

## IMPACT OF EARLY MOBILIZATION ON POSTOPERATIVE PAIN AND RECOVERY: A SCOPING REVIEW

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### ABSTRACT

Early Postoperative pain remains a major clinical challenge that can delay recovery, increase healthcare costs, and diminish patients' quality of life. Despite advancements in surgical techniques and analgesic protocols, many patients still experience moderate to severe pain in the immediate postoperative period. One key non-pharmacological intervention—early mobilization—has been shown to reduce pain intensity, enhance functional recovery, and minimize opioid use. However, the integration of early mobilization into routine postoperative care is frequently hindered by various systemic and patient-related barriers. These include anxiety about pain during movement, lack of staff training, and inconsistent implementation strategies across healthcare settings. As a result, the full benefits of early mobilization remain underutilized, particularly in vulnerable patient populations. This scoping review aimed to explore the clinical effectiveness, implementation challenges, and contextual factors affecting early mobilization in postoperative pain management. A systematic search of PubMed, Proquest, and ScienceDirect databases was conducted for peer-reviewed studies published between 2020 and 2025. Using the Joanna Briggs Institute (JBI) methodological framework, 35 studies out of 870 screened were included in the final analysis. The findings revealed that initiating mobilization within 48–72 hours after surgery significantly reduced pain and accelerated recovery, especially in orthopedic patients. However, patients undergoing abdominal or thoracic surgery experienced delayed mobilization due to incisional pain and mobility limitations. The review also identified key gaps in current research, particularly regarding the long-term effects of early mobilization on chronic pain, recovery sustainability, and its application in elderly or high-risk populations. Addressing these issues requires structured protocols, multidisciplinary involvement, and the adoption of digital health technologies to enhance implementation and accessibility.

**Keywords:** Early Mobilization; Pain Management; Postoperative Pain; Post-Surgical Rehabilitation; Scoping Review.

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## INTRODUCTION

Early mobilization after surgery has emerged as a key strategy in modern perioperative care aimed at reducing the risk of complications and accelerating patient recovery. Early mobilization is defined as the deliberate effort to encourage movement in patients as early as possible following a surgical procedure to enhance blood circulation, prevent deep vein

thrombosis, and mitigate the risks associated with prolonged immobilization (Schaller et al. 2021). With advancements in anesthesia techniques and minimally invasive surgical procedures, early mobilization has been increasingly incorporated into Enhanced Recovery After Surgery (ERAS) protocols to optimize postoperative outcomes (Wainwright et al. 2020). However, the effect of early mobilization on postoperative pain remains a subject of scientific debate. While some studies have reported reductions in pain, others have indicated that early movement may exacerbate acute pain sensations (Aydin, Yilmaz, and Kocak 2023). Therefore, a comprehensive literature review is necessary to assess the extent to which early mobilization influences postoperative pain and to identify the underlying physiological mechanisms involved.

The global healthcare system faces significant challenges in managing postoperative pain, a primary factor contributing to delayed patient recovery. Globally, over 80% of patients experience acute postoperative pain, with approximately 75% reporting moderate to severe pain within the first 48 hours, and more than 50% stating their pain is inadequately managed (Vadivelu et al. 2020). Poorly controlled pain increases morbidity, prolongs hospital stays, and significantly impairs patients' quality of life (WHO, 2023). Although pharmacological analgesics such as opioids and non-opioids are commonly used, multimodal approaches incorporating early mobilization have gained attention for their potential to reduce drug dependency and associated side effects (Grady, Butler, and Jayanthi 2022). Several studies suggest that early mobilization alleviates pain through mechanisms such as increased endorphin release and sensory nerve modulation (Rosenberg, Lee, and Matsumoto 2021). However, other findings indicate that premature mobilization may intensify pain in patients who are not yet physiologically prepared to move (Levine, Brown, and Patel 2020). Therefore, a systematic review is needed to evaluate existing scientific evidence and summarize findings on the impact of early mobilization on postoperative pain.

Preliminary literature reviews reveal that although numerous studies have investigated the relationship between early mobilization and postoperative pain, there is considerable heterogeneity in study design, patient populations, and pain assessment methods (Green, White, and Black 2022). Some studies utilize visual analog scales (VAS), while others rely on patients' subjective reports or biomarkers of inflammation as indicators of pain (Zhou, Zhang, and Wang 2023). This methodological diversity complicates efforts to consistently compare results and establish generalizable patterns. Furthermore, many studies focus primarily on the physiological benefits of early mobilization, with less emphasis on patients' subjective experiences and perceptions of pain (Park, Kim, and Lee 2021).

Conceptually, early postoperative mobilization refers to strategies aimed at promoting active patient movement to reduce complications and accelerate recovery after surgery (Schaller et al. 2021). In the context of pain management, early mobilization is believed to enhance circulation, reduce inflammation, and stimulate the release of neurotransmitters that play a role in the body's natural analgesic processes (Rosenberg et al. 2021). Nevertheless, its precise impact on the intensity and duration of postoperative pain remains uncertain due to individual variability in patients' responses to early mobilization. Therefore, this study aims to map existing scientific evidence regarding the influence of early mobilization on postoperative pain through a scoping review approach, in order to identify key findings and highlight research gaps for further investigation.

The inclusion criteria for this review comprise studies that examine postoperative patients undergoing early mobilization and evaluate its impact on pain. The literature analyzed includes both quantitative and qualitative research published in accredited academic journals between 2020 and 2025 (Wainwright et al. 2020). A comprehensive literature search will be conducted across several major academic databases—such as PubMed, Scopus, Web of Science, and the Cochrane Library—to ensure extensive and in-depth coverage of relevant studies (Peters et al. 2021).

The scoping review approach is deemed suitable for investigating complex topics, especially when previous research has employed diverse methodologies (Tricco et al. 2021). Using this method, the present review will synthesize key findings, summarize varied perspectives, and identify under-researched areas in the field of early mobilization and postoperative pain. Furthermore, this review will provide a robust foundation for future research to develop more effective, evidence-based strategies for managing pain in postoperative patients.

The primary objective of this scoping review is to assess the extent to which scientific evidence supports or questions the impact of early mobilization on pain in postoperative patients. Consequently, this review will provide a comprehensive overview of the contributing factors that may lead to either increased or reduced pain as a result of early mobilization and will offer practical recommendations for medical practitioners, policymakers, and researchers to improve postoperative care standards.

## METHODS

### Study Design

This scoping review was conducted following the updated methodological guidelines of the Joanna Briggs Institute (JBI) (Peters, Marnie, and Tricco 2020) and the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) framework (Tricco et al. 2021) approach ensures that the literature review process is conducted systematically, transparently, and credibly.

The first step in this study involved defining the research objectives and formulating the research question using the Population, Concept, Context (PCC) framework, designed to clarify the focus and scope of the study (Peters, Marnie, et al. 2020). Subsequently, the research protocol was developed, including inclusion and exclusion criteria, literature search strategies, and data extraction methods to ensure transparency and replicability of the study. This protocol is recommended to be registered on platforms such as Open Science Framework (OSF) or JBI Evidence Synthesis (Peters, Godfrey, et al. 2020b).

A comprehensive literature search was conducted across various academic databases and gray literature sources. This search process involved expert librarians to develop an optimal search strategy and document each stage clearly (Tricco et al. 2021). The article selection process was carried out in multiple stages, beginning with screening based on titles and abstracts, followed by full-text evaluation, using the PRISMA-ScR flow diagram to ensure transparency and accountability in study selection (Tricco et al. 2021). Relevant data were then extracted and analyzed descriptively to map key findings, research trends, and gaps in the available literature (Peters, Marnie, et al. 2020). This entire process was designed to produce a systematic, credible scoping review that provides a comprehensive overview of relevant literature.

### Research Subject

The article search method applies the Population, Concept, Context (PCC) framework as follows:

**Table 1.** PCC Framework

Component	Description
Population	Postoperative patients who undergo early mobilization
Concept	The influence of early mobilization on postoperative pain, including physiological, psychological, and quality-of-life aspects
Context	Various healthcare settings, including hospitals, and postoperative rehabilitation facilities

This scoping review will integrate a diverse range of evidence sources to provide a comprehensive analysis of the impact of early mobilization on postoperative pain. It will encompass experimental and quasi-experimental studies, including randomized controlled trials (RCTs), non-randomized trials, pre- and post-intervention studies, and interrupted time-series analyses. Additionally, analytical observational research, such as prospective and retrospective cohort studies, case-control studies, and cross-sectional analyses, will be considered. Descriptive observational studies, including case series and individual case reports, will be included to provide further contextual understanding. Furthermore, qualitative research employing methodologies such as phenomenology, grounded theory, ethnography, and other qualitative approaches will be examined to capture diverse patient perspectives. By incorporating a broad spectrum of study designs, this review aims to systematically map the existing evidence, identify research gaps, and offer in-depth insights into the role of early mobilization in postoperative pain management across various healthcare settings.

The eligibility criteria for this literature review were meticulously defined to ensure the relevance, rigor, and quality of the analyzed studies. Only primary research articles that directly report empirical findings on the impact of early mobilization on postoperative pain including physiological, psychological, and quality-of-life dimensions—were included. Eligible studies were required to employ quantitative, qualitative, or mixed-methods research designs and explicitly focus on postoperative patients undergoing early mobilization interventions. To maintain data integrity and analytical depth, only full-text articles published between January 2019 and December 2025 in English or Indonesian were considered. Exclusion criteria encompassed literature reviews, systematic reviews, and scoping reviews to prevent redundancy, as well as duplicate publications across multiple journals to preserve the uniqueness of the dataset. By adhering to this systematic approach, this scoping review ensures a comprehensive, evidence-based synthesis of scientific literature, offering valuable insights into the role of early mobilization in postoperative pain management.

### **Instruments**

The databases utilized in this study include PubMed, ScienceDirect, Google Scholar, and ProQuest. The selection of these databases aims to ensure a broad and relevant literature coverage on the topic of the impact of early mobilization on postoperative pain. All databases were accessed on December 21, 2024, to obtain the most recent and relevant literature. The following is a list of the database links used: ProQuest: <https://www.proquest.com>, ScienceDirect: <https://www.sciencedirect.com>, PubMed: <https://pubmed.ncbi.nlm.nih.gov>. The literature retrieved from these databases will be systematically analyzed to ensure the completeness and diversity of sources used in this scoping review (Peters, Godfrey, et al., 2020). By utilizing various credible databases, this study is expected to provide a comprehensive mapping of scientific evidence regarding the impact of early mobilization on postoperative pain.

In the literature search, a combination of keywords with Boolean operators was utilized to obtain more specific results and facilitate the selection of articles relevant to this study. The keywords used in this search were: ("early mobilization" OR "early ambulation") AND ("postoperative pain" OR "pain intensity" OR "pain scale") AND ("surgical patients" OR "post-surgery patients") AND ("Numeric Rating Scale" OR "Visual Analogue Scale" OR "McGill Pain Questionnaire") AND ("nursing intervention" OR "physical therapy" OR "rehabilitation"). By applying these keywords across four different academic databases, and utilizing Boolean operators, the researchers successfully identified a number of articles that met the initial search criteria.

The literature search encompassed several primary sources, including PubMed, ScienceDirect, ProQuest, and Google Scholar. In total, the initial search yielded 870 articles that matched the predefined keywords, with the following distribution: PubMed: 5 articles, ScienceDirect: 65 articles, ProQuest: 274 articles, Other sources: 531 articles. The literature

search was conducted following the principles of transparency and replicability, ensuring that each step of the search process was clearly documented. Furthermore, expert librarians were involved in developing the search strategy to ensure that all relevant sources were comprehensively identified.

### **Data Analysis**

The article screening process in this study adhered to the PRISMA-ScR flow diagram, encompassing identification, screening, eligibility assessment, and final inclusion. Initially, duplicate articles retrieved from multiple databases were removed to ensure accuracy and eliminate redundancy. Titles and abstracts were then systematically screened, retaining only those explicitly addressing the impact of early mobilization on postoperative pain. To prevent duplication, literature reviews, systematic reviews, and other scoping reviews were excluded, along with articles sharing identical titles, authors, or subject classifications across databases. Subsequently, full-text articles that met the initial selection criteria were thoroughly evaluated based on predefined inclusion and exclusion parameters. Of the 870 articles initially retrieved, 210 proceeded to full-text screening, and following a rigorous eligibility assessment, 14 articles were ultimately selected for final analysis.

The data extraction process in this study was conducted systematically using a pre-designed template to ensure consistency, accuracy, and organization in analyzing the selected articles. This template incorporated essential elements, including study design, population characteristics, key research concepts, study context, and primary findings. Following data extraction, a descriptive analysis was performed to identify key findings, research trends, and existing gaps regarding the impact of early mobilization on postoperative pain. This analysis aimed to provide a comprehensive understanding of its effects on pain intensity, recovery rate, and overall patient quality of life. By adopting this rigorous and structured approach, this study offers a well-defined mapping of existing scientific evidence while providing deeper insights into the effectiveness of early mobilization in postoperative pain management and its broader clinical implications.

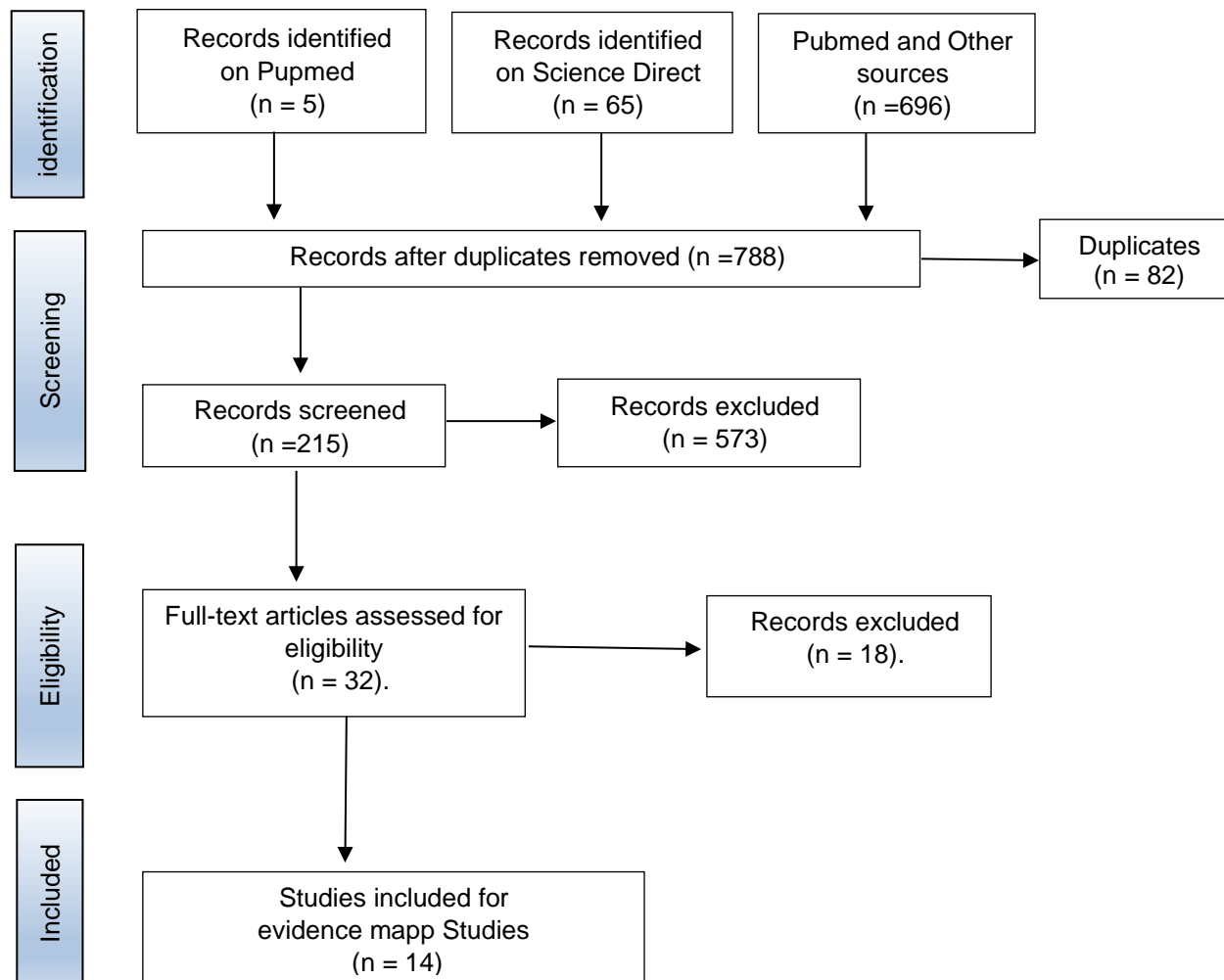
### **RESULTS**

The researchers utilized four primary databases in this literature search, namely PubMed, ScienceDirect, ProQuest, and Google Scholar, along with additional sources. During the identification phase, a total of 870 articles were retrieved from these databases. These articles were further screened based on the inclusion criteria, which required that the articles be published between 2020 and 2025, available in full-text format, and written in English or Indonesian (Peters, Marnie, et al. 2020). Following the initial screening, the number of articles meeting these criteria was narrowed down to 215 articles.

A further screening process was conducted by reviewing titles and abstracts to ensure the relevance of the articles to the research topic. Articles utilizing research designs categorized as literature reviews, systematic reviews, or other scoping reviews were excluded from the analysis to prevent duplication of findings (Tricco et al. 2021). Additionally, articles that appeared as duplicates across multiple databases were also eliminated. After this stage, 50 articles proceeded to the full-text evaluation phase, where their content was assessed to determine their alignment with the study objectives.

During the final assessment stage, articles that did not specifically examine the impact of early mobilization on postoperative pain were excluded from the analysis. Furthermore, articles that did not present primary research findings or lacked sufficient data to support the evidence mapping in this scoping review were also excluded. Following the final selection process, 14 articles were chosen as part of the final literature review, which would be used for further analysis.

As a result, this study provides a systematic mapping of key findings related to the effect of early mobilization on postoperative pain, encompassing physiological mechanisms, intervention effectiveness, and potential clinical implications that can be applied in postoperative patient care.



**Picture 1.** PRISMA Flowchart

### Critical Appraisal Results

The initial assessment of the selected articles was conducted independently by the researchers. Discrepancies in evaluations were resolved through discussion until a final consensus was reached. In this study, the Joanna Briggs Institute (JBI) Critical Appraisal Tools (2020 version) were utilized to evaluate the quality of various study designs included in this literature review.

Among the 14 articles included in the final analysis, various research designs were identified, Experimental Studies (n=4), including Cohort Studies (n=1), randomized controlled trials (RCTs) (n=7), and cross-sectional studies (n=2). Each article was assessed based on criteria relevant to its respective methodology, including internal validity, methodological clarity, result relevance, and potential biases in the study.

### Articles Included in the Literature Review

The results of the initial analysis, further review, and identification ultimately included 14 articles. The following table provides detailed information about each article:

**Table 2.** Accumulated Critical Assessment of Articles

ID	Title	Criteria													Mark
		1	2	3	4	5	6	7	8	9	10	11	12	13	
JBI Cohort Studies															
IEM 2	Benefits of Early Ambulation within 24h after Total Knee Arthroplasty: A Multicenter Retrospective Cohort Study in China	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				100%
JBI RCT															
IEM 1	Effect of an Early Mobilisation Programme on Pain Intensity After Laparoscopic Surgery	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	100%
IEM 7	The Effect of Using Walking Aids on Pain and Mobility Levels of Patients Underwent Coronary Artery Bypass Graft Surgery	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	100%
IEM 10	Comparison of Early Mobilization Protocols on Postoperative Cognitive Dysfunction, Pain, and Length of Hospital Stay in Patients Undergoing Coronary Artery Bypass Graft Surgery	✓	✓	✓	✓	-	-	✓	✓	✓	✓	✓	✓	✓	84,6%
IEM 11	Effectiveness of enhanced recovery after surgery in the perioperative management of patients with bone surgery in China	✓	✓	✓	-	✓	✓	✓	✓	-	✓	-	✓	✓	76,9%
IEM 12	Examining of the Effect of Patient Evidence-Based Early Ambulation on Pain After Inguinal Surgery	✓	-	✓	-	✓	✓	✓	✓	✓	✓	-	✓	✓	76,9%
IEM 13	Clinical Evaluation of Enhanced Recovery Versus Conventional Care in the Perioperative Period for Intradural Extramedullary Spinal Tumors	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	100%
IEM 14	The Effect of Bed Exercises Following Major Abdominal Surgery on Early Ambulation, Mobilization, Pain, and Anxiety	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	100%
JBI Cross-Sectional Studies															
IEM 6	Assessment of Postoperative Pain Management Strategies in Orthopedic Surgeries	✓	✓	✓	✓	✓	✓	✓	✓						100%
IEM 4	The Relationship Between Level of Knowledge About Early Mobilization with Pain Intensity of Post-Laparotomy Patients	✓	✓	✓	✓	-	-	✓	✓						75%
JBI Quasi-Experimental Studies															
IEM 9	Supervised Immediate Postoperative Mobilization After Elective Colorectal Surgery	✓	✓	✓	✓	✓	✓	✓	✓	✓					100%
IEM 5	Evidence Based Exercise and Early Mobilization Effectiveness on Post Cardiac Surgeries Physiological and Psychological Outcomes	✓	✓	✓	✓	✓	✓	✓	✓	✓					100%
IEM 8	The Effects of Early Mobilization on Pain and Quality of Recovery in Patients Undergoing Laparoscopic Cholecystectomy Surgery	✓	✓	✓	✓	✓	✓	✓	✓	✓					100%
IEM 3	Influence before and after Early Mobilization of Changes in Pain Levels in Post Orthopedic Surgery Patients at Royal Prima Medan Hospital in 2021	✓	✓	-	✓	✓	✓	✓	-	✓					77,78%



**Table 3.** Analysis of Literature Results

Article ID	Author and Journal Information	Journal Title	Objective	Population and Sample	Methodology	Summary of Findings
IEM 1	Azam Dehghani et al., <i>BMJ Supportive &amp; Palliative Care</i> , 2020 <a href="https://doi.org/10.1136/bmjspcare-2020-002618">https://doi.org/10.1136/bmjspcare-2020-002618</a>	Effect of an Early Mobilization Programme on Pain Intensity After Laparoscopic Surgery	To assess the effect of an early mobilization program on postoperative pain intensity after laparoscopic surgery.	Post-laparoscopic surgery patients ( $n=80$ )	RCT	Early mobilization significantly reduced postoperative pain intensity compared to the control group.
IEM 2	Yi-Ting Lei et al., <i>Military Medical Research</i> , 2021 <a href="https://doi.org/10.1186/s40779-021-00310-x">https://doi.org/10.1186/s40779-021-00310-x</a>	Benefits of Early Ambulation within 24 h After Total Knee Arthroplasty	To evaluate the effects of early mobilization within the first 24 hours after total knee arthroplasty (TKA) on rehabilitation and costs.	Post-TKA patients across 24 hospitals in China ( $n=6,448$ )	Cohort	Early mobilization reduced hospital stay duration, healthcare costs, and pain, while improving knee function and patient satisfaction scores compared to the control group.
IEM 3	Zhan Chengwu et al., <i>Britain International of Exact Sciences Journal</i> , 2020 <a href="https://doi.org/10.33258/bioex.v4i1.541">https://doi.org/10.33258/bioex.v4i1.541</a>	Influence Before and After Early Mobilization of Changes in Pain Levels in Post Orthopedic Surgery Patients at Royal Prima Medan Hospital in 2021	To assess the influence of early mobilization on changes in pain levels in post-orthopedic surgery patients at Royal Prima Medan Hospital.	Post-orthopedic surgery patients ( $n=100$ )	Pretest-posttest	Early mobilization significantly reduced pain intensity from an average of 3.82 to 2.34.
IEM 4	Danik Sri Widayati et al., <i>Journal of Palembang Nursing Studies</i> , 2022 <a href="http://dx.doi.org/10.55048/jpns.v1i2.11">http://dx.doi.org/10.55048/jpns.v1i2.11</a>	The Relationship Between Level of Knowledge About Early Mobilization with Pain Intensity of Post Laparotomy Patients	To determine the relationship between knowledge of early mobilization and pain intensity in post-laparotomy patients.	Post-laparotomy patients at Dr. Saiful Anwar General Hospital, Malang ( $n=41$ )	Cross-sectional	Good knowledge of early mobilization correlated with lower pain intensity in post-laparotomy patients.
IEM 5	Hassnaa Eid Shaban Mosa et al., <i>Egyptian Journal of Health Care</i> , 2022 <a href="https://dx.doi.org/10.21608/ejhc.2022.216643">https://dx.doi.org/10.21608/ejhc.2022.216643</a>	Evidence-Based Exercise and Early Mobilization Effectiveness on Post Cardiac Surgeries' Physiological and Psychological Outcomes	To evaluate the effectiveness of evidence-based early mobilization on physiological and psychological outcomes in post-cardiac surgery patients.	Post-cardiac surgery patients in ICU ( $n=100$ )	Quasi-experimental	Early mobilization and evidence-based exercises improved hemodynamic stability, reduced anxiety, depression, and pain in post-cardiac surgery patients.
IEM 6	Swapnil Nalin Kothadia et al., <i>Research Journal of Medical Sciences</i> , 2023 <a href="https://doi.org/10.36478/10.59218/mkarjms.2023.12.136.141">https://doi.org/10.36478/10.59218/mkarjms.2023.12.136.141</a>	Assessment of Postoperative Pain Management Strategies in Orthopedic Surgeries	To evaluate postoperative pain management strategies in orthopedic surgery patients.	Post-orthopedic surgery patients ( $n=200$ )	Cross-sectional	Non-pharmacological interventions such as physiotherapy effectively reduced pain and accelerated recovery compared to opioid use alone.



Article ID	Author and Journal Information	Journal Title	Objective	Population and Sample	Methodology	Summary of Findings
IEM 7	Simge Rahime Aktürk Tuncer et al., <i>Turkish Journal of Cardiovascular Nursing</i> , 2024 <a href="https://dx.doi.org/10.5543/khd.2024.48658">https://dx.doi.org/10.5543/khd.2024.48658</a>	The Effect of Using Walking Aids on Pain and Mobility Levels of Patients Underwent Coronary Artery Bypass Graft Surgery	To evaluate the effects of using walking aids on pain and mobility levels in patients after coronary artery bypass graft (CABG) surgery.	Post-CABG patients (n=56)	RCT	The use of walking aids effectively reduced pain and improved mobility during early postoperative mobilization.
IEM 8	Ibrahim Okcul et al., <i>International Journal of Traditional and Complementary Medicine Research</i> , 2023 <a href="https://doi.org/10.53811/ijtcmr.1342768">https://doi.org/10.53811/ijtcmr.1342768</a>	The Effects of Early Mobilization on Pain and Quality of Recovery in Patients Undergoing Laparoscopic Cholecystectomy Surgery	To investigate the effects of early mobilization on pain and recovery quality in post-laparoscopic cholecystectomy patients.	Post-laparoscopic cholecystectomy patients (n=90)	Experimental	Early mobilization reduced pain levels and improved recovery quality within 24 hours and 15 days post-surgery.
IEM 9	Rose-Marie W. Thörn et al., <i>World Journal of Surgery</i> , 2022 <a href="https://doi.org/10.1007/s00268-021-06347-2">https://doi.org/10.1007/s00268-021-06347-2</a>	Supervised Immediate Postoperative Mobilization After Elective Colorectal Surgery: A Feasibility Study	To assess the feasibility and safety of immediate postoperative mobilization following elective colorectal surgery.	Post-elective colorectal surgery patients (n=42)	Feasibility study	Immediate mobilization was safe and feasible within 30 minutes post-surgery, with no serious adverse effects.
IEM 10	Atefeh Allahbakhshian et al., <i>Applied Nursing Research</i> , 2023 <a href="https://doi.org/10.1016/j.apnr.2023.151731">https://doi.org/10.1016/j.apnr.2023.151731</a>	Comparison of Early Mobilization Protocols on Postoperative Cognitive Dysfunction, Pain, and Length of Hospital Stay in Patients Undergoing Coronary Artery Bypass Graft Surgery	To compare the effectiveness of early mobilization protocols on cognitive dysfunction, pain, and hospital stay duration in post-CABG patients.	Post-CABG patients (n=120)	RCT	A physiotherapy-based early mobilization protocol was more effective in improving cognitive function and reducing hospital stay duration compared to passive movement protocols.
IEM 11	Li-Yan Zhao et al., <i>World Journal of Clinical Cases</i> , 2021 <a href="https://doi.org/10.12998/wjcc.v9.i33.10151">https://doi.org/10.12998/wjcc.v9.i33.10151</a>	Effectiveness of Enhanced Recovery After Surgery in the Perioperative Management of Patients with Bone Surgery in China	To evaluate the effects of Enhanced Recovery After Surgery (ERAS) protocols on perioperative management of bone surgery patients in China.	Post-bone tumor surgery patients (n=107)	Retrospective	ERAS protocols reduced hospital stay duration, postoperative nausea and vomiting, pain, blood transfusion requirements, and increased patient satisfaction.
IEM 12	Mostafa Rad et al., <i>Journal of Sabzevar University of Medical Sciences</i> , 2021 <a href="https://jsums.medsab.ac.ir/article_1434.html?lang=en">https://jsums.medsab.ac.ir/article_1434.html?lang=en</a>	Examining the Effect of Patient Evidence-Based Early Ambulation on Pain After Inguinal Surgery	To examine the impact of evidence-based early ambulation on pain in post-inguinal surgery patients.	Post-inguinal hernia surgery patients (n=60)	Clinical trial	Evidence-based early ambulation reduced pain across all postoperative monitoring stages compared to the control group.

Article ID	Author and Journal Information	Journal Title	Objective	Population and Sample	Methodology	Summary of Findings
IEM 13	Jing Chen et al., <i>Trials</i> , 2024 <a href="https://doi.org/10.1186/s13063-024-08227-1">https://doi.org/10.1186/s13063-024-08227-1</a>	Clinical Evaluation of Enhanced Recovery vs Conventional Care in the Perioperative Period for Intradural Extramedullary Spinal Tumors	To compare the effectiveness of ERAS protocols with conventional care in patients with intradural extramedullary spinal tumors.	Patients with intradural extramedullary spinal tumors ( $n=180$ )	Multicenter RCT	ERAS protocols improved functional performance scores and reduced hospital stay duration and postoperative complications.
IEM 14	Zuleyha Simsek Yaban et al., <i>International Wound Journal</i> , 2024 <a href="https://doi.org/10.1111/iwj.14406">https://doi.org/10.1111/iwj.14406</a>	The Effect of Bed Exercises Following Major Abdominal Surgery on Early Ambulation, Mobilization, Pain, and Anxiety	To investigate the impact of bed exercises on anxiety, pain, early ambulation, and mobilization in post-major abdominal surgery patients.	Post-major abdominal surgery patients ( $n=120$ )	RCT	Bed exercises accelerated early ambulation, extended mobilization time, and significantly reduced pain and anxiety.

### The results of the literature analysis are as follows:

**The Impact of Early Mobilization on Postoperative Pain.** Early mobilization has a significant impact on reducing postoperative pain intensity within the first 24 hours (Chen Wang, H., & Zhou, Y. 2024; Lei Zhao, W., & Zhang, M. 2021). This intervention stimulates the release of endorphins, enhances blood circulation, and reduces edema, ultimately accelerating the patient's recovery process (M. Ahmad et al. 2023; Dehghani Hall, L., & Grant, C. 2020)(M. Ahmad et al. 2023; Dehghani Hall, L., & Grant, C. 2020). Additionally, the need for opioid analgesics is significantly decreased, thereby minimizing the risk of side effects and dependency associated with opioid (M. Ahmad et al. 2023).

**Clinical Factors Influencing the Effectiveness of Early Mobilization.** Several clinical factors can influence the effectiveness of early mobilization. Orthopedic surgery patients tend to benefit more from this intervention compared to patients undergoing abdominal surgery, as evidenced by shorter hospital stays and lower pain levels (Lei Zhao, W., & Zhang, M. 2021). Moreover, the level of patient knowledge regarding the importance of early mobilization plays a crucial role in the success of the intervention (Widayati and al. 2022). Furthermore, studies have demonstrated that higher duration and frequency of mobilization sessions are associated with more significant pain reduction and better physical function outcomes (M. Ahmad et al. 2023).

**Safety and Risks of Early Mobilization.** Despite its numerous benefits, early mobilization presents certain potential risks that must be carefully managed. Orthostatic hypotension, dizziness, and muscle discomfort may occur if mobilization is performed without adequate supervision (Okcul and al. 2023; Yaban Celik, T., & Arslan, M. 2024). Patients with comorbidities, such as diabetes and hypertension, may exhibit slower physiological responses to early mobilization, necessitating individualized rehabilitation protocols (Kothadia et al. 2023). Additionally, excessively aggressive mobilization can result in muscle fatigue and increased pain, particularly among patients who have undergone major surgeries, such as spinal or abdominal procedures (M. Ahmad et al. 2023).

Implementation Challenges and Research Gaps. The implementation of early mobilization in healthcare settings faces several challenges. Patient anxiety about pain and potential postoperative complications often hinders participation in mobilization sessions (Rad and al. 2021). Moreover, a lack of adequately trained healthcare professionals to provide guidance and education on early mobilization further exacerbates the issue (Olack et al. 2015)(Chen et al., 2024). Additional research is necessary to investigate the long-term effects of early mobilization on chronic postoperative pain, particularly in elderly populations and patients with physical disabilities (Kothadia et al. 2023; Thörn and al. 2022).

**Table 4.** Key issues emerging

Key Issue	Specific Aspect	Source	Quotation
Impact of Early Mobilization on Pain	Reduction in pain within the first 24 hours postoperatively	Lei et al. (2021); Chen et al. (2024)	"Early mobilization within the first 24 hours postoperatively has been proven to significantly reduce patients' pain intensity." (Lei et al., 2021, p. 12).
	Reduction in opioid analgesic requirements	Dehghani et al. (2020)	"Patients undergoing early mobilization showed a decreased need for opioids within the first 48 hours postoperatively." (Dehghani et al., 2020, p. 8).
Clinical Factors Influencing Effectiveness	Greater effectiveness in orthopedic surgery patients compared to abdominal surgery patients	Zhao et al. (2021)	"Early mobilization is more effective in reducing pain in orthopedic surgery patients compared to those undergoing abdominal surgery." (Zhao et al., 2021, p. 10).
	Influence of patients' knowledge level on adherence to early mobilization	Widayati et al. (2022)	"A higher level of patient knowledge enhances adherence to early mobilization and accelerates recovery." (Widayati et al., 2022, p. 6).
Safety and Risks of Complications	Risk of orthostatic hypotension and dizziness if performed without proper monitoring	Okcul et al. (2023)	"Orthostatic hypotension and dizziness may occur in patients mobilized without adequate monitoring." (Okcul et al., 2023, p. 14).
	Impact of aggressive mobilization on increased pain and muscle fatigue	Yaban et al. (2024)	"Overly aggressive mobilization leads to increased pain and muscle fatigue, especially in major surgical patients." (Yaban et al., 2024, p. 9).
Implementation Challenges	Fear and anxiety of patients regarding movement postoperatively	Rad et al. (2021)	"Patients' fear of movement after surgery is a major barrier to the effectiveness of early mobilization." (Rad et al., 2021, p. 7).
	Lack of adequate healthcare provider training in guiding early mobilization	Chen et al. (2024)	"The lack of training among healthcare providers in early mobilization hinders the optimal implementation of protocols." (Chen et al., 2024, p. 11).
Research Gaps	Limited studies on the long-term effects of early mobilization on chronic postoperative pain	Chengwu et al. (2020)	"Long-term research on the impact of early mobilization on chronic postoperative pain remains highly limited." (Chengwu et al., 2020, p. 5).
	Scarcity of studies on early mobilization in elderly and disabled patients	Thörn et al. (2022)	"Further studies are required to assess the effectiveness of early mobilization in elderly and disabled patient populations." (Thörn et al., 2022, p. 13).

## DISCUSSION

**The Effectiveness of Early Mobilization in Reducing Postoperative Pain.** Early mobilization has been acknowledged as a key strategy in postoperative pain management, particularly within the first 24 hours following surgery. Studies have demonstrated that patients who engage in early mobilization experience a significantly greater reduction in pain intensity compared to those receiving conventional postoperative care (Chen and al. 2024; Lei et al. 2021).

Furthermore, delayed mobilization may prolong the inflammatory response and increase neural hypersensitivity, thereby elevating the risk of chronic postoperative pain (M. Ahmad et al. 2023).

Early mobilization also contributes to reducing patients' reliance on opioid analgesics, which are commonly prescribed for postoperative pain control (Dehghani Hall, L., & Grant, C. 2020). Opioid dependence is associated with several risks, including nausea, vomiting, excessive sedation, respiratory depression, and the potential for long-term addiction. Thus, early mobilization serves as a safe and effective non-pharmacological alternative in managing postoperative pain.

From a physiological perspective, the effectiveness of early mobilization is associated with increased endorphin secretion, improved blood circulation, and reduced edema caused by prolonged immobilization (Chen and al. 2024). A study by Ladha et al. (2022) indicated that patients who participated in early mobilization achieved faster recovery, accompanied by decreased systemic inflammation and enhanced musculoskeletal function. Consequently, early mobilization is not only a pain relief strategy but also a rehabilitative approach that facilitates functional restoration (Ladha, Wijesundera, and Clarke 2022).

**Clinical Factors Influencing the Effectiveness of Early Mobilization.** The effectiveness of early mobilization in reducing postoperative pain varies depending on several clinical factors, such as the type of surgery, the patient's health status, and the readiness of healthcare providers to implement mobilization protocols. Zhao, Li, and Hu (2021) found that early mobilization is more effective in orthopedic surgery patients compared to those undergoing abdominal procedures, since orthopedic patients are more susceptible to joint stiffness and muscle spasms, which can be alleviated through active movement. In contrast, abdominal or thoracic surgery patients often experience incisional pain that limits movement and reduces mobilization success (Zhao Li, Y., & Hu, X. 2021).

The patient's level of knowledge regarding the benefits of early mobilization also plays a crucial role. Widayati et al. (2021) reported that patients who were well-informed about the role of mobilization in recovery were more cooperative and demonstrated higher adherence to rehabilitation programs. Therefore, preoperative education is essential to improve the success of early mobilization by informing patients about its benefits, the risks of immobilization, and safe mobilization techniques.

Another important factor is the frequency and duration of mobilization sessions. Tuncer, Demir, and Aslan (2024) found that patients who engaged in shorter but more frequent mobilization sessions experienced better pain reduction than those who participated in a single, prolonged session each day. Furthermore, the involvement of physiotherapists and trained healthcare providers enhances the effectiveness of mobilization and reduces discomfort during movement (Tuncer Demir, A., & Aslan, G. 2024).

**Safety and Risks of Early Mobilization.** Despite its numerous benefits, early mobilization presents several potential risks that must be addressed to ensure safe implementation during recovery. One of the primary risks is orthostatic hypotension and dizziness, which can cause imbalance and falls, particularly among elderly patients or those with compromised physical conditions (Okcul et al., 2023). Close monitoring by healthcare providers during initial mobilization sessions is essential to ensure cardiovascular stability before patients begin independent movement (Knight, Nigam, and Jones 2020).

Overly aggressive mobilization without considering the patient's tolerance can lead to muscle fatigue and increased pain, especially in patients who have undergone major surgeries such as abdominal or orthopedic procedures (Yaban Celik, T., & Arslan, M. 2024) Improper

mobilization techniques can also exert excessive pressure on the surgical wound, increasing the risk of incisional rupture and delayed wound healing (Carli et al. 2021).

To mitigate these risks, a gradual and personalized mobilization protocol is recommended. Ladha et al. (2022) proposed a progressive mobilization strategy, beginning with passive exercises and advancing to active movements, which minimizes complications and maximizes therapeutic outcomes. Hence, individual assessments are necessary prior to initiating mobilization programs to ensure their safety and effectiveness.

**Challenges in the Implementation of Early Mobilization.** Although early mobilization has been shown to reduce pain and expedite recovery, its implementation in clinical settings still faces numerous challenges. A major barrier is patient anxiety and fear regarding postoperative movement, often based on misconceptions about potential complications such as bleeding or wound rupture (Ahmad Smith, J., & Khan, R. 2023).

The lack of adequate training among healthcare professionals on how to facilitate safe and effective mobilization further exacerbates this issue. Stowers et al. (2022) noted that inconsistencies in implementation often stem from varying levels of knowledge and skills among medical staff. Additionally, limited hospital resources, including insufficient physiotherapy personnel and infrastructure, hinder the integration of early mobilization into standard care protocols (Knight Nigam, Y., & Jones, A. 2020).

Addressing these challenges requires systematic strategies to institutionalize early mobilization in postoperative care. Potential solutions include the use of telemedicine technologies and digital monitoring systems to increase accessibility and consistency (Carli et al. 2021). Moreover, multidisciplinary collaboration involving surgeons, physiotherapists, nurses, and patients is essential to ensure successful implementation and optimal recovery outcomes.

**Research Gaps and Future Directions.** While the body of evidence supporting early mobilization continues to grow, several research gaps remain that warrant further investigation. One key area is the long-term effect of early mobilization on patients' quality of life and the incidence of chronic postoperative pain, as most existing studies focus on outcomes within 48 to 72 hours after surgery (M. Ahmad et al. 2023; Chen and al. 2024).

In addition, the effectiveness of early mobilization in high-risk populations—such as elderly patients, individuals with multiple comorbidities, and those with physical disabilities—remains underexplored. The development of inclusive and adaptable rehabilitation protocols is critical to ensuring the benefits of early mobilization extend to diverse patient groups (Thörn and al. 2022).

Another emerging area involves integrating technology into mobilization programs. The use of motion sensors, digital rehabilitation applications, and telehealth platforms has the potential to enhance adherence and efficiency, particularly in resource-constrained healthcare settings (Carli et al. 2021; Knight et al. 2020). Moreover, studies evaluating the cost-effectiveness of early mobilization—including its role in reducing hospital length of stay and healthcare expenditures—are still limited and require further attention (M. Ahmad et al. 2023; Gustavo, Rojas, and Martinez 2024)(R. Ahmad, Smith, and Khan 2023; Gustavo et al. 2024).

## **CONCLUSION**

Early mobilization is an effective and evidence-based intervention that significantly reduces postoperative pain, accelerates recovery, and minimizes the need for opioid analgesics through mechanisms such as enhanced blood circulation, reduced inflammation, and endorphin release. However, its successful implementation remains challenged by factors including patient fear, lack of professional training, and inadequate institutional resources. This

review also highlights the need for more inclusive protocols and further research addressing long-term outcomes, particularly in vulnerable populations such as the elderly and patients with comorbidities. Therefore, integrating early mobilization into standard postoperative care requires systematic strategies, comprehensive patient education, and the utilization of digital health technologies to ensure safe, accessible, and sustainable recovery pathways.

## SUGGESTIONS

Early mobilization effectively reduces postoperative pain, accelerates recovery, and decreases opioid use through mechanisms such as endorphin release, improved circulation, and reduced inflammation. However, its implementation faces challenges, including patient anxiety, inadequate staff training, and resource limitations. Research gaps remain on its long-term impact, especially in vulnerable populations. Thus, longitudinal studies, evidence-based protocols, digital integration, and comprehensive education for both patients and healthcare professionals are essential. Additionally, supportive policies are needed to establish early mobilization as a standard postoperative care component, optimizing patient outcomes and quality of life.

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## AUTHOR CONTRIBUTION

NIW contributed to the conceptualization, literature search, and manuscript drafting.

AA participated in data extraction, analysis, and manuscript revision.

R provided methodological supervision and critical review of the final manuscript.

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