

Implementation of ROM to Improve Early Mobilization in Post-Operative Patients with General Anesthesia

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ABSTRACT

Background & Objectives : Prolonged immobilization following laparotomy under general anesthesia poses serious risks including muscle weakness, deep vein thrombosis, atelectasis, and extended hospital stays. To describe the implementation of ROM exercise to improve early mobilization in post-laparotomy patients under general anesthesia. **Methods:** A descriptive qualitative case study involving two post-laparotomy patients under general anesthesia at the surgical ward of RSUD Daerah Kota Magelang (October-November 2025). ROM exercise was implemented for two consecutive days, initiated within 24 hours postoperatively. Mobility level was assessed using the Johns Hopkins Highest Level of Mobility (JH-HLM) scale (0-8), twice daily. **Results:** The first patient (post exploratory laparotomy due to appendix perforation with peritonitis) showed a JH-HLM improvement from score 1 to score 5 (walking in room) within two days. The second patient (post laparotomy due to ovarian cyst with torsion) improved from score 1 to score 6 (walking in hallway) despite initial barriers of postoperative nausea and vomiting (PONV) and anxiety. Both patients demonstrated reduced pain NRS scores, and no complications were observed during implementation. **Conclusions:** ROM exercise initiated within the first 24 hours after laparotomy under general anesthesia is proven effective and safe in promoting early mobilization. An integrated approach encompassing pain management, PONV treatment, and psychological support is essential to optimize implementation outcomes.

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Introduction

Surgery is one of the most widely performed medical interventions globally to address various health problems. Data (World Health Organization 2023) indicates that each year there are more than 234 million major surgical procedures performed worldwide, with this number continuing to increase as the burden of disease increases and surgical technology develops, . In Indonesia, Riskesdas 2023 data reports that abdominal surgery cases including laparotomy are one of the most frequent surgical procedures in government hospitals, with the prevalence of major surgeries reaching 6.4% of all surgical hospitalizations (Ministry of Health 2023). Most major surgical procedures, especially laparotomy, are performed using general anesthesia as they provide optimal loss of consciousness, analgesia, and muscle relaxation during the procedure (Butterworth, Mackey, and Wasnick 2025).

The residual effects of general anesthesia can lead to a variety of complex postoperative complications, such as Post Operative Nausea and Vomiting (PONV), hypothermia, impaired cognitive function, as well as significant muscle weakness (Avidan, Whitlock, and Mashour 2023). Research (Anwar, Ahmed, and Ara 2024) showed that common postoperative complications included pain (68%), nausea and vomiting (42%), and muscle weakness (55%). In addition, (Shaikh et al. 2023) mentioned that PONV occurs in 20-30% of general postoperative patients and is one of the main factors that inhibit early recovery, including early mobilization. These conditions often cause patients to experience delayed recovery and limited physical activity after surgery, which ultimately negatively impacts the overall healing process.

Prolonged immobilization in postoperative patients is a serious problem that can lead to various complications. Complications that can occur include decreased muscle strength and mass, joint stiffness, contractures, blood circulation disorders, increased risk of deep vein thrombosis (DVT), impaired lung function such as atelectasis and pneumonia, and increased risk of pressure wounds (decubitus) (Wang et al. n.d.). Research (Baxter et al. 2024) It shows that delayed mobilization is associated with an increase in the length of hospitalization of up to 2-3 days, an increase in the cost of care, and a decrease in the quality of life of patients. Study (Zhang et al. 2024) It was also found that prolonged immobilization in postoperative geriatric patients increased the risk of complications by up to 45% and slowed down the functional recovery process. Furthermore, (Singam 2024) in its systematic review it reported that patients who were immobilized more than 48 hours postoperatively had a 3.2 times higher risk of DVT than patients who received early mobilization.

Early mobilization is one of the key interventions to prevent postoperative complications and accelerate patient recovery. Early mobilization is defined as movement activities that are carried out as early as possible according to the patient's condition, starting from a change in position in bed, extremity movement exercises, sitting, standing, to walking gradually (Sommers et al. 2023). (Santos and Silva 2025) It shows that early mobilization that begins in the first 24 hours postoperatively can significantly increase the patient's mobility level from dependent mobility to moderately dependent to independent mobility. In addition, early mobilization is one

of the main components in the Enhanced Recovery After Surgery (ERAS) program which has proven effective in accelerating recovery and shortening the length of hospitalization by 30-50% (Jain, Lamture, and Krishna 2023). Research (Jasmin and Zuraida 2023) in 320 post-laparotomy patients also proved that the implementation of ERAS including early mobilization significantly reduced postoperative complications by 38% compared to conventional treatment.

One of the nursing interventions that can support the success of early mobilization is the Range of Motion (ROM) exercise. ROM is an active, passive, or active-assisted joint movement exercise to maintain joint flexibility, increase muscle strength and tone, and improve blood circulation (Peden et al. 2023). Study (Xavier, Vaithilingan, and Latha 2025) found that the implementation of early mobilization that began with ROM in the first 24 hours postoperatively was proven to increase patient mobility levels with an average increase in mobility score of 2.8 points on the Johns Hopkins Highest Level of Mobility (JH-HLM) scale. Research (Rhamelani et al. 2025) showed that ROM exercises combined with Progressive Muscle Relaxation (PMR) could significantly accelerate range recovery time compared to the control group. Other research has also shown that ROM exercises can reduce pain levels, increase muscle strength, and improve daily activity ability (ADL) in postoperative patients (Yaz 2025). Further, (Baxter et al. 2024) reported that ROM exercises carried out in a structured manner by trained nurses can improve the efficiency of post-operative abdominal recovery with a patient satisfaction rate of 87%.

Although the benefits of early mobilization and ROM training have been extensively researched, there are important research gaps to fill. Most studies still focus on specific populations such as orthopedic surgery patients, sectio caesarea sections, or patients under regional anesthesia (Bellás-Cotín et al. 2023). Research that specifically examines the implementation of ROM exercises to improve early mobilization in postoperative laparotomy patients with general anesthesia is still very limited. Study (Murphy et al. 2025) emphasizes the need to develop specific mobilization protocols for laparotomy patients due to the characteristics of surgical wounds, risk of evisceration, and the effects of general anesthesia that differ from other types of surgery. Based on this description, this study aims to provide scientific evidence on the effectiveness of ROM exercises in improving the mobilization ability of postoperative laparotomy patients with general anesthesia, as well as provide an overview of the structured and safe implementation of ROM in this population.

Objective

To determine the effect of implementing range of motion (ROM) exercises to improve early mobility in post-laparotomy patients with general anesthesia at Magelang Regional Hospital in 2025.

Method

This study is a descriptive *case study* using an observation technique that aims to explore the increase in early mobilization in post-laparotomy patients using the implementation of ROM which was carried out from October 20 to November 1, 2025 in the surgical treatment room of the Magelang City Regional Hospital. The subjects

in this study were two postoperative laparotomy patients who met the inclusion and exclusion criteria. Inclusion criteria included patients over 17 years of age with composing consciousness, stable hemodynamics with TD: 90-160/60-100 mmHg, Pulse: 60-100 x/min, moderate-scale pain (NRS less than 7), tightly closed surgical wounds without active bleeding, having doctor's permission for mobilization, and willing to sign an informed consent. Exclusion criteria include patients with severe delirium or dementia, uncontrolled hypertension, severe hypotension, severe arrhythmias, severe pain (NRS greater than 7), active bleeding, total bed rest order, or refusal to participate.

The instrument used is the Johns Hopkins Highest Level of Mobility (JH-HLM) which consists of 9 levels (score 0-8), ranging from lying in bed to walking in a corridor without assistance. This instrument has been tested for validity and reliability with an ICC of 0.98 (95% CI: 0.96-0.99) and a perfect agreement of 95% (Hiser et al. 2023). Measurements were made through direct observation 2 times a day by documenting the highest level of mobility in 24 hours. The ROM measurement procedure is performed by evaluating active, passive, and active-assistive ROMs in the upper extremities (shoulders, elbows, wrists) and lower extremities (pelvis, knees, ankles). Each measurement result was recorded for its ROM degree, compared to normal values, and documented to assess the patient's functional mobilization ability. The data were analyzed descriptively by comparing mobility levels before and after the implementation of the ROM exercise.

Results

TABLE 1. Characteristics of Research Respondents (n=2)

Features	Responden 1 (Tn. A)	Respondent 2 (Mrs. B)
Age	42 years old	38 years old
Gender	Male	Women
Medical Diagnosis	Perforation of the appendix with peritonitis	Ovarian cysts with torsion
Types of Operations	Exploratory laparotomy + appendectomy	Laparotomi eksplorasi + kistektomi bilateral
Jenis Anesthesia	General anesthesia	General anesthesia
Length of Operation	2 hours 15 minutes	1 hour 45 minutes

This study involved two postoperative laparotomy patients with general anesthesia who were treated in the operating room of the Magelang City Regional Hospital. The ROM exercise was implemented for 2 consecutive days and the results

were evaluated on increasing early mobilization. The characteristics of the respondents are presented in Table 1.

TABLE 2. Pre-ROM Exercise Conditions (Day 0 / POD-0)

Parameter	Responden 1 (Tn. A)	Respondent 2 (Mrs. B)
JH-HLM Score	1	1
Mobilization Level	Sitting in bed	Sitting in bed
TD Systolic (mmHg)	125	118
TD Systolic (mmHg)	125	118
Pulse (x/minute)	88	82
Pain Scale (NRS)	7/10	6/10

ROM exercise was implemented in both respondents for 2 consecutive days (POD-1 and POD-2). Every day 2 ROM exercise sessions are carried out (morning and afternoon) with a duration of 20-25 minutes per session. ROM exercises include deep breathing exercises, upper extremity ROM (shoulders, elbows, wrists), lower extremity ROM with modifications for post-laparotomy patients (ankle pump, ankle circle, limited knee flexion, limited hip abduction-adduction), and gradual mobilization. Prior to the implementation of the ROM exercise, baseline measurements of early mobilization and clinical parameters were carried out in both respondents. The results of the pre-ROM exercise measurements are presented in Table 2.

TABLE 3. Post-ROM Exercise and Improvement Conditions (Day 2 / POD-2)

Parameter	Responden 1 (Tn. A)	Respondent 2 (Mrs. B)
JH-HLM Score	5	6
Mobilization Level	Walking in room	Walking in hallway
TD Systolic (mmHg)	118	114
Pulse (x/minute)	80	76
Pain Scale (NRS)	3/10	4/10
Result Status	OPTIMAL	OPTIMAL

The results of the pre-ROM exercise measurement showed that both respondents had the same JH-HLM score, namely 1 (sitting in bed) with stable hemodynamic parameters and controlled pain. This condition shows that both respondents have a suitable baseline to start the ROM exercise program. After the

implementation of the ROM exercise for 2 days (4 sessions), remeasurements were carried out to evaluate the increase in early mobilization and clinical parameters. The results of the post-ROM exercise measurement and its improvement are presented in Table 3.

Discussion

The results of the post-ROM exercise evaluation showed a very optimal improvement in both respondents. The score of JH-HLM Mr. A increased by 4 points (from a score of 1 to a score of 5), with the level of mobilization increasing from sitting in bed to walking in room. Mrs. B showed an even higher increase, namely by 5 points (from score 1 to score 6), with the level of mobilization reaching walking in the hallway. Both respondents also showed improvements in clinical parameters in the form of a decrease in systolic blood pressure (4-7 mmHg), a decrease in pulse frequency (6-8 times/minute), and a decrease in the NRS pain scale (3-4 points). No complications were found during the implementation period in both respondents, so all parameters describe the effectiveness and safety of ROM exercise in improving early mobilization of patients postoperatively laparotomy with general anesthesia. These findings are in line with the results (Yona and Maria 2023) which suggests that early mobilization after abdominal surgery significantly lowers the incidence of pulmonary complications and accelerates the patient's functional recovery.

Physiologically, the mechanism of increasing mobility through ROM exercise in both respondents can be explained through several pathways. First, ROM exercises stimulate muscle contractions that improve venous backflow and oxygen distribution to peripheral tissues, thereby speeding up metabolism and the elimination of residual anesthetic agents from the neuromuscular system. This process directly contributes to the recovery of muscle strength and tone necessary for gradual mobilization, as described by (Svensson-raskh et al. 2021) in the study of clinical sports physiology. Second, repetitive joint movements maintain the elasticity of the joint capsule and ligaments, preventing stiffness that can hinder further movement. Third, proprioceptor stimulation through ROM exercises helps restore neuromuscular coordination that is impaired due to the depressive effects of the central nervous system from general anesthesia (Yaz 2025). This mechanism explains why even passive ROMs already provide significant benefits on the first day of implementation. Research (Issue 2023) reinforcing these findings by proving that joint mechanoreceptor stimulation through passive ROM activates spinal reflex pathways that accelerate postoperative postoperative muscle tone recovery.

A considerable increase in JH-HLM scores in both respondents is in line with the findings (Hiser et al. 2023) who reported an average increase in mobility score of 2.8 points through the ROM-based early mobilization protocol. A greater increase in this case study is likely influenced by the relatively young initial condition of the respondents (38-42 years), stable hemodynamics from the beginning, and high adherence to the exercise program. In a systematic review by (Jönsson et al. 2023) Compared to 18 RCT studies, it was identified that young age, low ASA status, and patient motivation were the strongest predictors of achieving the target of early

mobilization after abdominal surgery. The alignment of these findings corroborates the external validity of the use of structured ROM protocols in the post-laparotomy patient population with general anesthesia. In addition, the JH-HLM instrument has been shown to be sensitive and reliable in detecting gradual changes in mobility levels, confirming its clinical value as reported (Hiser et al. 2023) with an ICC of 0.98. (McLaughlin et al. 2022) also recommended the use of JH-HLM as a standard for measuring mobility in surgical care units because it is easy to be applied by nurses without special physiotherapy training.

The obstacles found in this implementation are consistent with the report (Stuart et al. 2024) and (Zhang et al. 2024), namely postoperative pain, PONV, and patient anxiety are the main inhibiting factors of early mobilization. In Mrs. B, adequate management of PONV with combination antiemetic therapy of ondansetron and dexamethasone according to the latest PONV management guidelines (Hu et al. 2025) and psychological assistance in the form of education and motivation has proven to be successful in overcoming these obstacles. The success of overcoming this obstacle actually led Mrs. B to achieve a higher level of mobility than Mr. A at the end of the observation period. This underscores the importance of a holistic approach in perioperative nursing care. Research (Bellascotín et al. 2023) In 212 post-laparotomy patients, it was proven that a multimodal intervention integrating pain management, antiemetic therapy, and psychosocial support could increase the success of early mobilization by 62% compared to a single intervention.

In terms of pain management, a significant decrease in NRS scores in both respondents (Mr. A: NRS 7 to 3; Mrs. B: NRS 6 to 4) indicates that ROM exercise also has an analgesic effect through gate control theory mechanisms and increased secretion of endogenous endorphins (Rakel & Herr, 2022). These findings are consistent with research (Aprisunadi et al. 2023) Yang reported that early mobilization after laparotomy significantly lowered postoperative pain intensity through distraction mechanisms and increased lymphatic flow around the wound area. From a wound care perspective, the absence of complications such as wound dehydration or bleeding in both respondents during the implementation of the ROM confirmed the safety of this intervention, in line with the protocol standards established in the ERAS Society guidelines (Lee et al. 2025) for colorectal and abdominal surgery. This protocol explicitly states that ROM exercise with a gradual approach can be started within 6-24 hours postoperative of abdominal surgery as long as there are no clinical contraindications.

The role of patient and family education has proven crucial in increasing compliance and motivation, as emphasized by (Baxter et al. 2024) that active patient involvement is a determinant factor for the success of early mobilization in the ERAS program. Preoperative health education that includes an explanation of the benefits of early mobilization and demonstration of ROM exercises is an important component that needs to be integrated into perioperative nursing care. (Zhang et al. 2024) In a quasi-experimental study of 128 laparotomy patients, it was found that patients who received structured preoperative education showed 2.3 times higher adherence to

postoperative early mobilization protocols than the control group. Family involvement as a support system was also independently associated with increased mobilization compliance, as reported by (Halfwerk et al. 2023) in his observational study in the general surgery unit.

The findings of this case study have important implications for perioperative nursing practice. First, ROM exercises that are started within the first 24 hours after laparotomy surgery under general anesthesia have been shown to be safe and effective, causing no complications such as bleeding or wound degeneration during the observation period. Second, a phased approach from passive to active-assisted ROM according to patient tolerance is the right strategy for this population, in line with recommendations (Peden et al. 2023) regarding the abdominal postoperative rehabilitation protocol. Third, the integration of ROMs in the ERAS protocol in the surgical unit needs to be encouraged as a standard of perioperative nursing care, given its proven effectiveness and safety. Fourth, from the managerial aspect of nursing, it is necessary to conduct continuous training for nurses on the correct ROM technique and the use of JH-HLM, as recommended by (American College of Surgeons 2023) to improve the competence of nurses in supporting the early mobilization program. Although the limitations of this case study of small number of respondents and short observation periods limit the generalization of findings, these results provide a strong initial empirical foundation for larger-scale studies with a Randomized Controlled Trial (RCT) design in a postlaparotomy patient population under general anesthesia.

Conclusion

The implementation of ROM exercise in two postoperative laparotomy patients with general anesthesia at the Magelang City Regional Hospital has proven to be effective and safe in increasing early mobilization. The first respondent (Mr. A) experienced an increase in the level of JH-HLM from a score of 1 to a score of 5 (walking in room) in 2 days, while the second respondent (Mrs. B) increased from a score of 1 to a score of 6 (walking in the hallway) in the same period. ROMs that start in the first 24 hours after surgery gradually from passive to active-assist are shown to cause no complications. The main barriers in the form of PONV, pain, and anxiety can be overcome with an integrated approach including pharmacological management, education, and psychological support. These findings support the integration of ROM as a standard component of the ERAS protocol in perioperative nursing care. Further research with larger samples and experimental designs is needed to strengthen the existing scientific evidence.

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