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Does early physical therapy intervention reduce opioid burden and improve functionality in the management of chronic lower back pain?

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Abstract

Introduction: Chronic lower back pain is a leading cause of disability in US adults. Opioid use continues to be controversial despite the Centers for Disease Control and Prevention guidance on chronic pain management to use nonpharmacologic and nonopioid pharmacologic interventions. The objectives of the study were to assess the impact of early physical therapy (PT) intervention on improving functionality and reducing opioid burden in patients with chronic lower back pain.

Methods: A single-center, retrospective chart review of patients receiving ≥6 PT visits and treated with either opioids first (OF) or PT first (PTF) therapy for chronic lower back pain were evaluated. Concomitant use of nonopioid and nonpharmacologic therapy was permitted. The Oswestry Disability Index (ODI), a survey measuring functionality, was recorded for PTF group. Pain scores and medication use including opioids were collected at treatment initiation and completion.

Results: One hundred and eighty patients were included in three groups: OF group (n = 60), PTF group (n = 60), and PTF + ODI group (n = 60). The PTF + ODI group had mean ODI reduction of 11.9% ($P < .001$). More OF patients were lost to follow up (68.3%) or failed PT (60%) compared to the PTF group, 38.3% and 3.3% ($P < .001$). Reduction in both opioid and nonopioid medications as well as pain scores were observed but not statistically significant.

Discussion: Early PT resulted in improved functionality, decreased pain, and reduced medication use upon PT completion. These findings suggest PT, along with nonopioid modalities, are a viable first-line option for the management of chronic lower back pain.

Keywords: physical therapy, chronic lower back pain, lower back pain, pain, opioids, Oswestry Disability Index

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Introduction

About 10% to 20% of individuals with acute lower back pain will develop chronic lower back pain (CLBP). Chronic lower back pain was defined using National Institute of Neurological Disorders and Stroke[1] definition of pain and disability persisting for more than 3 months. In the United States, CLBP is the third leading disease contributing to

disability adjusted life years with a mean increase of 24% from 1990 to 2010.[1-4] Lost work days from CLBP is approximately 149 million days per year accruing costs upwards of $100 billion to $200 billion annually.[5] Chronic lower back pain is often managed by opioids but use as first-line therapy remains controversial. Not only are opioids associated with tolerance and risk of addiction, patients with CLBP have reduced progress in regaining functionality.[6] Kidner et al[6] found the work-return rate for very high opioid users (>120 mg/d of morphine equivalents) versus nonopioid users was 76% and 94%, respectively. Compared to other specialties, family practice, general practice, and internal medicine opioid prescription use per capita increased by 7.35% between 2007 to 2012.[5,7] Despite recent improved prescribing habits, the repercussions in disability and patient harm are still evident as patients continue to struggle with addiction, substance use, chronic pain, and psychiatric comorbidities.[8-10]

In 2016, the Centers for Disease Control and Prevention (CDC)[5] published guidelines to improve opioid prescribing habits and reduce opioid harm in individuals using opioids chronically. The CDC recommends using pharmacologic and nonpharmacologic strategies. The guidelines[5] encourage caution when prescribing opioids by using the lowest effective dose, using immediate release formulations, developing treatment goals, and discussing risks as well as benefits with the patient. Furthermore, CLBP studies have shown exercise reduces pain and improves functionality but no specific type of exercise or therapy were recommended.[11-16] Lastly, Gomes et al[8] and Dunn et al[9] showed opioid use for chronic pain was associated with increased overdose rates in patients using higher doses. A 2.5-fold higher risk of overdose (hazard ratio 2.33, confidence interval [CI] 1.26-4.32) was found when long-acting opioids were used compared to the immediate-release formulations.[10] With significant dangers associated with opioid use, additional studies in CLBP to evaluate the benefit of specific nonpharmacologic interventions such as physical therapy (PT) and impact on medication use for pain management are needed. Benefits of improved functionality and decreased opioid use may theoretically provide improved outcomes in treatment of neurologic and psychiatric comorbidities. This study's objective was to assess the impact of early PT intervention on improving functionality and opioid burden reduction in patients with CLBP.

Methods

This study, approved by the Scripps Institutional Review Board, was a single-institution, retrospective chart review conducted at Family Health Centers of San Diego (FHCSD), Department of Physical Therapy in collaboration with Scripps Mercy Hospital San Diego, Department of Pharmacy using FHCSD electronic health records between January 1, 2014 and August 14, 2018. This study was originally designed to evaluate reduction in opioid burden with early PT confirmed by temporal relationship when opiate(s) were used prior or after PT initiation. The opioids first (OF) group was identified by patients using opioids prior to PT initiation, and the PT first (PTF) group, referred to as early PT, were patients not using opioids at PT initiation. When the Oswestry Disability Index (ODI) survey for monitoring functional improvement began at FHCSD PT Department in September 2017, an additional group of PTF patients was added to evaluate functionality improvements with early PT without prior opioid use and redefined functionality based on ODI as the new primary objective.[17]

Patients were included if they were 18 years or older, completed ≥6 PT visits, diagnosed with CLBP for ≥3 months, and used either opioids or PT as first-line therapy at the beginning of the study. Concomitant, nonopioid pharmacologic and nonpharmacologic therapy was allowed. Patients were excluded if they concomitantly used opioids and physical therapy at the beginning of the study.

Variables collected included demographics, comorbidities (eg depression, musculoskeletal disorders, history of falls), and opioid use based on the statewide prescription drug monitoring program. Medications used were recorded at the initial PT evaluation and post PT treatment. Using the 1 to 10 numeric pain rating scale, pain scores at the initial PT evaluation and the last PT office visit were collected. Patient functionality was also collected at the initial PT evaluation and at the last PT visit using a validated, self-administered survey known as the ODI survey. This survey evaluates the patient's level of disability and assigns them to 1 of the 5 following categories: 0% to 20% minimal, 21% to 40% moderate, 41% to 60% severe, 61% to 80% crippled, and 81% to 100% immobile.[17] Changes in ODI scores greater than 10% are considered clinically significant.[17]

The primary study outcome was functionality measured by a reduction in ODI scores among CLBP patients only using PT first. The secondary study outcomes compared CLBP patients using either PT first versus opioid treatment first. These outcomes were reduction in opioid burden, as evidence by decreased opioid and nonopioid medication use post-PT treatment, reduction in objective pain scores post-PT, number of patients failing PT and continuing or initiating opioids during study, and number of patients lost to follow up.

Descriptive statistics evaluated demographics and baseline characteristics. Wilcoxon signed rank reported a change in ODI. Continuous variables were expressed as

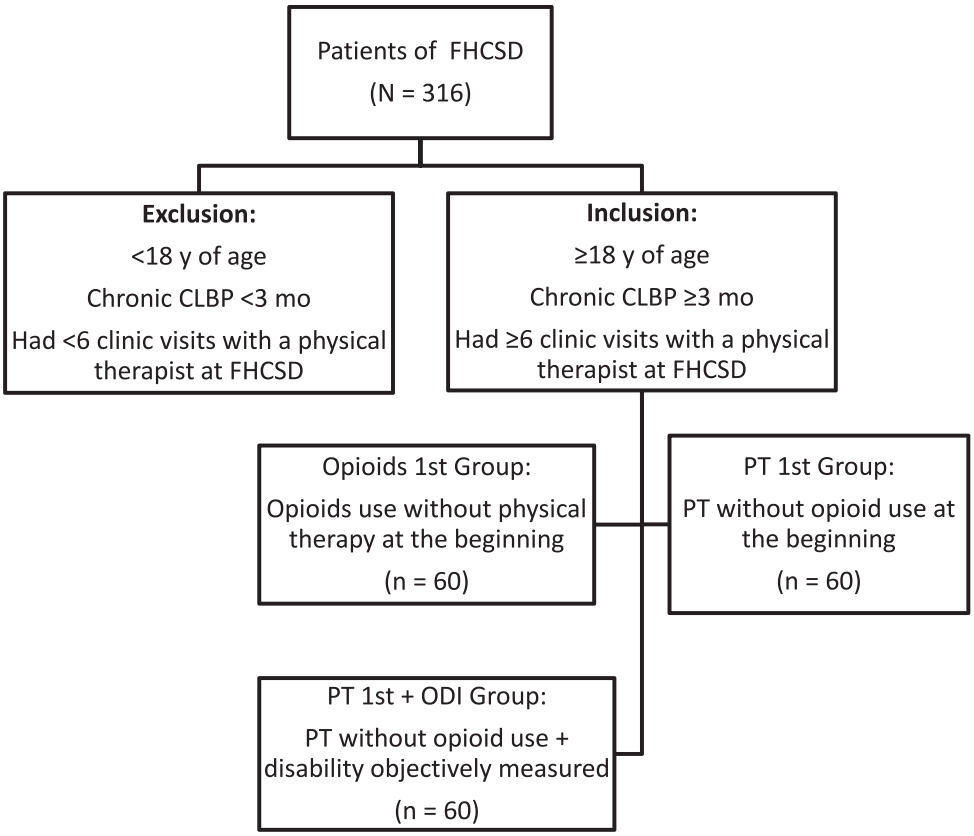

FIGURE: Patient selection of the chronic lower back pain (CLBP) study conducted at Family Health Centers of San Diego (FHCSD; ODI = Oswestry Disability Index; PT = physical therapy)

a mean ± SD. Categorical variables were analyzed using Fisher's exact test. A *P* value <.05 was considered statistically significant for all outcomes, and a power level of 0.9 was calculated to detect a 1-point difference in the primary outcome for sample size. A multivariable logistic regression was used to determine associations between baseline medication use and change in functionality. Corresponding 95% CI was calculated using a significance level of 5% for logistic regression. Statistical analysis was performed using IBM SPSS®, version 23 (Armonk, NY).

Results

Of the 316 eligible patients, 180 (57%) met inclusion criteria (Figure). A total of 60 patients (33.3%) used opioids as a first-line therapy, 60 (33.3%) used PT as a first-line therapy, and 60 (33.3%) used PT first-line and reported ODI scores. The FHSCD Department of PT began using ODI for functionality in September 2017 and, therefore, only 60 of the 120 PTF group had documented ODI scores. In this study, most patients with CLBP included were female, who were predominately Hispanic followed by white (non-Hispanic) then black. More patients in the OF group compared to both PTF groups had a history of depression 53% versus 30.8% (*P* = .11), substance use disorder 30% versus 20% (*P* < .001), a fall within the past year 45% versus 15.8% (*P* < .001), and on average had more falls 1.1 ± 1.6 versus 0.3 ± 0.6 (*P* < .001; Table 1).

The PTF group showed improved functionality with a mean ODI decrease of 11.9% (*P* < .001), with 61.7% having an ODI reduction greater than 10% (Table 2). Subjective pain scores decreased similarly among all groups and were not statistically different between groups (Table 2). A higher portion of patients in the OF group were lost to follow up (68.3%) compared with the PTF group (38.3%; *P* = .026). Only 3.3% of patients in the PTF group failed PT and required opioids versus 60% of patients in the OF group, who failed PT and continued to require opioids (*P* < .001; Table 2). Both opioid and nonopioid medications decreased among each group (Table 2). The most common opioids used at baseline were hydrocodone-acetaminophen (n = 34) followed by tramadol (n = 37; Table 2). The most common nonopioid medications used at baseline were nonsteroidal anti-inflammatory drugs (NSAIDs; n = 115), acetaminophen (n = 67), and muscle relaxants (n = 59). Total number of opioids used in the OF group decreased by 48.3%, while nonopioid medication use decreased by 29.9% in the OF group and 42.8% in the PTF

TABLE 1: Patient demographics of the presented study[a]

Patient Characteristic	OF Group (n = 60)	PTF Group (n = 60)	PTF + ODI (n = 60)	*P* Value[b]
Average age, mean ± SD	53.4 ± 12.2	46.1 ± 14.9	43.3 ± 14.1	.0041
Sex				
Female, No.	41	34	38	.419
Race				
White (non-Hispanic)	15 (25)	13 (22)	17 (28)	NS
Hispanic	20 (33)	31 (52)	28 (47)	NS
Asian	3 (5)	3 (5)	2 (3)	NS
Black	16 (27)	11 (18)	10 (17)	NS
Other	6 (10)	2 (3)	3 (5)	NS
Depression	32 (53)	17 (28)	20 (33)	.11
Anxiety	15 (25)	7 (12)	14 (23)	.131
Substance use disorder history	18 (30)	20 (33)	4 (7)	<.001
Other mental health disorders	18 (30)	10 (17)	11 (18)	.157
History of falls	27 (45)	8 (13)	11 (18)	<.001
Average No. of falls, mean ± SD[c]	1.1 ± 1.6	0.2 ± 0.5	0.3 ± 0.6	<.001
Musculoskeletal disorders	46 (77)	37 (62)	13 (22)	<.001

NS = not significant; ODI = Oswestry Disability Index; OF = opioids first group; PTF = physical therapy first group.

[a]Unless otherwise noted, data presented in No. (%) format.

[b]*P* values for demographics compares OF group to total of PTF and PTF + ODI group.

[c]Falls averaged over total number of falls for the specified group.

group (Table 2). Gabapentin was used by more OF patients at baseline (n = 24 vs n = 9, $P < .001$) and was the only non-opioid medication that showed increased use between both groups at PT completion. Multivariable logistic regression showed baseline NSAIDs ($P = .004$; CI 2.3-94.6; odds ratio 14.8) and acetaminophen use ($P = .005$; CI 2.1-64.8; odds ratio 11.72) was associated with a greater than 10% change in ODI when controlled for chest pain, sex, and initial ODI score.

Discussion

To our knowledge, this is the first assessment of early PT intervention for pain, functionality, and opioid use in the management of CLBP. Our results suggest early PT significantly improves functionality of patients with CLBP. Functional improvements included areas assessed in the ODI: pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life, social life, and traveling. Improvements in these areas are also areas targeted in improving various psychiatric comorbidities such as depression. Results showed early PT in CLBP provided similar reductions in pain compared to patients using opioids with PT. These findings are consistent with one large, systematic review[16] showing no benefit in chronic pain control between opioids versus alternative nonopioid medications. Krebs et al[18] demonstrated similar reduction in pain between opioids and nonopioid medications, but nonopioids provided sustained reductions in pain relief as opposed to opioids. These results also support CDC recommendations to use nonpharmacologic and non-opioid medications as first-line treatments for chronic pain. Although no significant difference between groups emerged in pain reduction, the positive trend suggests PT with nonopioids provided comparable pain relief to PT with opioids.

Fritz et al[19] found an increased risk of long-term opioid use with primary care versus physical therapy visits following a new consultation for lower back pain. Although infrequently used, PT incorporates nonpharmacologic pain management strategies including exercises, spinal manipulation, and education to improve CLBP.[19-21] Several studies[19,22,23] suggest early use of PT are associated with lower CLBP-related costs and reduced use of MRI, spinal injections, and opioid use. While this study did not focuse on the CLBP-related costs and use of other services, PT did reduce the use of nonopioid and opioid medications. Interestingly, most patients in the OF group who failed PT and continued opioid medications still received a benefit in pain reduction and decreased number of medications used for pain relief. Therefore, patients currently using opioids for CLBP may still benefit from PT. Increasing PT referral and use may improve pain and function in CLBP in addition to mitigating opioid use to reduce overdose potential.[19,22,24,25]

TABLE 2: Details of the study outcomes[a]

Primary Outcome	PTF + ODI		
Functionality Scores	**Pre-PT**	**Post-PT**	***P* Value**
Mean ± SD Oswestry score, %	39.8 ± 19.8	27.9 ± 26.3	<.001
>10% change in Oswestry score, No. (%)[b]	37 (61.7)	...	...

Secondary Outcomes	OF	PTF	PTF + ODI	*P* Value[c]
Pain scores, mean ± SD[d]				
Pre-PT pain score	9.2 ± 1.0	8.5 ± 1.0	5.41 ± 2.1	NS
Post-PT pain score	4.7 ± 2.9	3.7 ± 1.0	2 ± 2.5	NS
PT completion, n				
Failed PT and used opioids	36	3	1	.0001
Lost to follow up with PT	41	28	18	.026

	OF		PTF		PTF + ODI	
Medication Usage, No. (%)	**Pre-PT**	**Post-PT**	**Pre-PT**	**Post-PT**	**Pre-PT**	**Post-PT**
Total opioids	91 (100)	47 (100)	...	3 (100)	...	1 (100)
Morphine	2 (2.2)	2 (4.3)	...	1 (33.3)	...	0
Codeine	8 (8.8)	0	...	0	...	0
Oxycodone	8 (8.8)	9 (19.1)	...	1 (33.3)	...	1 (100)
Hydrocodone	34 (37.4)	16 (34)	...	0	...	0
Buprenorphine	2 (2.2)	0	...	0	...	0
Tramadol	37 (40.6)	20 (42.6)	...	1 (33.3)	...	0
Total nonopioids	127 (100)	93 (100)	85 (100)	36 (100)	67 (100)	54 (100)
NSAIDs	50 (39.4)	33 (35.5)	43 (50.6)	10 (27.8)	22 (32.8)	22 (40.7)
Acetaminophen	25 (19.7)	13 (13.9)	22 (25.9)	6 (16.7)	20 (29.9)	16 (29.6)
Muscle relaxant	23 (18.1)	18 (19.4)	14 (16.4)	8 (22.2)	22 (32.8)	10 (18.5)
Gabapentin	24 (18.9)	25 (26.9)	6 (7.1)	10 (27.8)	3 (4.5)	5 (9.3)
Unspecified	5 (3.9)	4 (4.3)	0	2 (5.5)	0	1 (1.9)

NS = not significant; NSAIDs = nonsteroidal anti-inflammatory drugs; ODI = Oswestry Disability Index; OF = opioids first group; PT = physical therapy; PTF = physical therapy first group.

[a]N = 60 for the following groups: PTF + ODI, OF, PTF, and PTF + ODI.

[b]*P* value for mean Oswestry score compares only PTF + ODI group prior to and after PT completion. A greater than 10% change in ODI indicates a significant difference within 90% confidence interval.

[c]*P* values for PT completion outcomes compares OF group to total of PTF and PTF + ODI group.

[d]Pain score based on numeric scale from 1 to 10. Pain scores compared between all 3 groups without significance.

Our study also highlighted patients in the opioid group had more comorbidities compared with PT group including depression and patient falls. Depression is a common comorbidity in patients with CLBP, which is associated with higher opioid use and rates of substance use disorder.[19,26-30] Studies have shown individuals with CLBP and psychological conditions do not respond to opioid treatment and have an increased risk of long-term use or misuse.[19,31] Our results suggest that patients with CLBP complicated by depression are more likely to be prescribed opioids and have a higher risk for substance use. It should be noted that depression rates with this group may have led to high failure rates and increased loss to follow up compared to PTF group.

Lastly, falls are also a common health concern contributing to patient morbidity and mortality in CLBP and opioid use, especially in elderly (>65 years of age) who have a 4 to 5 times higher likelihood of falling while taking opioids versus NSAIDs.[32] In our study, a significantly higher number of falls in patients taking opioids was seen, which emphasizes the need for more cautious prescribing in patients with CLBP as they are already limited in their

mobility due to pain. The decision to prescribe opioids in elderly with CLBP should be avoided if possible.

We acknowledge the limitations of this study as it was a retrospective, single-center study with a majority female population and may not be generalizable to all CLBP populations. In contrast, retrospective design may be reflective of clinical practice and prescribing patterns of primary care setting in patients with CLBP. Additionally, baseline characteristics in the OF group included older patients with more musculoskeletal disorders, falls, and mental health disorders representing a sicker group, which may be prone to worse outcomes. Medication usage was based on availability of information provided by the electronic medical record, which limited our ability to determine when medications were initiated or discontinued as well as quantities and doses prescribed outside of FHCSD. Moreover, we were unable to assess the use of illicit substances, nonprescription opioids, or additional nonpharmacologic treatments. Groups were not matched and, thus, may include additional unidentified confounders. Overall, the population size is small, and additional patients would add to the robustness of these results. It should be noted that ODI is a patient-assessed survey and may exhibit response bias based on patient willingness to report accurately. Only the total ODI score was available, and assessment of the individual components from the survey were not possible. The ODI scale was also implemented in September 2017, leading to the low number of patients included in this group as well as this scale is not used in the OF group. Lastly, numeric pain scores were not consistently monitored for trends among patients in all groups.

Conclusion

Initial CLBP treatment with early PT leads to a significant improvement in functionality, reduced pain scores, and reduced medication burden for both treatment groups. The OF treatment revealed no difference in pain reduction compared to PT first, but this outcome was not evaluated in functional improvement. Although PT improves functionality, it is uncertain if PT is functionally beneficial compared to opioids as this was not compared. These findings suggest that PT interventions should be considered a first-line, nonpharmacologic treatment option for CLBP along with nonopioid pharmacologic agents. Multiple risks and limited efficacy restrict our ability to recommend opioids as a safe, initial treatment option for CLBP.

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