1, 133]=3.35$; $P=.038$; $\eta_p^2=.049$). This analysis indicated that the MME greater than 30 group had the least pain severity improvement (pretreatment mean ± SD, 4.29±0.79; posttreatment mean ± SD, 3.44±1.30) compared with the MME less than 30 (pretreatment mean ± SD, 4.20±0.96; posttreatment mean ± SD, 3.00±1.00) and nonopioid groups (pretreatment mean ± SD, 4.23±1.09; posttreatment mean ± SD, 2.63±1.39). Due to opioid status and BZD status appearing not to influence patient responsiveness to treatment on most outcomes based on ANCOVA analyses, the reliable change analysis focused on the sample as a whole.

Table 3 shows results of reliable change analyses from pre- to posttreatment at the 90% CI for PI, PS, pain catastrophizing, and depressive symptom measures. Reliable change was similar across the 4 measures, averaging 43.7% (range, 25.0%-50.0%). Reliable exacerbation in symptoms occurred in pain interference (3.7%; n=5 of 134); pain severity (2.2%; n=3 of 134), pain catastrophizing (0.7%; n=1 of 134), and depressive symptoms (0.7%; n=1). When evaluating rates of improvement on an individual basis, 76.9% (n=103 of 134) of patients reliably improved in at least 1 measure,

TABLE 2. OA Pre- and Posttreatment Values for All Pain Outcome Variables[a]

Outcome Variable	Pretreatment, Mean ± SD	Posttreatment, Mean ± SD	Mean Difference ± Standard Error	95% CI	*P*	*d*[b]
Self-report measures						
Pain severity	4.24±0.98	2.95±1.31	1.29±0.13	1.04 to 1.53	<.001	1.12
Pain interference	4.21±1.12	3.15±1.28	1.06±0.10	0.86 to 1.26	<.001	0.88
Mental health QOL	43.46±20.78	70.19±18.26	−26.73±2.00	−30.67 to −22.78	<.001	1.37
Physical health QOL	32.68±14.75	57.74±19.68	−25.06±1.57	−28.17 to −21.95	<.001	1.44
Depressive symptoms	0.03±0.97	−0.98±0.71	1.01±0.09	0.84 to 1.18	<.001	1.19
Pain catastrophizing	25.49±11.35	15.13±10.25	10.36±1.04	8.30 to 12.43	<.001	0.96
Performance-based measures						
5-Minute Walk (ft)	1039.97±365.09	1214.60±360.12	−174.63±22.12	−218.45 to −130.82	<.001	0.48
50-Foot Walk (s)	14.27±5.35	11.38±3.14	2.89±0.33	2.25 to 3.54	<.001	0.66
Timed Up-and-Go (s)	14.19±6.33	10.66±3.23	3.53±0.46	2.62 to 4.45	<.001	0.70
Repeated Sit-to-Stand (s)	19.24±20.08	12.63±6.48	6.61±1.55	3.55 to 9.67	<.001	0.44
Repeated Trunk Flexion (s)	13.85±5.94	9.37±2.32	4.48±0.55	3.39 to 5.57	<.001	0.99
Loaded Reach (cm)	51.47±13.12	58.87±12.31	−7.41±1.13	−9.65 to −5.17	<.001	0.58

[a]OA = older adult; QOL = quality of life.
[b]Effect size, pretreatment to immediately posttreatment (0.2 = small, 0.5 = medium, 0.8 = large).

TABLE 3. Reliable Change Analyses From Pre- to Posttreatment and Pretreatment to Follow-up

Measure	Test-Retest (*r*)	S_{diff}	Reliable Decline, %	Reliable Improvement, %
Pre- to posttreatment				
PI (WHYMPI)	0.86	0.64	3.7	50.0
PS (WHYMPI)	0.75	0.82	2.2	38.0
Pain catastrophizing (PCS)	0.75	7.65	0.7	38.0
Depressive symptoms				
CES-D	0.57	10.50	0.0	25.0
PHQ-9	0.84	2.54	1.1	60.0.3
5-Minute Walk Test	0.99	51.28	4.5	63.4
50-Foot Walk	0.95	1.40	1.5	41.8
Timed Up-and-Go	0.98	1.01	0.0	59.7
Repeated Sit-to-Stand	0.45	15.65	0.7	6.7
Repeated Trunk Flexion	0.45	4.73	0.0	11.2
Loaded Reach	0.99	1.80	9.7	54.5
Pretreatment to follow-up				
PI (WHYMPI)	0.86	0.68	3.5	43.9
PS (WHYMPI)	0.75	0.87	1.7	33.3
Pain Catastrophizing (PCS)	0.75	8.53	0.0	33.3
Depressive symptoms				
CES-D	0.57	11.22	0.0	6.9
PHQ-9	0.84	2.49	0.0	53.8

CES-D = Center for Epidemiological Studies—Depression Scale; PCS = Pain Catastrophizing Scale; PHQ-9 = Patient Health Questionniare-9; PI = Multidimensional Pain Inventory Interference Subscale; PS = Multidimensional Pain Inventory Severity Subscale; S_{diff} = standard error of the difference between pre- and posttreatment or pretreatment and follow-up; WHYMPI = West Haven-Yale Multidimensional Pain Inventory.

53.7% (n=72 of 134) improved in at least 2 measures, 32.1% (n=43 of 134) improved in at least 3 measures, and 11.9% (n=16 of 134) improved in all 4 pain-related self-report measures.

Similarly, reliable change analyses were conducted for performance-based measures: 5-Minute Walk Test (test-retest=0.99; S_{diff}=51.28; reliable improvement=63.4%; n=85 of 134), 50-Foot Walk Test (test-retest=0.95; S_{diff}=1.40; reliable improvement=41.8%; n=56 of 134), Timed Up-and-Go (test-retest=0.98; S_{diff}=1.01; reliable improvement=59.7%; n=80 of 134), repeated Sit-To-Stand Test (test retest=0.45; S_{diff}=15.65; reliable improvement=6.7%; n=9 of 134), repeated Trunk Flexion (test-retest=0.45; S_{diff}=4.73; reliable improvement=11.2%; n=15 of 134), and Loaded Reach (test-retest=0.99; S_{diff}=1.80; reliable improvement=54.5%; n= 73 of 134). Average rate of improvement was 39.5% (reliable change in improve range was 6.7%-63.4%). There was evidence of reliable decline for performance-based measures. Specifically, 4.5% (n=6 of 134) reliably declined in 5-Minute Walk Test; 1.5% (n=2 of 134), in 50-Foot Walk Test; 0.7% (n=1 of 134), in repeated Sit-to-Stand; and 9.7% (n=13 of 134), in Loaded Reach. There was no evidence of reliable decline In Timed Up-and-Go and repeated Trunk Flexion performance. Evaluating rates of improvement for performance-based measures on an individual basis revealed that 88.0% (n=118 of 134) of study participants improved in at least 1 measure of physical performance, 71.6% (n=96 of 134) improved in at least 2 measures, 45.5% (n=61 of 134) improved in at least 3 measures, 23.9% (n=32 of 134) improved in at least 4 measures, 7.5% (n=10 of 134) improved in at least 5 measures, and 0.7% (n=1 of 134) improved in all 6 measures of physical performance.

Medication Taper

On treatment completion, all OAs in the opioid group completed the opioid taper and discontinued use (MME mean ± SD, 55.24±63.26 at pretreatment; Table 4). A

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TABLE 4. Pre- and Posttreatment Older Adult Changes in Frequency of Medication Use[a,b]

Medication Type	Pretreatment (N=134)	Posttreatment (N=134)	Within-Subjects Change, χ^2_1[c]
Opioids, n (%)	73 (54.5)	0 (0.0)	71.01[d]
BZDs, n (%)	47 (35.1)	29 (21.6)	67.21[d]
Sedative-hypnotics, n (%)	36 (26.9)	14 (10.4)	41.37[d]
Selective serotonin reuptake inhibitors, n (%)	32 (23.9)	29 (21.6)	0.19
Serotonin-norepinephrine reuptake inhibitors, n (%)	36 (26.9)	29 (21.6)	1.00
Tricyclic antidepressants, n (%)	17 (12.7)	10 (7.5)	2.02
Anticonvulsants	65 (48.5)	57 (42.5)	0.96

[a]BZD = benzodiazepine.
[b]Effect size, pretreatment to immediately posttreatment (0.01 = small, 0.06 = medium, 0.14 = large).
[c]McNemar test used for within-subjects comparisons.
[d]$P<.001$.

period effect was detected for mean BZD dose, suggesting a significant pre- (mean ± SD, 15.81±11.96 mg) to posttreatment (mean ± SD, 9.78±10.24 mg) mean dose reduction in BZD irrespective of opioid use status ($F[1, 32]=35.14$; $P<.001$). A significant number of patients tapered off BZDs ($P<.001$) and sedative-hypnotics ($P<.001$) by posttreatment. At posttreatment, there were no significant differences between the nonopioid and opioid groups in the proportion of patients taking BZDs, tricyclic antidepressants, or anticonvulsants [$\chi^2_1<.91$; P's$>.34$]. Conversely, a significant difference existed between the opioid and nonopioid groups in the proportion of patients taking prescription sleep medications, with a higher proportion of opioid users completing treatment on sedative-hypnotics [$\chi^2_1=4.22$; $P=.04$].

Pretreatment to 6-Month Follow-up Changes in Outcome Measures

Comparisons of OAs who completed and did not complete follow-up questionnaires revealed no group differences in demographic variables, and there were no significant differences on any self-report outcomes at pretreatment ($P>.05$). Repeated-measures ANCOVAs were conducted to compare pretreatment with 6-month follow-up to assess treatment durability (Table 5). Period effects were again significant ($F[1, 55]>47.20$; P's$<.001$; $d>0.45$) for all outcomes in directions indicating improvement. There were no significant opioid group by period interactions ($F[1, 55]<1.05$; P's$>.309$; $\eta_p^2<0.019$).

Reliable change analyses were again conducted for PI, PS, pain catastrophizing, and depressive symptoms (Table 3). Reliable change was similar across measures, averaging 34.7% (range, 28.1%-43.9%). Reliable exacerbation in symptoms only occurred in PI (3.5%; n=2 of 57) and PS (1.7%; n=1 of 57). When evaluating on an individual basis, 87.7% (n=50 of 57) of patients reliably improved on 1 measure, 64.9% (n=37 of 57) improved in at least 2, 43.8% (n=25 of 57) improved in 3, and 22.8% (n=13 of 57) improved in all 4 pain-related measures from pre- to posttreatment.

Five (8.8%) of the 57 patients who completed the IPRP and returned the questionnaire reported using opioids. Of those who reported opioid use at 6 months, most were using opioids at pretreatment (n=4). Six (10.5%) did not answer if they were using opioids on the 6-month questionnaire. Of those who chose not to answer, 1 of 6 (16.7%) was taking opioids at pretreatment.

DISCUSSION

These findings replicate and expand on the literature supporting the effectiveness of IPRP with opioid cessation on OAs with CNP. OAs who tapered off opioids showed functional gains comparable to their non–opioid-using counterparts and experienced sustained improvements at follow-up. This suggests that OAs can benefit from IPRP intervention even while undergoing the additional task of

TABLE 5. Older Adult Pretreatment, Posttreatment, and 6-Month Follow-up Comparisons for Self-report Pain Outcomes[a]

Outcome Variable	Pretreatment, Mean ± SD	Posttreatment, Mean ± SD	6-mo Follow up, Mean ± SD	Pre- to Posttreatment Comparisons		Pretreatment to 6-mo Follow-up Comparisons	
				Within-Subjects Effect *F*	*d*[b]	Within-Subjects Effect *F*	*d*[b]
Pain severity	4.18±0.84	2.95±1.34	3.33±1.44	47.06[c]	1.10	21.80[c]	.72
Pain interference	4.21±1.08	3.06±1.36	3.08±1.49	47.20[c]	0.94	36.97[c]	.91
Mental health QOL	42.83±22.12	69.48±18.55	61.17±23.89	82.26[c]	1.31	30.80[d]	.80
Physical health QOL	31.49±15.71	55.58±19.87	39.67±20.09	116.42[c]	1.34	13.84[c]	.45
Depressive symptoms	0.01±0.97	−0.86±0.71	−0.70±0.77	53.88[c]	1.02	23.52[c]	.81
Pain catastrophizing	26.32±10.46	15.36±10.18	18.43±12.73	48.72[c]	1.06	1.06[c]	.68

[a]QOL = quality of life.
[b]Effect size, pretreatment to immediately posttreatment (0.2 = small, 0.5= medium, 0.8= large).
[c]*P*<.001, period effect.
[d]*P*<.01, period effect.

tapering opioid use. Additionally, the IPRP intervention successfully assisted patients in reducing or eliminating opioid and nonopioid medications that increase risk for adverse events in OAs. Furthermore, reliable change analyses suggested that 76.9.% (n=103 of 134) of OAs treated demonstrated reliable improvement in at least 1 pain-related outcome, and 88.0% (118 of 134) reliably improved in at least 1 measure of physical performance at posttreatment.

Approximately half the study participants were using opioids on admission to IPRP. There is a high rate of opioid prescribing in the United States[36] because 1 of 5 patients with CNP or pain-related diagnoses receive opioid prescriptions during an office visit.[37] Opioid prescribing to OAs has increased significantly, and 35% of older patients with chronic pain misuse opioid prescriptions.[38,39] Evidence suggests that opioid treatment for CNP results in medication-related adverse symptoms and is not significantly better for functional improvement compared with nonopioid approaches.[40] Our study demonstrates in IPRP that not only do OAs using opioids functionally improve, but OAs do so while decreasing use of medications that may be misused or increase risks for adverse events and falls.

Most importantly, OAs demonstrated significant improvement on all outcome measures regardless of opioid use. This provides additional evidence of the effectiveness of the IPRP for OAs with chronic pain. The improvement in functional outcomes posttreatment has significant impact on OAs, who may be frailer and functionally impaired from chronic pain. OAs who were not using opioids at pretreatment showed a more robust response and reduction in overall pain than their opioid counterparts, suggesting that opioids may interfere with treatment response. Overall, OAs with a mean chronic pain duration of 14 years obtained benefit from the IPRP, which highlights that these patients should not be excluded from IPRPs. Interestingly, although there may be potential concern or stigma regarding an OA's tolerability of IPRP, the percentage of noncompletion for this sample was lower (11.3%; 17 of 151) than a general adult IPRP sample (17.2%).[20]

Encouragingly, all opioid users successfully tapered off all opioid use. We also found a low rate of return to opioid use at follow-up regardless of use at admission. This is consistent with previous studies demonstrating relatively low return to opioid rates among patients who completed tapers in IPRP, emphasizing functional restoration[20] compared with greater than 90% relapse rates reported by patients who complete detoxification alone.[41] Patients in this study possess 2 risk factors for polypharmacy: age and CNP status.[42] Polypharmacy appeared to be present within the sample as well, and often OAs are prescribed these medications when experiencing mental health symptoms.[43,44] Although OAs using opioids on admission were taking more sedative hypnotics, there were similar patterns of medication use across groups. Importantly, we found that in the

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course of decreasing use of Beers Criteria medications, OAs reported improvements in mood and functional status.

Our study has some limitations. Mostly white demographics may limit the generalizability of our findings; however, our study sample is representative of a tertiary-level IPRP. We did not collect cognitive assessments, although our IPRP requires patients to have intact cognitive functioning for full participation. Further, while other studies have demonstrated that IPRPs are superior to no treatment, wait-list control, and single-discipline treatments,[45] this study did not use a control group for follow-up comparisons. Future studies should investigate outcomes with a comparison group. Although the response rate at follow-up (42.5%; 57 of 134) is comparable to a previous longitudinal IPRP study,[20] this may be a limitation due to selection bias and adds a caveat to the treatment durability findings. Though we did not find significant group differences in opioid or BZD status, further investigation into how outcomes may vary as a function of MME or BZD dose is warranted. Despite these, our study providing insight into OAs with chronic pain is unique in that more outcome measures related to functional/physical measures are used and supports the effectiveness of IPRPs for older patients with chronic pain.

CONCLUSION

Older adults with chronic pain responded well to the IPRP. Such programs should be strongly considered and more widely used for OAs with chronic pain. This will help address the opioid crisis by reducing opioid use, reduce the risk of adverse events by reducing medications that hold such risks for older adults, but more importantly helping patients become more functional and enjoy better QOL.

Abbreviations and Acronyms: **ANCOVA** = analysis of covariance; **ANOVA** = analysis of variance; **BZD** = benzodiazepine; **CES-D** = Center for Epidemiologic Studies- Depression Scale; **CNP** = chronic noncancer pain; **IPRP** = interdisciplinary pain rehabilitation program; **MME** = morphine milligram equivalent; **OA** = older adult; **PCS** = Pain Catastrophizing Scale; **PHQ-9** = Patient Health Questionnaire-9; **PI** = pain interference; **PRC** = Mayo Clinic Pain Rehabilitation Center; **PS** = pain severity; **QOL** = quality of life; S_{diff} = standard error of the difference; **WYMHPI** = West Haven-Yale Multidimensional Pain Inventory

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