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Effectiveness of a Multidisciplinary Chronic Pain Management Program in a Local Pain Center

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Abstract

Objectives: There has been increased recognition of multidisciplinary approach for managing chronic pain. There is a high incidence of co-morbid depression and anxiety as well as functional disability impacting activities of daily living with chronic pain diagnoses. In the current study, we assessed the effectiveness of an affordable Living Life Well Pain Rehabilitation Program (LLWPRP), developed in a local outpatient chronic pain clinic.

Methods: Retrospective data analysis using data collected from May 2012 - May 2015 with total of 86 patients was performed. The LLWPRP is a 12-week program with biweekly meetings. It involves a combination of education about pain, cognitive behavioral therapy, mindfulness training, mild exercise, peer support and family involvement. Participants completed a pre and post questionnaire with standardized measures of depression (PHQ-9), anxiety (GAD-7), risk of opioid misuse (SOAPP), pain acceptance (CPAQ), treatment outcome (S-TOPS) and disability (Oswestry), as well as functional testing.

Results: Participants showed a statistically significant improvement in all physical functionality tests used; significant reduction in PHQ-9, GAD-7, SOAPP); and significant improvements in willingness to engage in activities and pain acceptance-understanding. These improvements were independent from gender, age and types of pain.

Conclusion: Despite limitations, our study demonstrated the effectiveness of the LLWPRP and further supports the notion of managing chronic pain using a multidisciplinary approach.

Keywords: Cognitive behavioral therapy (CBT); Acceptance and commitment therapy (ACT); Pain rehabilitation; Retrospective study; Depression; Anxiety

Introduction

Chronic Pain is generally defined as persistent or recurrent pain lasting longer than 3 months and often persistent beyond the estimated duration of tissue healing [1,2]. Chronic pain affects more than 100 million individuals in the United States and accounts for 20% of outpatient visits, 12% of prescriptions, and over 600 billion dollars in direct and indirect expenses [1,3]. Chronic pain is thus a major medical and social issue, affecting the quality of life of individuals by interfering with work and social involvement. The extensive use of opioids for chronic pain management is also a major concern due to the multiple adverse side effects of opioids [4-6]. As a result, in 2016, new CDC guidelines eliminated opioids as first line therapy for chronic pain in favor of alternative therapies [7]. Further, recent studies suggested positive correlations between pain and disability and between pain and depressive symptoms [8-12]. Historical management of psychiatric complications included tricyclic antidepressants and/or benzodiazepines. However, such medications have been shown to decrease self-efficacy and increased perception of pain, resulting in further exacerbated depression and limited functionality [13,14]. Due to the limited long-term efficacy and associated health risks of pharmacological intervention for chronic pain, there is an urgent need for alternative, non-medicinal therapies for chronic pain.

Cognitive behavior therapies (CBT) are evidence-based treatments used for many psychiatric disorders. CBT can be used individually or in a group setting to encourage coping skills and reduce maladaptive behaviors [15]. The biopsychosocial aspect of chronic pain-related disability makes CBT a theoretically ideal treatment strategy to improve coping skills and functionality. Stemming from traditional CBT, acceptance and commitment therapy (ACT), a mindfulness-based and values-guided behavioral therapy [16], has been shown to be effective in treating chronic pain [17-19]. ACT/CBT in combination with physical therapy and appropriate medical management may represent the future of multidisciplinary chronic pain treatment.

In 2012, a community hospital pain clinic developed a 12-week outpatient program, the Living Life Well Pain Rehabilitation Program (LLWPRP), which aimed to use ACT/CBT and exercise programs to improve psychological, physical and functional components of pain to enhance patients' overall quality of life. We performed a retrospective review of pre and post intervention data collected between 2012 and 2015 to evaluate the LLWPRP.

Material and Methods

LLWPRP and Subjects

The LLWPRP was established in May 2012 in a community pain clinic based on the concept that chronic pain is a biopsychosocial disorder [20-22] and for the significant number of pain patients whose pain was not effectively managed through medication or surgical intervention. The program is 12 weeks long. It involves a combination of education about pain, ACT-focused CBT, mild exercise, peer

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support and family involvement. The total estimated cost of the program is between $5,000-7,000 per patient. Patients were identified from the pain center by their attending pain specialists and invited to enroll in the LLWPRP. Often, these individuals had exhausted all other available treatments. LLWPRP participants then underwent 12 weeks of biweekly group classes (up to six individuals within each class; approximately 1 hour group counseling session plus 1 hour physical exercise session per group class session) focusing on improvement of functional abilities, quality of life, and physical component of pain along with peer support. During these sessions, ACT was introduced. ACT/CBT encouraged participants to develop self-observation skills in order to predict pain flare ups and understand their own mood-pain relationship. Participants were also introduced to basic pain-related neurophysiology to learn that although pain is a critical protective mechanism, pain and tissue damage are not always related. Through classes and support groups, participants learned to live with chronic pain and associated disabilities. Participants learned about pain negative feedback loops leading to disability and sedentary lifestyle, which exacerbates initial pain. These concepts were reinforced over time throughout the program. Patients also participated in exercise classes that encouraged graded exposure to pain to increase physical activity, promote mobility, reduce fear of movement, and alleviate disability. Participants could also interact with each other and find a community that understood their pain and accepted their limitations. Through these support groups they may find validity in their suffering and encourage one another's path to recovery. Keeping LLWPRP in the outpatient setting also made the program relatively affordable. To determine the effectiveness of the LLWPRP, psychosocial and physical evaluation data were collected from participants. Data from patients enrolled between May 2012 and February 2015 (completed by May 2015) were de-identified and used in this study. Out of the 121 enrolled patients (in 32 separate classes with up to 6 individuals per class), complete data was available for 86 patients. The majority of the participants had generalized pain (61/86), and no patient had pain that only affected the upper body (detailed in the Results). This study was approved by the Institutional Review Boards (IRB) of the involved hospital (Protocol # 139) and university (Exemption Protocol # 011416-007).

Outcome Data Collected from the LLWPRP

Patients were asked to complete pre- and post- evaluations of physical functions and various questionnaires focusing on the psychosocial well-being of the patient. These evaluations were designed to help attending physicians design proper pain management plans for individual patients. In this study, we used these evaluations to determine the effectiveness of the program.

Physical function tests included functional reach, pegboard, sit-to-stand and six-minute walk. The functional reach test assesses a patient's stability by measuring the maximum distance they are able to reach downward when bending forward while standing with straight knees in a fixed position [23]. The average of three tests was used for evaluation. Pegboard testing is used to address primarily upper body and neck pain functional limitations by measuring patients' ability to reach above the shoulders and head. It involves repeated peg placement as high as the patient can achieve with each arm over one minute. The total height of repeated peg placement with each arm over one minute was used for data analysis. Sit-to-stand test assesses functional lower extremity strength and pain impairment [24]. The total number of sit-to-stands within 30 seconds were recorded. Six-min-walk test assesses the distance walked over 6 minutes as a sub-maximal test of aerobic capacity and endurance while also allowing for the examiner to monitor patient functional gait [25].

The questionnaire consisted of several standardized measures of mood, risk and attitudes. Depression and anxiety were measured with the Patient Health Questionnaire-9 item (PHQ-9) [26] and the generalized anxiety disorder-7 (GAD-7) [27] respectively, both of which are common screening tools used in primary care. Risk of opioid misuse was measured with the Screener and Opioid Assessment for Patients with Pain (SOAPP), which has 5 items and surveys participants on prior drug use, mood and legal problems. A higher SOAPP score predicts a higher risk of opioid misuse, [28] The standardized 20-item Chronic Pain Acceptance Questionnaire (CPAQ) was used to assess 1) pain acceptance level (9 sub items) with a lower score correlating to higher pain acceptance; and 2) participant's willingness to engage in social activities regardless of pain (11sub items), with a higher score correlating to be more willing to experience pain for engagement [29].

Treatment outcomes were assessed with the Shortened Treatment Outcomes in Pain Survey, S-TOPS [30] that includes a variety of sub-measures: 1) perceived physical health (ability to complete various physical activities), 2) pain problem (scored from 0, no pain to 6, worst possible), 3) social and recreational activity (perception of pain interfering with interpersonal relationships), 4) treatment satisfaction and expectations (satisfaction with their pain treatment plans), 5) healthcare perceptions (perceptions of treatment, their healthcare providers, and the overall quality of care) and 6) ability to work (perception of the amount pain interferes with ability to perform work-related tasks). Sleep quality was determined using the MOS Sleep Scale [31-33] by measuring number of hours of sleep, number of hours it took to fall asleep and symptoms of sleep deprivation and fatigue. A Disability Index Score was calculated using both the Oswestry [34] and Oswestry Neck scores [35] with higher scores indicating more impaired. It should be noted only patients who had upper body pain (including patients who had generalized pain) were included in the Oswestry Neck score analysis

Statistics

All data analysis was performed using IBM SPSS Statistics version 21 (IBM, Armonk, New York). For measures that did not have continuous values, they were ranked first before tests. For the pre- vs. post- comparisons, as we consider the sum of the scores to approximate a continuous scale and given that the sample size is large, the paired t-test was used. To identify whether specific demographic factor (age, gender, etc.) could be a predictor for any of the outcome measures, multiple regression analyses were performed. To determine whether there were correlations between any two of the outcome measures, Spearman Correlation test (two-tailed) was used. $p \leq 0.05$ were considered statistically significant.

Results

Demographics of Subjects

A total of 121 LLWPRP participants were enrolled between May 2012 and February 2015 (completed by May 2015), of which there were completed data on 86 participants (50 females and 36 males, from32 individual classes) Participants ranged from 23 years to 73 years (median age = 52). Locational characteristics of pain were collected from the medical record and classified into 10 categories (presented as number within each category, percentage in total): 1) cervical (0, 0%); 2) cervicobrachial (0, 0%); 3) lumbar (15, 17.44%,); 4) lumbocrural (5, 5.81%); 5) upper extremity (0, 0%); 6) upper extremity joint (0, 0%); 7) lower extremity (2, 2.32%); 8) lower extremity joint (1, 1.16%); 9) polyarthropathy (2, 2.32%); and 10) generalized pain (61, 70.93%). The majority of participants were categorized as having "generalized"

chronic pain at the time of enrollment. As many of the patients had exhausted other available treatments for chronic pain, this may reflect the progression of chronicity of pain, in which a focal pain often gradually progresses into diffuse pain in part due to the development of central sensitization [36].

Pre- Vs. Post- Physical Functional Tests

Following LLWPRP, participants showed a statistically significant improvement in physical functionality in all tests (summarized in Table 1), including functional reach (p=0.001), peg board test (p<0.001 for both left and right sides), sit-to-stand test (p<0.001) and six-min-walk (p=0.022) (Table 1).

Pre- Vs. Post- Psychosocial Outcome Measurements

The results of psychosocial outcome measurements are summarized in Tables 2 to 4.

Following LLWPRP, participants showed significant reduction in depression (PHQ-9, p<0.001), anxiety (GAD-7, p<0.001), and risk of opioid misuse (SOAPP, p=0.005) (Table 2). Participants showed improvement in both CPAQ survey subcategories, willingness to engage in activities regardless of pain (p<0.001) and pain acceptance (p<0.001).

The S-TOPS questionnaire indicated significant improvement in multiple quality of life factors (Table 3). Specific improvements included patients' perceptions in 1) physical health (p=0.029), 2) pain problem (p=0.001), 3) social and recreational activity (p<0.001), 4) treatment satisfaction and expectations (p=0.001), 5) healthcare satisfaction (p=0.001), and 6) ability to work (p=0.024).

Participants showed slight but significant improvement in sleep quality as measured by the MOS Sleep Scale (pre 27.19±0.93 vs. post 29.94±0.97 (maximal score 53), p=0.001). Participants also showed improvement in Oswestry Disability Index (pre 23.78±0.69 vs. post 20.62±0.89 (maximal score 50), p<0.001) and Oswestry Neck Disability Score (pre 22.60±0.743 vs. post 19.88±1.01 (restricted to patients whose pain involved the neck and upper body, n=61; maximal score 53), p=0.002).

Correlations between Outcome Measurements

Correlations between functional test and questionnaire results were evaluated before and after LLWPRP. Although there are slight differences between pre-LLWPRP and post-LLWPRP, the general trends are similar. We found that many parameters were significantly correlated with each other (Table 4). Multiple strong correlations were noted between functional assessments. Particularly sit-to-stand was significantly correlated with all other functional tests both before and after the LLWPRP. For many functional tests, increased physical functioning negatively correlated with the Oswestry Disability Index score both pre- and post-LLWPRP.

Depression (PHQ-9) was positively correlated with anxiety (GAD-7), and both were strongly correlated with multiple other measures. Specifically, levels of depression and anxiety were positively correlated with the risk of opioid misuse per SOAPP, worsened sleep quality (MOS), Oswestry Disability Index score, and how much pain gets in the way of participant's social activities (per S-TOPS sub-item), while negatively correlated with pain acceptance and willingness to engage in activities score per CPAQ and perception of physical health per S-TOPS sub-item. Interestingly, levels of depression and anxiety was associated with treatment satisfaction and expectation before, but not after, LLWPRP.

Risk of opioid misuse per SOAPP was found to have a strong positive correlation with depression, anxiety, perceived social and recreational activity (S-TOPS sub-item), and Oswestry Disability Index score.

Both chronic pain acceptance and willingness to engage in activities (CPAQ sub-items) were negatively associated with depression and anxiety and positively correlated with perception of physical health

Functional test	Pre-LLW (Mean ± SEM)	Post-LLW (Mean ± SEM)	*P* value (paired t-test)
Functional reach (inches)	5.53 ± 0.82	3.86 ± 0.61	0.001*
Peg board left (inches)	387.03 ± 17.26	463.18 ± 18.64	<0.001*
Peg board right (inches)	406.42 ± 18.071	510.39 ± 21.293	<0.001*
Sit-to-stand (number of repetitions)	6.95 ± 0.35	9.08 ± 0.39	<0.001*
Six-min-walk (feet)	859.98 ± 48.38	961.99 ± 51.24	0.022*
*Indicates significant difference when comparing pre-LLW and post-LLW scores			

Table 1: Pre- vs. post- physical functional tests.

Psychosocial outcome questionnaire	Pre-LLW (Mean ± SEM)	Post-LLW (Mean ± SEM)	*P* value (paired t-test)
PHQ-9 (0-27)[a]	12.48 ± 0.77	9.73 ± 0.66	<0.001*
GAD-7 (0-21)	9.01 ± 0.67	7.04 ± 0.58	<0.001*
SOAPP (0-20)	4.51 ± 0.37	3.93 ± 0.31	0.005*
CPAQ-Willingness to engage in activities regardless of pain (0-66)	29.56 ± 1.31	36.87 ± 1.43	<0.001*
CPAQ- Pain acceptance (0-54)	35.93 ± 0.99	30.05 ± 1.21	<0.001*
[a]Range of score for each questionnaire are listed within the parenthesis.			
*Indicates significant difference when comparing pre-LLW and post-LLW scores.			

Table 2: Selected pre- vs. post- psychosocial outcome measurements.

Psychosocial outcome questionnaire	Pre-LLW (Mean ± SEM)	Post-LLW (Mean ± SEM)	*P* value (paired t-test)
Perceived physical health (0-108)[a]	61.44 ± 1.48	65.36 ± 1.63	0.029*
Perceived pain problem (0-24)	16.44 ± 0.36	14.75 ± 0.54	0.001*
Perceived social and recreational activity# (0-20)	11.41 ± 0.42	9.79 ± 0.41	<0.001*
Perceived treatment satisfaction and expectations (0-12)	6.94 ± 0.27	8.21 ± 0.30	0.001*
Perceived health care satisfaction (0-20)	14.29 ± 0.48	16.20 ± 0.54	0.001*
Perceived ability to work (0-60)	31.47 ± 1.22	34.47 ± 1.30	0.024*
[a]Range of score for each questionnaire are listed within the parenthesis.			
*Indicates significant difference when comparing pre-LLW and post-LLW scores.			
#A higher score indicates pain gets in the way of social activities more			

Table 3: Pre- vs. post- S-TOPSP outcome measurements.

	Functional	Sit-to-stand	Six-min-walk	Peg-board left	Peg-board right	PHQ-9	GAD-7	SOAPP	CPAQ 1[a]	CPAQ	S-TOPS	S-TOPS	S-TOPS	S-TOPS	S-TOPS	S-TOPS	Sleep	Oswestry
	reach									2	1[b]	2	3	4	5	6		
Functional		-0.363	-0.101	-0.181	-0.208	0.009	0.071	0.081	-0.268	0.27	-0.33	0.291	0.135	0.05	0.013	-0.253	-0.097	0.489
reach		.001*	0.368	0.104	0.06	0.936	0.528	0.47	.015*	.014*	.003*	.008*	0.227	0.654	0.907	.022*	0.386	.000*
Sit-to-stand	-0.305		0.573	0.587	0.608	0.004	-0.022	-0.084	0.044	-0.043	0.263	-0.139	0.067	0.076	0.193	0.193	0.025	-0.454
	.008*		.000*	.000*	.000*	0.969	0.845	0.455	0.695	0.701	.018*	0.214	0.551	0.498	0.082	0.082	0.827	.000*
Six-min-walk	-0.025	0.444		0.34	0.39	0.11	0.138	0.147	-0.066	0.18	0.09	0.028	0.23	0.012	0.05	-0.015	-0.136	-0.247
	0.828	.000*		.002*	.000*	0.321	0.211	0.182	0.553	0.101	0.416	0.799	.035*	0.916	0.653	0.891	0.217	.023*
Peg- board left	-0.226	0.487	0.165		0.952	-0.062	-0.04	-0.075	0.053	0.064	0.145	-0.273	-0.121	0.054	0.178	0.146	0.109	-0.434
	0.051	.000*	0.158		.000*	0.574	0.716	0.495	0.63	0.562	0.189	.011*	0.268	0.624	0.104	0.183	0.32	.000*
Peg- board right	-0.18	0.59	0.29	0.703		-0.048	-0.038	-0.054	-0.006	0.069	0.144	-0.263	-0.098	0.064	0.164	0.171	0.081	-0.42
	0.123	.000*	.012*	.000*		0.665	0.727	0.627	0.954	0.53	0.191	.015*	0.375	0.559	0.133	0.118	0.46	.000*
PHQ-9	0.103	-0.167	0.066	-0.195	-0.246		0.707	0.488	-0.458	0.222	-0.564	0.073	0.466	-0.32	-0.163	-0.32	-0.487	0.32
	0.379	0.149	0.574	0.091	.033*		.000*	.000*	.000*	.042*	.000*	0.505	.000*	.003*	0.137	.003*	.000*	.003*
GAD-7	0.112	-0.101	0.032	-0.183	-0.32	0.775		0.484	-0.404	0.367	-0.557	0.211	0.441	-0.41	-0.192	-0.244	-0.278	0.228
	0.341	0.389	0.789	0.117	.005*	.000*		.000*	.000*	.001*	.000*	0.053	.000*	.000*	0.078	.024*	.010*	.036*
SOAPP	0.065	-0.074	0.065	0.06	-0.028	0.506	0.491		-0.238	0.333	-0.402	0.093	0.499	-0.096	-0.013	-0.221	-0.205	0.268
	0.582	0.526	0.578	0.606	0.813	.000*	.000*		.028*	.002*	.000*	0.399	.000*	0.383	0.909	.042*	0.059	.013*
CPAQ	-0.14	0.168	-0.075	0.144	0.113	-0.323	-0.291	-0.064		-0.259	0.571	-0.165	-0.517	0.325	0.218	0.436	0.214	-0.326
1	0.231	0.148	0.525	0.215	0.331	.003*	.007*	0.562		.017*	.000*	0.13	.000*	.002*	.045*	.000*	.049*	.002*
CPAQ	0.298	-0.185	-0.049	-0.092	-0.163	0.277	0.427	0.315	-0.175		-0.34	0.089	0.229	-0.06	0.102	-0.178	-0.055	0.171
2	.009*	0.109	0.679	0.428	0.16	.010*	.000*	.003*	0.108		.002*	0.417	.035*	0.588	0.354	0.103	0.618	0.119
S-TOPS	-0.357	0.362	0.097	0.229	0.341	-0.444	-0.36	-0.15	0.662	-0.253		-0.343	-0.416	0.247	0.082	0.59	0.355	-0.573
1	.002*	.002*	0.413	.050*	.003*	.000*	.001*	0.175	.000*	.021*		.001*	.000*	.024*	0.46	.000*	.001*	.000*
S-TOPS	0.216	-0.255	-0.153	-0.384	-0.401	0.239	0.26	0.166	-0.078	0.383	-0.105		0.256	-0.064	-0.118	-0.35	-0.203	0.384
2	0.063	.026*	0.19	.001*	.000*	.028*	.017*	0.13	0.478	.000*	0.344		.018*	0.562	0.284	.001*	0.062	.000*
S-TOPS	0.147	-0.084	0.016	-0.072	-0.038	0.551	0.422	0.446	-0.262	0.498	-0.321	0.354		-0.193	-0.181	-0.504	-0.265	0.309
3	0.208	0.469	0.891	0.539	0.746	.000*	.000*	.000*	.016*	.000*	.003*	.001*		0.077	0.098	.000*	.014*	.004*
S-TOPS	-0.037	0.181	0.008	0.144	0.2	-0.155	-0.061	-0.025	0.447	0.04	0.467	-0.084	-0.157		0.572	0.094	0.075	-0.027
4	0.75	0.117	0.948	0.216	0.083	0.157	0.581	0.82	.000*	0.715	.000*	0.443	0.151		.000*	0.391	0.493	0.805
S-TOPS	-0.099	0.115	-0.066	-0.039	0.055	0.04	0.067	0.035	0.437	0.077	0.331	0.097	-0.062	0.571		0.092	0.077	-0.061
5	0.397	0.324	0.576	0.738	0.639	0.715	0.542	0.75	.000*	0.484	.002*	0.378	0.575	.000*		0.401	0.485	0.579

S-TOPS	-0.279	0.366	0.042	0.315	0.38	-0.19	-0.122	-0.052	0.501	-0.164	0.706	-0.192	-0.268	0.426	0.361		0.458	-0.471
6	.015*	.001*	0.722	.006*	.001*	0.081	0.269	0.637	.000*	0.133	.000*	0.078	.013*	.000*	.001*		.000*	.000*
Sleep	-0.082	0.101	-0.141	0.339	0.303	-0.263	-0.098	-0.071	0.348	0.075	0.467	-0.215	-0.195	0.33	0.158	0.443		-0.315
	0.489	0.39	0.229	.003*	.008*	.016*	0.373	0.52	.001*	0.498	.000*	.050*	0.076	.002*	0.152	.000*		.003*
Oswestry	0.391	-0.293	-0.112	-0.25	-0.259	0.434	0.327	0.361	-0.204	0.489	-0.476	0.501	0.519	-0.094	0.051	-0.367	-0.221	
	.001*	.010*	0.34	.029*	.024*	.000*	.002*	.001*	0.062	.000*	.000*	.000*	.000*	0.391	0.64	.001*	.043*	

Table 4: Correlations between outcome measurements.

Open unshaded areas indicate correlations between outcome measures pre-LLW; Shaded areas indicate correlations between outcome measures post-LLW

Data are presented as Spearman correlation coefficient (r) and corresponding *p* value. * indicates $p<0.05$.

[a]CPAQ 1 = CPAQ-Willingness to engage in activities regardless of pain; CPAQ 2 = CPAQ-Pain acceptance.

[b]S-TOPS 1 = S-TOPS-Perceived physical health; S-TOPS 2 = S-TOPS-Perceived pain problem; S-TOPS 3 = S-TOPS-Perceived social and recreational activity; S-TOPS 4 = S-TOPS-Perceived treatment satisfaction and expectations; S-TOPS 5 = S-TOPS-Perceived health care satisfaction; S-TOPS 6 = S-TOPS-Perceived ability to work.

and perceived social and recreational activities (S-TOPS sub items). In addition, willingness to engage in activities (CPAQ sub-item) was also positively associated with perceived social and recreational activities, satisfaction with both treatment and healthcare, and perceived ability to work (S-TOPS sub-items).

Effects of Demographic Factors on Outcome Measurements

Regression analysis showed that individual factors such as age, gender, and the characteristics of pain did not dramatically affect improvement following LLW program. Younger age was a predictor for depression (p=0.037) and the risk of opioid misuse (p=0.047). Class number (the class individual patients enrolled in) affected pain acceptance (p=0.037), several outcome measures in the S-TOPS questionnaire (perceived physical health, p<0.001; perceived pain problem, p=0.004; treatment satisfaction and expectation, p<0.001; health care satisfaction, p<0.001), sleep quality (p=0.003), and Oswestry Disability Index (p=0.040), suggesting the potential impact of socialization and peer support on the LLWPRP.

Discussion

Chronic pain is a multifactorial problem with psychological and social influences on pain perception and level of disability [20]. It is becoming clearer that opioid use in the setting of chronic pain can unintentionally lead to opioid dependence, addiction, abuse, and overdose as well as many other unwanted health complications and risks. There has been an increased interest in incorporating ACT/CBT into pain management to address the biopsychosocial aspect of chronic pain, facilitate symptom reduction, and improve overall functions [15-19,37]. The LLWPRP was an affordable out-patient program designed to incorporate pain education, ACT/CBT, mindfulness and exercise programs with standard medical management with the aim to improve patient physical functionality and quality of life.

Our analysis showed that following LLWPRP, there were statistically significant improvements in physical functionality and sleep quality and reductions in depression, anxiety, opioid misuse and disability. Participants were more willing to engage in activities that could induce pain to achieve their work and social goals. Satisfaction with treatment plan and healthcare overall also improved. Results indicate that LLWPRP is a comprehensive approach to chronic pain management that provides participants a chronic solution to a chronic problem. The LLWPRP does not attempt to solve each individual's source of pain but rather give the patients avenues to change their perception of pain. Participants were given tools to manage their pain and the psychosocial side effects that accompany it, therefore resulting in better treatment outcomes and increased perceptions of one's ability to cope with chronic pain [15]. In addition, although gender and age could potentially affect the outcome of CBT treatment [38-40], our data indicate that LLWPRP was effective regardless of participants' age, gender and their pain characteristics, demonstrating the broader utility of this program. It should be noted that although increasing evidence suggests that a multidisciplinary CBT-focused program would be beneficial to patients with chronic pain, a positive outcome from our study should not be assumed. In a systemic review by Knoerl et al. [41], it is reported that out of 35 randomized controlled studies, only 43% of them showed significant improvement in pain intensity. The review could not identify a clear optimal CBT dose for CBT intervention. Further, less than half of the trials included outcome measurements for anxiety, quality of life, sleep disturbance, treatment satisfaction, global impression of change, and fatigue as recommended by the IMMPACT, core outcome measures for chronic pain clinical trial [42]. Therefore, our study offers a comprehensive examination of the local LLWPRP program involving physical functionality testing and 7 individual survey instruments, many of which included multiple categories.

As mentioned above, multiple tests for physical function and various questionnaires for psychosocial aspects of chronic pain were used to evaluate treatment effects. We further conducted correlation studies to determine whether selected tests/questionnaires (rather than all) could be used in the future to reduce patients' burden. While multiple correlations were observed, a battery of multiple tests/surveys appeared ideal for assessing the effectiveness and potential improvement of the treatment. Nevertheless, sit-to-stand and six-min-walk seemed to be the most representative physical functionality tests. PHQ-9 and GAD-7 evaluate moods/emotions that are associated with many chronic pain patients (30-45%) [20], thus are necessary. S-TOPS measures various unique aspects of individual's perceptions and are critical in assessing patients' progress. In addition, SOAPP (opioid misuse) and CPAQ (pain acceptance) are also essential given the importance of avoiding long-term opioid usage in pain management, the usage of ACT in treatment, and the necessity of self-management in chronic pain management. Limitations include the study being conducted in Maine, in which racial diversity is limited. Recruitment of participants with complex ethnicity and cultural backgrounds would help to determine the effectiveness of LLWPRP in diverse populations. Socioeconomic status and education levels should also be considered in future studies. There might also be self-selection of the participants who were able to afford recurrent treatment and had the time to engage in classes. Access to this outpatient program may be limited due to disability related restricted travel. Reducing chronic pain stigma and increasing the number of community-based programs could overcome some of these limitations. Further, except for the functionality tests, outcomes were identified through self-reported questionnaires, which are subject to participants' accuracy. Moreover, review of patient's medical records to determine pain classification was challenging as patients frequently

listed several causes of their pain that could not be easily classified into one category. Due to that participants could be seen by other physicians, we were not able to collect complete medication usage data for each patient retrospectively. Therefore, we cannot make any conclusions regarding the influence of LLWPRP on medication, particularly pain medication usage (however, patients were educated about opioid usage-benefits and drawbacks in pain management, and results showed significantly reduced risk of opioid misuse indicated by SOAPP). This could be further investigated in future prospective studies under a well-controlled condition. In addition, we only evaluated the acute effects of LLWPRP. In future, we would like to follow the participants beyond the 12-week program to evaluate continued effects of the program.

Conclusion

Despite existing limitations, our study demonstrated the strength of the LLWRP. Overall, participants exhibited better physical function, reported higher satisfaction of their healthcare, improved perception of their pain, and lower ratings of negative psychological outcomes. These findings support the continuation of programs like LLWPRP that address chronic pain via a biopsychosocial approach. Our data supports the development of similar affordable, out-patient clinic based, yet holistic programs in other communities.

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