

# Breaking the Cycle: How Physical Therapy Modalities Impact Emergency Department Visits in Patients with Chronic Low Back Pain

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## Abstract

**Aim:** Low back pain (LBP) is a common health problem worldwide and ranks among the top ten reasons for emergency department (ED) visits, although most cases do not require immediate care. This study aimed to compare ED visits for LBP during a 6-month follow-up period between patients receiving a home-based exercise program and those receiving additional physical therapy (PT) modalities, exploring a previously uninvestigated aspect.

**Materials and Methods:** This retrospective study included 419 patients with chronic LBP treated at the Department of Physical Medicine and Rehabilitation from July 2021 to January 2023. Patients were divided into two groups: those who received a home-based exercise program and those who received PT modalities in addition to exercise programs. Using appropriate statistical methods, the two groups were analyzed for their ED visits and potential influencing factors during a 6-month follow-up period.  $p < 0.05$  was accepted as statistically significant.

**Results:** Patients receiving physiotherapy had significantly fewer ED visits during the 6-month follow-up period ( $p = 0.001$ ). No association was observed between ED visits and patient demographics.

**Conclusion:** The study demonstrated that integrating PT modalities into the management of chronic LBP resulted in fewer ED visits.

**Keywords:** Emergency department, low back pain, physical therapy

## Introduction

Low back pain (LBP) is conventionally characterized as discomfort, muscular constriction, or rigidity localized to the anatomical region below the costal margin and superior to the inferior gluteal creases (1). Pain persisting for more than 12 weeks is defined as chronic LBP (2). The prevalence of chronic LBP varies among studies; however, one study conducted in a geographic area close to our study area reported a prevalence rate of 13.1% (3). LBP is one of the most common reasons for emergency department (ED) visits, although most cases do not require immediate or urgent care (4,5).

The treatment of LBP remains a challenge for clinicians (6). A systematic review of the guidelines strongly recommends patient education, advice to stay active, return-to-work programs, exercise programs/therapy, psychological therapies, multidisciplinary treatment, and surgical options for specific groups (7). However, it is noteworthy that more than two-thirds of patients with LBP experience a recurrence within one year of improvement (8). Physical therapy (PT) modalities are among the most commonly used conservative treatments for LBP (9). Numerous studies that combine exercise with PT modalities have consistently demonstrated their beneficial effects on pain relief, functionality improvement, reduction of disability, and mitigation of psychological disorders (9-13). However, in our comprehensive



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**Cite this article as:** Akyıldız Tezcan E, Çağlar A, Sanalp Menekşe T. Breaking the Cycle: How Physical Therapy Modalities Impact Emergency Department Visits in Patients with Chronic Low Back Pain. Eurasian J Emerg Med. 2024;23(1): 70-4.

**Received:** 13.11.2023

**Accepted:** 09.02.2024



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literature review, there was no prior investigation of their impact on ED visits. The aim of this study was to compare ED visits for LBP during the 6-month follow-up period between patients who received a home-based exercise program and those who received PT modalities consisting of hot pack (HP), therapeutic ultrasound (US), and transcutaneous electrical nerve stimulation (TENS) in addition to the home-based exercise program.

## Materials and Methods

**Study population:** This retrospective study included patients with chronic mechanical LBP who were treated at the Department of Physical Medicine and Rehabilitation of our hospital between July 2021 and January 2023.

Patients were included if they met the following criteria: (a) documented history of chronic mechanical LBP persisting for at least 12 weeks, (b) age >18 years, and (c) diagnosis confirmed by lumbar magnetic resonance imaging. Patients with any of the following conditions were excluded: (a) severe systemic diseases, (b) malignancies, (c) vertebral fractures, (d) neurological deficits, (e) history of spinal surgeries, (f) pregnancy, (g) inflammatory rheumatic disorders, and (h) low back trauma within the last 6 months. Moreover, patients who did not complete 10 sessions in the PT group were also excluded from the study. Demographics including age and gender were recorded, and details of ED visits during the 6-month post-treatment period. Pain assessments of the patients were retrospectively conducted by reviewing the data collected using the Numerical Rating Scale (NRS).

A total of 121 patients were excluded from the study for the following specified reasons: 44 patients had ankylosing spondylitis, 25 patients reported a history of lumbar surgery, 17 patients had neurological deficits, 5 patients had rheumatoid arthritis, 4 patients had Behçet's syndrome, 3 patients had recent trauma history within the last 6 months, 3 patients had spine fractures, 3 patients were under the age of 18, 3 patients had lumbar mass, 2 patients had systemic malignancy, 2 patients had familial mediterranean fever, 1 patient had myasthenia gravis, 1 patient had psoriatic arthritis, 1 patient had amyotrophic lateral sclerosis, 1 patient had scleroderma, 1 patient had sarcoidosis, 1 patient had severe chronic kidney disease, 1 patient had split cord malformation, 1 patient had severe heart failure, 1 patient had severe Parkinson's disease, 1 patient was diagnosed with Still's disease. Finally, 419 patients were included in the study.

**Treatment modalities:** A subset of patients received a home-based exercise program, whereas others received PT modalities that included HP, US, and TENS in addition to the home-based exercise program. HP therapy sessions lasted 20 min. US therapy was administered continuously for 6 min at a frequency of 1 MHz

and a power density of 1.5 W/cm<sup>2</sup>. TENS therapy was applied continuously for 30 min at a frequency of 100 Hz and a pulse duration of 40  $\mu$ s. The number of sessions ranged from 10 to 15 because of the retrospective nature of the study.

Individualized home-based exercise programs were prescribed to each patient, accounting for their unique medical conditions. These programs typically comprise strengthening exercises for the abdominal and lumbar muscles and stretching exercises for the hip flexors and lumbar extensors. Patients were instructed to perform these exercises for a minimum of 5 days per week. Written instructions for the exercise program were provided, and any exercises that the patients had difficulty comprehending were explained in detail by a physiotherapist.

## Statistical Analysis

Statistical analyses were conducted using IBM Statistical Package for the Social Sciences statistics version 22 software (IBM, Armonk, New York, USA). Descriptive statistics were expressed as mean and standard deviation or median and interquartile range or percentile, as appropriate. A p value of 0.05 was considered statistically significant. Normal distribution of the data was analyzed using the Kolmogorov-Smirnov test. Comparisons of age and body mass index between the groups were performed using independent samples t-tests. Differences in gender distribution, smoking habits, presence of comorbidities, and the presence of visiting the ED within a 6-month period were assessed using chi-square tests. To analyze the number of ED visits, the Mann-Whitney U test was used to evaluate differences between the PT and control groups. This test was also employed to assess differences in NRS scores between the groups. Within each group, changes in NRS scores over time were analyzed using the Wilcoxon signed-rank test. Furthermore, in the subgroup of participants assigned to a home-based exercise regimen, the association between ED visits and various factors, including comorbidities and gender, was examined using chi-square tests. The relationship between the presence of ED visit and age was explored using Student's t-test. Finally, the correlation between the number of ED visits and patient age was explored using Spearman's rank correlation coefficient, denoted as Spearman's rho.

## Results

A total of 419 patients were enrolled in this study. Of these, 110 patients received PT modalities in conjunction with home-based exercise programs, whereas the remaining 309 patients received exclusive home-based exercise programs. A flowchart of the study is shown in Figure 1. In our comparative analysis of the two groups, demographic characteristics and comorbidities were

closely examined. The only difference that emerged as statistically significant pertained to the age distribution between the groups. For a comprehensive breakdown of these data, please refer to Table 1, which provides detailed information on this aspect.

No significant differences were observed in the initial pain scores, as measured by the NRS, between the groups that received PT modalities and those that did not [median (25<sup>th</sup>, 75<sup>th</sup> P); 7 (5,7), 6 (5,7), p=0.204, respectively]. At the conclusion of the 6-month study period, both groups exhibited improved pain scores [PT group: median (25<sup>th</sup>, 75<sup>th</sup> P); baseline 7 (5,7), 6<sup>th</sup> month 5 (4,6),

p<0.001; exercise group median (25<sup>th</sup>, 75<sup>th</sup> P); baseline 6 (5,7), 6<sup>th</sup> month 5 (5,7), p<0.001]. The improvement in pain scores was significantly greater in the group receiving PT (median (25<sup>th</sup>, 75<sup>th</sup> P); 2 (1,2), 1 (0,1), p<0.001, respectively). Detailed data on patients' pain scores are presented in Table 2.

During the 6-month follow-up period, patients who received PT had a statistically significant reduction in the number of ED visits compared with those who received home-based exercise therapy alone [median (25<sup>th</sup>, 75<sup>th</sup> P); 0 (0,0), 0 (0,0), p=0.001]. When we categorize patients into two groups, one comprising those who have not visited the ED in the past 6 months and the other comprising those who have sought ED care at least once, it becomes clear that patients receiving PT modalities tend to visit the ED significantly less frequently than those not receiving PT (p=0.013). For an in-depth understanding of this trend, Table 2 offers comparative data on ED visit frequencies, while Table 3 details the specific number of visits within each group.

Due to the limited number of ED visits in the PT group (only 6 individuals), analyzing factors influencing these visits was not feasible. In contrast, within the exercise group, the presence of comorbidities did not markedly impact the likelihood of ED admissions, with similar rates observed between individuals with at least one comorbidity (15.4%, 31 individuals) and those without any (14.8%, 16 individuals; p=0.999). Additionally, gender was not a significant factor in determining ED visits, as evidenced by 13.2% of females and 20.2% of males requiring care (p=0.166). Age also showed no significant correlation with ED visits, with comparable age distributions in those who did and did not visit the ED (45.22±13.18 vs. 48.23±13.66, respectively; p=0.167). No significant association between age and ED visit numbers was observed (CC=0.096, p=0.091).

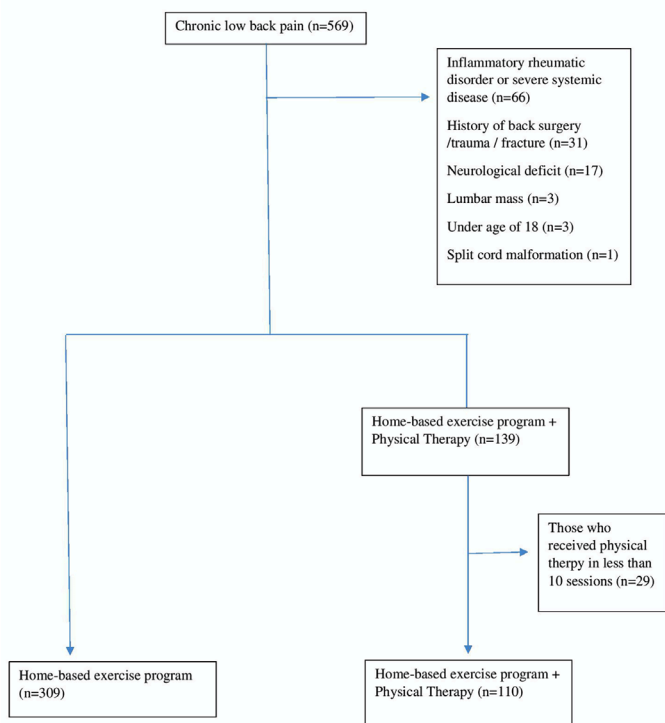


Figure 1. The flowchart of the study

	Home-based exercise n=309	Physical therapy + Home-based exercise n=110	p value	
Age (year); mean (SD)	47.74 (13.60)	53.66 (13.54)	<0.001	
BMI (kg/m <sup>2</sup> ); mean (SD)	29.63 (5.46)	29.67 (5.81)	0.953	
Gender; female n (%)	220 (77%)	85 (71%)	0.262	
Smoking habit; smoker n (%)	67 (22%)	25 (23%)	0.926	
Comorbidities; n (%)				
	Hypertension	64 (20.71%)	19 (17.27%)	0.524
	Diabetes mellitus	39 (12.62%)	13 (11.82%)	0.959
	Hypothyroidism	15 (4.85%)	7 (6.36%)	0.718
	Coronary artery disease	9 (2.91%)	5 (4.55%)	0.610
	Hyperlipidemia	20 (6.47%)	8 (7.27%)	0.947
	Asthma	20 (6.47%)	5 (4.55%)	0.618

BMI: Body mass index, N: Number, SD: Standard deviation

**Table 2. NRS pain scores and emergency department visits of participants**

	Home-based exercise n=309	Physical therapy + Home-based exercise n=110	p value
NRS pain score at baseline; median (IQR 25-75)	6 (5,7)	7 (5,7)	0.204
NRS pain score at 6 <sup>th</sup> month; median (IQR 25-75)	5 (5,7)	5 (4,6)	<0.001
NRS pain score change between baseline and 6th month	1 (0,1)	2 (1,2)	<0.001
ED visits; median (IQR 25-75)	0 (0,0)	0 (0,0)	0.001
Visiting ED at least once within 6 month period; n (%)	47 (15.2%)	6 (5.5%)	0.013

ED: Emergency department, IQR: Interquartile range, NRS: Numerical Rating Scale, IQR: Interquartile range

**Table 3. Emergency department visits for low back pain**

ED visits	Physical therapy (n=110)		Control group (n=309)	
	Number of patients	Percentage of patients	Number of patients	Percentage of patients
0	104	94.5	262	84.8
1	3	2.7	35	11.3
2	3	2.7	8	2.6
3	-	-	3	1
4	-	-	-	-
5	-	-	1	0.3

ED: Emergency department

## Discussion

In this study, which involved 419 patients, a lower rate of ED admissions was observed in patients treated with PT modalities than in other patients. This finding underscores the importance of incorporating PT modalities into the treatment regimens of patients struggling with chronic mechanical LBP.

Although PT interventions are routinely applied to alleviate LBP in clinical practice, there remains a paucity of comprehensive investigations in this field. It is pertinent to examine comparative studies featuring relatively extensive patient cohorts. One of the first studies in this research field under consideration belongs to Koldaş Doğan et al. (10). In this study, a cohort of 60 patients was divided into three groups: the first group underwent home-based exercise and aerobic exercise, the second group received home-based exercise in conjunction with PT modalities, and the third group exclusively engaged in home-based exercise (11). Notably, all groups showed a reduction in pain; however, the treatment approach used in the second group, which is similar to our study, showed superior efficacy in improving disability and reducing psychological distress (10).

Another important investigation on this topic was conducted by Yılmaz et al. (12), in 2015, which included a cohort of 56 patients divided into two groups: an exercise-only cohort and a group that combined exercise with PT. When assessed one month after treatment, the cohort that received PT combined with exercise

experienced a greater reduction in pain and an improvement in functional status (12). In a randomized controlled trial conducted by Şahin et al. (13) between February 2011 and August 2013, 104 patients were assigned to either the PT group or the control group. After one year of follow-up, the results showed superior improvements in both pain assessment scores and disability indices within the PT group compared with the control group (13). Collectively, these studies have consistently demonstrated the beneficial effects of PT on pain management, functional disability, and psychological well-being in patients with LBP. The convergence of evidence from these investigations supports our findings and further validates the alignment between our study and the prevailing body of research. It is worth noting that our study explored an additional dimension of the impact of PT, specifically its role in reducing ED visits for patients with chronic LBP. Our research clearly confirmed that PT not only alleviates pain but also contributes to a significant reduction in ED visits for this patient population.

From the perspective of the ED, the issue of overcrowding emerges as a paramount concern, primarily due to its impact on the quality of healthcare and its role in increasing the overall burden on the healthcare system (14). Considering the imperative to reduce ED visits, notably LBP ranks among the most prevalent causes for admissions to ED globally (4,15). A meta-analysis of 21 studies from 12 countries estimated the prevalence of LBP cases in EDs to be 4.39%, placing LBP in the top ten causes of ED admissions (4,15). A meta-analysis conducted by Galliker

et al. (5) in 2020 further revealed that the prevalence of cases requiring immediate or urgent treatment among patients with LBP admitted to the ED ranged from 2.5% to 5.1% in prospective studies and from 0.7% to 7.4% in retrospective studies. These figures clearly indicate that the majority of these patients do not warrant immediate or urgent intervention, thereby unnecessarily contributing to ED overcrowding.

### Study Limitations

Our study's limitations are primarily rooted in its retrospective nature, which inherently limited the scope of data available for analysis. In the PT group, the small sample size (n=6) who visited the ED hindered a detailed examination of factors influencing these visits. This gap in data, especially regarding pain exacerbation circumstances and patients' working status, is a critical area for future research. The retrospective design also resulted in variability in the number of PT sessions administered. Another significant constraint was our inability to monitor patients' use of pain-relief medications outside the hospital setting, a factor that could greatly influence the decision to seek emergency care. Pain is inherently subjective, and individual decisions to seek emergency care can vary widely based on pain tolerance and personal circumstances. Regarding the observed age difference between the groups, we do not view this as a limitation. Although this difference is a result of the study's retrospective design, our analysis found no significant correlation between age and ED visits. On the other hand, its strength lies in the ease of patient standardization as it is the only comprehensive ED serving a population of over 60,000 people. Our study represents a pioneering exploration of this topic.

### Conclusion

In conclusion, our findings highlight the potential benefits of integrating PT modalities into the comprehensive management of chronic LBP. This not only contributes to improved patient care but is also consistent with the broader goal of reducing the burden of ED. We advocate for further multicenter and prospective studies to validate and extend these findings, offering a more comprehensive understanding of the role of PT in improving the management of chronic LBP and healthcare resource allocation.

### Ethics

**Ethics Committee Approval:** This study was conducted in accordance with the Declaration of Helsinki and was approved by the Local Ethics Committee of Necmettin Erbakan University (decision number: 2023/4514, date: 15.09.2023).

**Informed Consent:** Retrospective study.

### Authorship Contributions

Surgical and Medical Practices: E.A.T., A.Ç., Concept: E.A.T., A.Ç., T.S.M., Design: E.A.T., A.Ç., T.S.M., Data Collection or Processing: E.A.T., A.Ç., Analysis or Interpretation: E.A.T., A.Ç., T.S.M., Literature Search: E.A.T., A.Ç., T.S.M., Writing: E.A.T.

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study received no financial support.

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