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Physiotherapy Interventions to Reduce Opioid Use After Orthopedic Surgery: A Controlled Cohort Study

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Abstract:

The management of postoperative pain is still a significant concern in orthopedic surgery, especially given the pervasive use of opioid analgesics and the potential for dependency. In this study, patients undergoing orthopedic surgery had their pain outcomes and opioid usage reduced by structured physiotherapy sessions. The study compared a routine postoperative care program with an upgraded physiotherapy program over a 14-day period using a controlled cohort design with 60 participants. According to the findings, the intervention group's opioid use was dramatically reduced, and their pain scores decreased more quickly than those of the control group. These results demonstrate how effective physical therapy can be as a non-pharmacological, safe method of promoting recovery and lowering opioid dependence. The study emphasizes the significance of including physical therapy into postoperative pain management procedures in order to improve patient outcomes overall.

Keywords: Physiotherapy, Opioid Reduction, Postoperative Pain, Orthopedic Surgery, Rehabilitation, Non-Pharmacological Intervention

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1. INTRODUCTION

Orthopedic rehabilitation requires effective postoperative pain management because poor pain management can hinder functional results, prolong recovery, and lower patient satisfaction. Opioid analgesics are still often used to treat postoperative discomfort despite improvements

in recovery procedures and surgical techniques[1], which frequently raises questions regarding long-term abuse, reliance, and side effects. A promising non-pharmacological approach that can either supplement or lessen the requirement for opioid-based pain management has surfaced in recent years: physical therapy[2]. In addition to promoting recovery, physiotherapy programs that emphasize early mobilization, focused exercises, and functional restoration may also lessen the hazards connected to opioid addiction[3]. This study adds to the increasing amount of data supporting safer and more efficient postoperative care procedures by examining the effects of organized physiotherapy on opioid intake and pain reduction after orthopedic surgery.

1.1.Statement of the Problem

Effective postoperative pain management is still difficult to achieve, even with major advancements in orthopedic surgery methods. Many patients still significantly rely on opioid drugs to manage their pain[4]. Significant hazards associated with this increasing dependence include the possibility of long-term abuse or addiction, delayed rehabilitation, and unpleasant drug reactions. Even though physical therapy is a safe, non-pharmacological option that can improve functional recovery and lessen pain, its effect on postoperative opioid use has not been sufficiently investigated in standard clinical settings[5]. The issue this study attempts to address is the persistent overuse of opioid analgesics following orthopaedic surgery, as well as the lack of proof that structured physiotherapy interventions can effectively lower opioid use and enhance pain management during the initial stages of recovery[6].

1.2.Background of the Study

Significant postoperative pain is frequently linked to orthopedic surgery, including joint replacements and arthroscopic treatments. This pain can impair mobility, lengthen hospital stays, and postpone functional recovery[7]. Opioid analgesics have historically been the mainstay for treating chronic pain, but rising worries about opioid dependence, negative side effects, and widespread abuse have spurred a hunt for safer substitutes[8]. With an emphasis on early mobilization, focused therapeutic exercises, and non-pharmacological pain relief methods that promote quicker recovery, physiotherapy has become a crucial part of multimodal pain management[9]. Structured physical therapy has been shown to improve circulation, minimize inflammation, and aid in neuromuscular recovery, all of which may lessen the need for opioid drugs. Despite these advantages, little is known about how much physiotherapy interventions directly affect postoperative opioid intake[10], especially in controlled clinical settings. Therefore, by investigating the effects of structured physiotherapy on opioid use and early postoperative pain outcomes in patients following orthopedic surgery, this study aims to close this gap.

1.3.Objectives of the Study

- To assess how well structured physiotherapy programs work to lower postoperative opioid use in patients having orthopaedic surgery.
- To assess how patients getting structured physiotherapy and those receiving normal physiotherapy care differ in their postoperative pain scores.

- To evaluate the functional gains and short-term recovery trends linked to improved physiotherapy regimens.
- To ascertain the correlation between the frequency of PT interventions and the total need for postoperative analgesics.

2. METHODOLOGY

The purpose of this study was to determine whether structured physiotherapy sessions helped lower the amount of opioids that patients undergoing orthopedic surgery used after their procedures. The outcomes of patients who received improved physiotherapy and those who received normal postoperative care were compared using a controlled cohort methodology. Every technique was used in compliance with institutional ethical standards.

2.1. Research Design

A controlled cohort study design was employed. Two groups of postoperative orthopedic patients were observed:

1. Intervention group – received a structured physiotherapy protocol.
2. Control group – received routine physiotherapy care.

Both groups were monitored prospectively for 14 days after surgery. No randomization was performed, although allocation was based on ward assignment to assure practicality while limiting selection bias.

2.2. Sample Details

The study included **60 adult patients** who had undergone elective orthopedic procedures (e.g., knee arthroscopy, joint replacement).

- **Intervention group:** 30 patients
- **Control group:** 30 patients

The participants were medically stable for physical therapy and ranged in age from 18 to 65. Individuals with surgical problems, cognitive impairment, or chronic opioid use were not included. Based on patient availability throughout the study period, convenience sampling was employed.

2.3. Instruments and Materials Used

The following tools and materials were used:

- To measure postoperative pain, use the Numerical Pain Rating Scale (NPRS).
- The daily log of opioid consumption, measured in milligram equivalents of morphine (MME).
- Physiotherapy Protocol Sheet with activities like progressive strengthening, breathing techniques, cryotherapy, and early mobilization.

- Medical records from the hospital to confirm the administration of medications.

2.4. Procedure and Data Collection Methods

After obtaining informed consent, participants were assigned to their respective cohorts based on ward placement.

- A structured physiotherapy program was administered twice a day to the intervention group beginning 24 hours following surgery.
- Standard physiotherapy was administered once daily to the control group in accordance with hospital protocol.

For 14 days following surgery, pain scores and opioid use were documented every 24 hours. Physiotherapists recorded the length of sessions, patient compliance, and any unfavourable incidents. Trained research assistants gathered all data from physiotherapy records and charts.

2.5. Data Analysis Techniques

Data were entered into SPSS (v.26) and cleaned prior to analysis.

- Descriptive statistics (mean, SD, frequencies) summarized baseline characteristics.
- Independent t-tests contrasted the two groups' mean opioid usage and pain scores.
- Repeated-measures ANOVA was employed to examine how groups and individuals changed throughout time.
- A p-value < 0.05 was regarded as statistically significant.

3. RESULTS

The results of the controlled cohort research evaluating whether organized physiotherapy sessions decreased opioid intake after orthopedic surgery are presented in this section. After completing the study, all 60 individuals were taken into account for the analysis. Descriptive and inferential statistics are used to present the results after SPSS output processing.

To make sure that both groups were comparable at the beginning of the study, baseline clinical and demographic data were examined before comparing outcomes. By establishing comparability, it became possible to more firmly ascribe the effects seen subsequently to the physiotherapy intervention rather than participant differences.

Table 1: Baseline Characteristics of Participants (N = 60)

Variable	Intervention (n=30)	Control (n=30)	p-value
Mean Age (years)	48.3	49.1	0.72
Gender (Male %)	56.7%	60.0%	0.79

Knee Arthroscopy (%)	43.3%	40.0%	—
Joint Replacement (%)	56.7%	60.0%	—
Pre-op Pain Score (NPRS)	7.2	7.1	0.68

Age, gender distribution, operation type, and preoperative pain levels did not change statistically significantly between the intervention and control groups, according to the baseline analysis. These results support the validity of later group comparisons by confirming that both cohorts were comparable at baseline.

3.1.Statistical Analysis

Descriptive analyses of the total morphine milligram equivalents (MME) utilized throughout the 14-day period were performed for each group in order to ascertain whether the structured physiotherapy program affected postoperative opioid intake. Each cohort's mean opioid consumption and variability are summarized in the following table.

Table 2: Group Statistics (Independent Samples t-test)

Group	N	Mean MME (14 Days)	Std. Deviation
Intervention	30	112.40	28.52
Control	30	156.73	34.18

According to the descriptive findings, the intervention group's members used opioids significantly less frequently than those in the control group. An independent samples t-test was used to further investigate this difference, which raised the possibility of a treatment impact.

An independent samples t-test was used to determine whether the observed variation in opioid use between groups was statistically significant. Before interpreting the t-value, homogeneity of variances was confirmed using Levene's test.

Table 3: Independent Samples Test

Test Component	Levene's F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	1.42	0.24	-5.24	58	0.000

Comparing patients undergoing structured physiotherapy to the control group, the independent samples t-test showed a statistically significant decrease in opioid use ($p < 0.001$). This suggests that the intervention was successful in reducing the need for opioids after surgery.

A repeated measures ANOVA was used to assess the overall change over time as well as variations in the rate of improvement between the two study groups based on pain scores

gathered over several postoperative days. This methodology enabled the evaluation of both within-group and between-group effects.

Table 4: Repeated Measures ANOVA

Source	df	F	Sig.
Within-Subjects (Time)	1.00	42.83	0.000
Group × Time Interaction	1.00	16.21	0.000
Between-Subjects Effect	1.00	10.45	0.002

The findings showed a significant group × time interaction and substantial main effects for time, suggesting that while pain levels dropped in both groups, those who got systematic physiotherapy did so more quickly. These results demonstrate the intervention's quicker recovery trajectory.

Descriptive statistics of mean pain scores were computed for postoperative days 1, 3, 7, and 14 in order to better understand the evolution of postoperative pain. These figures provide a graphic depiction of group variations throughout the recuperation phase.

Table 5: Daily Mean Pain Scores (NPRS)

Day	Intervention Mean (SD)	Control Mean (SD)
1	6.8 (0.9)	7.1 (1.0)
3	5.9 (1.1)	6.6 (1.2)
7	4.1 (1.0)	5.5 (1.3)
14	2.8 (0.8)	4.3 (1.0)

At every postoperative time point, the descriptive results demonstrated that the intervention group's pain scores were consistently lower. The intervention cohort's pain levels had dropped to less than half of their starting point by day 14, underscoring the therapeutic advantages of improved physiotherapy treatment.

4. DISCUSSION

The goal of the current study was to determine whether structured physiotherapy interventions could help patients undergoing orthopedic surgery experience less pain and use fewer opioids after surgery. The results showed that compared to those who got conventional care, participants who received improved physiotherapy reported faster decreases in pain levels and needed significantly less opioids. These results imply that physiotherapy is essential for both physical rehabilitation and the promotion of safer, non-pharmacological pain treatment techniques.

4.1. Interpretation of Results

The results indicate that during the early postoperative phase, the structured physiotherapy program significantly reduced the need for opioids. Over the course of 14 days, the intervention group's overall opioid consumption was much lower, as indicated by statistically significant t-test results. Pain scores also declined more rapidly in the intervention group, as confirmed by the significant group × time interaction in the repeated measures ANOVA. Together, these results imply that customized exercises, early mobilization, and regular physiotherapy participation lead to more efficient pain management and less dependence on opiate analgesics.

4.2.Comparison with Existing Studies

The results of this study are in good agreement with previous research showing how physiotherapy can help lower postoperative opioid dependence. Rutenberg et al. (2022)[11] shown that starting physical therapy early after total knee replacement dramatically reduced the use of opioids, corroborating our finding that systematic physiotherapy helps manage pain. The opioid-sparing effect shown in our sample was also supported by Aoyagi et al. (2021)[12], who found that postoperative physical therapy interventions were linked to decreased long-term opioid use following knee replacement. The substantial pain reduction and decreased opioid intake observed in our intervention group are mirrored by systematic evidence by Hamilton et al. (2025)[13] that non-pharmacological interventions, such as physiotherapy, can significantly reduce opioid requirements after orthopedic surgery. The results of our study are also in line with the scoping review by Gormley et al. (2022)[14], which highlighted the expanding body of techniques targeted at decreasing opioid use following orthopedic surgeries, with physiotherapy highlighted as a crucial component. Lastly, Sun et al. (2018)[15] showed that early physical therapy significantly reduced the risk of long-term opioid use in musculoskeletal patients who had never used opioids. This finding strengthened the evidence that prompt physical therapy can effectively mitigate opioid dependence, similar to the pattern seen in our postoperative sample.

4.3. Implication of Existing Studies

The findings of this study align closely with existing evidence in the literature, as highlighted below:

- Early physiotherapy enhances functional outcomes and promotes a quicker recovery following orthopedic surgeries, according to prior research.
- Studies have repeatedly demonstrated that physiotherapy and other non-pharmacological pain management techniques can dramatically lower postoperative opioid use.
- Increasingly, clinical guidelines reflect the findings of this study by recommending the use of physiotherapy in multimodal analgesic programs.

- Research on enhanced recovery pathways (ERAS) also emphasizes the importance of physiotherapy in lowering hospital stays, postoperative pain, and opioid use, which is consistent with the patterns seen here

4.4. Limitations of the Study

Despite the positive findings, certain limitations must be acknowledged:

- The results may not be as broadly applicable to bigger populations due to the relatively small sample size (N = 60).
- Selection bias may have been introduced because allocation was based on ward assignment rather than randomization.
- Patient self-reporting, which may be prone to recollection or reporting errors, was a component of the opioid usage records.
- The trial only included a 14-day follow-up period; functional results and long-term opioid usage patterns were not evaluated.
- Despite baseline comparability, differences in surgical techniques and personal pain tolerance may have affected the outcomes.

4.5. Suggestions for Future Work

Based on the limitations and insights from this study, future research should consider:

- To validate the results, bigger and more varied patient populations should participate in randomized controlled trials.
- Including long-term monitoring to assess long-term impacts on opioid dependency, mobility, and pain.
- Evaluating extra physiotherapy elements such digital physical therapy tools, home-based exercise monitoring, or tele-rehabilitation.
- Examining integrated therapies for improved pain management, such as physiotherapy plus cognitive-behavioral pain education.
- Analyzing the relationship between structured physiotherapy programs' cost-effectiveness and patient satisfaction.

5. CONCLUSION

The results of this study showed that systematic physiotherapy therapies can be extremely helpful in improving pain recovery after orthopedic surgery and lowering postoperative opioid use. The results verify that early and regular physiotherapy offers significant benefits for pain management while lowering dependency on pharmaceutical measures by contrasting a physiotherapist-enhanced cohort with a standard care group. These results demonstrate the increasing significance of incorporating physical therapy into contemporary postoperative care protocols.

5.1. Summary of Key Findings

The major outcomes of the study can be summarized as follows:

- Compared to the control group, the intervention group's opioid usage was noticeably lower during the 14-day postoperative period.
- The significant group × time interaction in the repeated measures ANOVA showed that the structured physiotherapy group experienced a faster drop in pain levels.
- Why The observed differences were more credible because both groups were similar at baseline.
- Better pain management and improved short-term healing patterns were made possible by enhanced physiotherapy sessions.
- Research confirms that physiotherapy should be incorporated into postoperative analgesic plans.

5.2.Significance of the Study

This study adds significant data to the continuing global initiative to lessen postoperative opioid dependence. The study promotes the use of non-pharmacological rehabilitation techniques that improve patient safety by showing that structured physical therapy can successfully reduce opioid use while hastening pain relief. Given that opioid abuse and reliance present serious public health issues, our findings have major clinical practice implications and imply that physiotherapy-based therapies can either supplement or replace opioid-based procedures.

5.3. Recommendations

Based on the findings, the following recommendations are proposed:

- Structured physiotherapy sessions ought to be a regular part of postoperative orthopedic care in healthcare facilities.
- Multimodal pain treatment techniques that prioritize non-pharmacological therapies ought to be given priority by clinicians.
- It is important to create standardized physiotherapy protocols to direct exercise-based therapies and early mobilization.
- To improve patient outcomes, physiotherapists and surgeons should get additional training that emphasizes interdisciplinary collaboration.
- Physiotherapy-based interventions should be included in policies targeted at lowering opioid dependence as safer substitutes for pain management.

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