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Nurse-Led early mobilization and functional recovery program: Impact on postoperative recovery, complications, and length of hospital stay among patients undergoing major abdominal surgery

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Abstract--Background: Major abdominal surgery is commonly associated with postoperative pain, delayed mobilization, reduced functional capacity, postoperative complications, and prolonged hospitalization. Early mobilization is an important component of postoperative nursing care that can promote physical recovery, restore functional independence, and facilitate earlier discharge. A structured nurse-led approach may enhance patients' adherence to progressive mobilization and support safe functional recovery. **Aim:** To evaluate the impact of a nurse-led early mobilization and functional recovery program on postoperative recovery, complications, and length of hospital stay among patients undergoing major abdominal surgery. **Subjects and Method:** A quasi-experimental one-group pretest-posttest design was conducted among a purposive sample of 100 patients undergoing major abdominal surgery at the General Surgery Department and Surgical Units of Sohag University Hospitals. Data were collected using Tool I: Structured Patient Assessment Tool, Tool II: Quality of Recovery-15 (QoR-15), Tool III: Cumulated Ambulation Score (CAS), and Tool IV: Postoperative Complications Assessment and Hospital Stay Record. The program included preoperative education and postoperative progressive mobilization, beginning with bed exercises and sitting, followed by standing, chair transfer,

assisted ambulation, and gradual independent walking according to patients' clinical condition and tolerance. Breathing exercises, pain-management education, safety precautions, and individualized daily mobility goals were also incorporated. **Results:** After implementation of the nurse-led program, patients showed significant improvement in postoperative recovery and functional mobility compared with pre-intervention findings ($p < 0.001$). The proportion of patients achieving satisfactory functional recovery increased, while postoperative complications decreased significantly. Furthermore, the duration of hospital stay was reduced following the intervention ($p < 0.001$). **Conclusion:** The nurse-led early mobilization and functional recovery program was effective in improving postoperative recovery and functional mobility, reducing postoperative complications, and shortening hospital stay among patients undergoing major abdominal surgery. **Recommendations:** Structured nurse-led early mobilization should be incorporated into routine postoperative nursing care for patients undergoing major abdominal surgery. Individualized mobility plans, regular assessment of functional progress, and systematic documentation of mobilization milestones are recommended to support safe and timely recovery.

Keywords--Early mobilization, Functional recovery, Hospital stay, Major abdominal surgery, Postoperative complications.

Introduction

Major abdominal surgery is associated with substantial physiological stress and temporary impairment of physical function. Patients may experience postoperative pain, muscle weakness, reduced mobility, delayed gastrointestinal recovery, respiratory complications, venous thromboembolism, and prolonged hospitalization. In addition, postoperative immobility may contribute to muscle deconditioning, functional decline, and delayed return to independence. Therefore, strategies that promote early restoration of physical activity and functional capacity represent important components of postoperative recovery and nursing care (Pashikanti & Von Ah, 2012; Ljungqvist et al., 2017).

Early mobilization is an essential component of enhanced recovery after surgery (ERAS) and involves initiating physical activity as soon as clinically appropriate after surgery. Progressive activity may include active and passive bed exercises, sitting at the bedside, standing, transferring to a chair, and walking, with gradual advancement according to the patient's clinical condition and tolerance. Early mobilization aims to reduce the physiological consequences of prolonged immobility, preserve muscle function, promote independence, and facilitate the return to normal physical activity (Gustafsson et al., 2019).

Evidence indicates that early postoperative mobilization may contribute to improved recovery following abdominal and gastrointestinal surgery. Early activity can help maintain muscle strength, reduce the adverse effects of bed rest, promote functional independence, and support recovery of normal daily activities.

However, the effectiveness of mobilization may vary according to the timing, frequency, intensity, surgical procedure, patient characteristics, and overall structure of the recovery program. Therefore, early mobilization is most appropriately implemented as a structured and individualized component of multimodal postoperative recovery rather than as an isolated activity **(Castelino et al., 2016)**.

Nurses have a central role in facilitating postoperative mobilization because they provide continuous assessment, symptom and pain management, patient education, assistance with physical activity, safety monitoring, and evaluation of functional progress. Within ERAS pathways, nursing care contributes to the coordination of early activity with pain control, nutritional recovery, respiratory care, and other postoperative interventions. Consequently, a structured nursing intervention can incorporate mobilization into routine postoperative care while allowing activity to be individualized according to the patient's clinical condition, functional ability, and tolerance **(Reaza-Alarcón et al., 2019)**.

Several barriers may delay postoperative mobilization, including pain, generalized weakness, dizziness, fatigue, fear of movement, the presence of drains and catheters, and insufficient knowledge regarding safe activity. These barriers highlight the importance of individualized nursing assessment and progressive activity planning. A nurse-led program can address such barriers through individualized mobility goals, patient education, active and breathing exercises, appropriate pain management, safety precautions, and repeated assessment of the patient's response to activity. Such an organized approach may facilitate progressive functional recovery and support earlier achievement of discharge-readiness milestones **(Rababa et al., 2021)**.

The medical-surgical nurse plays a central role in promoting early mobilization and functional recovery among patients undergoing major abdominal surgery. Nursing responsibilities begin with assessment of the patient's baseline functional status, level of consciousness, pain intensity, muscle strength, vital signs, respiratory status, surgical wound, drains, catheters, and ability to tolerate physical activity. Based on this assessment, the nurse identifies potential barriers to mobilization and develops an individualized and progressive mobility plan in collaboration with the healthcare team. During mobilization, the nurse provides patient education, encourages deep-breathing and limb exercises, assists with sitting, standing, transferring, and ambulation, and applies appropriate safety measures to reduce the risk of falls and other complications **(Pashikanti & Von Ah, 2012)**. The nurse also monitors the patient's response to activity, including pain, dizziness, dyspnea, fatigue, oxygen saturation, heart rate, and blood pressure, and adjusts the level of activity according to clinical tolerance. Documentation of mobility milestones enables the nurse to evaluate functional progress, communicate changes to the multidisciplinary team, and contribute to discharge planning. These responsibilities are consistent with the ERAS approach, in which coordinated nursing care, early activity, symptom control, and continuous assessment are important elements of postoperative recovery **(Ljungqvist et al., 2017; Gustafsson et al., 2019)**.

Significance of the Study

Major abdominal surgery places patients at increased risk of postoperative functional decline, complications, delayed recovery, and prolonged hospitalization. Although early mobilization is an important component of enhanced postoperative recovery, its implementation may be inconsistent because of postoperative pain, weakness, fear of movement, invasive devices, and inadequate patient knowledge. Medical-surgical nurses are in a key position to overcome these barriers through continuous assessment, patient education, progressive mobilization, safety monitoring, and evaluation of functional progress. Therefore, a structured nurse-led early mobilization program may provide a practical nursing approach for supporting postoperative recovery and improving patients' functional outcomes.

The significance of the present study lies in addressing postoperative recovery from a comprehensive nursing perspective by integrating progressive mobilization with individualized assessment, education, symptom management, and safety measures. Evaluating its effects on functional recovery, postoperative complications, and length of hospital stay may provide evidence to support the integration of structured mobility protocols into routine medical-surgical nursing practice. The findings may also assist nurses in standardizing postoperative mobility care, identifying patients who require additional support, and contributing to earlier and safer functional recovery.

Aim of the Study

The aim of this study was to **evaluate the impact of a nurse-led early mobilization and functional recovery program on postoperative recovery, complications, and length of hospital stay among patients undergoing major abdominal surgery.**

Research Hypotheses

The study hypothesized that:

- Patients who receive the nurse-led early mobilization and functional recovery program will demonstrate significant improvement in postoperative functional recovery after implementation compared with their pre-intervention assessment.
- Patients who receive the nurse-led program will experience a reduction in the occurrence of postoperative complications following the intervention.
- Patients who receive the nurse-led program will have a shorter length of hospital stay following implementation of the intervention.

Subjects and Methods

Research Design

A quasi-experimental one-group pretest–posttest research design was used.

Research Setting

The study was conducted at the General Surgery Department and relevant surgical units of Sohag University Hospitals, Sohag, Egypt. These units provide

surgical care for patients undergoing various major abdominal procedures and provide an appropriate setting for implementing and evaluating a structured postoperative early mobilization program.

Subjects

A purposive sample of 100 patients undergoing major abdominal surgery was recruited according to predetermined inclusion and exclusion criteria. Patients were enrolled consecutively until the required sample size was achieved.

Inclusion Criteria

Patients were eligible to participate if they:

- Were aged **18 years or older**.
- Had undergone **major abdominal surgery**.
- Were medically stable and considered eligible for postoperative mobilization.
- Were conscious, able to communicate, and able to follow instructions.
- Had no contraindication to early postoperative mobilization.
- Agreed to participate in the study.

Exclusion Criteria

Patients were excluded if they:

- Had a pre-existing severe mobility limitation that prevented assessment of postoperative functional recovery.
- Had major neurological, musculoskeletal, or cardiopulmonary conditions that substantially restricted mobilization.
- Developed a postoperative condition requiring prolonged intensive care or strict immobilization.
- Had postoperative complications requiring emergency reoperation before completion of the intervention.
- Were unable to communicate or participate in the planned educational and mobilization activities.

Sampling Technique

A **purposive sampling technique** was used. Patients who met the eligibility criteria were identified and recruited based on the purpose of the study and their suitability for participation in the nurse-led early mobilization program.

Sample Size Calculation

For a one-group pretest–posttest design, the sample size was estimated based on the formula for comparing two related means:

$$n = \frac{(Z_{\alpha/2} + Z_{\beta})^2}{d^2}$$

Where:

- n = required sample size.
- $Z_{\alpha/2}$ = standard normal deviate for a two-sided significance level of 0.05 = **1.96**.
- Z_{β} = standard normal deviate corresponding to **80% statistical power = 0.84**.
- d = anticipated standardized effect size.

Assuming a **medium anticipated effect size of $d=0.28$** :

Sample Size Calculation:

*The sample size was calculated using the formula for comparing two related means in a one-group pretest–posttest design. Assuming a two-sided significance level of 0.05, 80% statistical power, and an anticipated standardized effect size of 0.28, the calculated sample size was 100 patients. Therefore, a purposive sample of **100 patients undergoing major abdominal surgery** was recruited for the present study.*

Data Collection Tools

Data were collected using the following tools:

Tool I: Structured Patient Assessment Tool

The Structured Patient Assessment Tool was developed by the researchers based on a review of relevant surgical nursing literature (**Oodit et al., 2022**), perioperative care principles, and Enhanced Recovery After Surgery (ERAS) recommendations. The tool was designed to obtain baseline information and document clinical and surgical characteristics that may influence postoperative recovery, functional mobility, postoperative complications, and length of hospital stay. It consisted of three parts.

Part I included the patients' sociodemographic characteristics, namely age, sex, marital status, educational level, occupation, residence, and body mass index (BMI) when applicable.

Part II assessed the patients' clinical characteristics, including the diagnosis, comorbidities, previous abdominal surgery, preoperative functional status, and preoperative mobility level.

Part III covered surgical and immediate postoperative characteristics, including type of abdominal surgery, surgical status, type of anesthesia, surgical drains and urinary catheter, and **supplemental oxygen immediately postoperatively**.

Tool II: Quality of Recovery-15 (QoR-15)

The Quality of Recovery-15 (QoR-15) by **Myles et al., (2022)** was used to assess the overall quality of postoperative recovery among the studied patients. The QoR-15 is a validated patient-reported outcome measure specifically developed to evaluate recovery after surgery and anesthesia. It consists of 15 items covering five clinically relevant dimensions: physical comfort, physical independence, psychological support, emotional state, and pain and other postoperative symptoms. The items assess aspects such as feeling rested, comfortable breathing, ability to communicate and eat, physical comfort, ability to perform personal activities, psychological support, feeling calm and in control, anxiety or depression, pain, nausea and vomiting, and sleep. Each item is rated on an 11-point numerical rating scale ranging from 0 to 10, with positively worded items scored from 0 representing the poorest condition to 10 representing the best condition, while negatively worded items are reverse scored so that higher scores consistently indicate better recovery. The total score is obtained by summing the 15 item scores, producing a possible range of 0–150, with higher scores indicating better postoperative recovery. For the purpose of descriptive interpretation, a total score of 0–89 indicates poor recovery, 90–121 moderate recovery, 122–135 good recovery, and 136–150 excellent recovery. These categories should be presented as interpretive categories rather than replacing the continuous QoR-15 score in the primary statistical analysis.

Tool III: Cumulated Ambulation Score (CAS)

The Cumulated Ambulation Score (CAS) by **Ferriero et al., (2018)** was used to objectively assess basic postoperative functional mobility. The CAS is an observational mobility measure that evaluates the patient's ability to perform three fundamental activities of daily mobility: getting in and out of bed, sitting to standing, and walking. Each activity is scored on a three-level scale from 0 to 2, where 0 indicates inability to perform the activity despite assistance, 1 indicates the ability to perform the activity with human assistance, and 2 indicates independent performance. The three item scores are summed to obtain a total CAS ranging from 0 to 6, with higher scores indicating greater functional independence. Thus, a score of 0–2 reflects severely impaired mobility, 3–4 indicates partially dependent mobility, 5 indicates nearly independent mobility, and 6 indicates independent performance of all three basic mobility activities. However, because the original CAS is primarily interpreted according to the actual total score, with 6 representing independence in all assessed activities, the descriptive categories used in this study should be clearly identified as researcher-defined interpretive bands rather than established diagnostic cut-offs. The CAS may be assessed repeatedly during the postoperative period to document changes in functional mobility and the patient's progress toward independent ambulation.

Tool IV: Postoperative Complications Assessment and Hospital Stay Record

The Postoperative Complications Assessment and Hospital Stay Record was used to systematically monitor postoperative morbidity and hospitalization outcomes (**Dindo et al., 2004**). The tool consisted of two parts.

Part I assessed the occurrence and characteristics of postoperative complications, including respiratory complications such as atelectasis, pneumonia, respiratory distress, and prolonged oxygen requirement; gastrointestinal complications such as postoperative ileus, nausea and vomiting, abdominal distension, delayed return of bowel function, and intestinal or anastomotic complications when applicable; wound-related complications such as surgical site infection, wound dehiscence, excessive wound drainage, hematoma, or seroma; urinary complications such as urinary retention and urinary tract infection; thromboembolic complications including deep-vein thrombosis and pulmonary embolism; and other clinically documented complications such as postoperative bleeding, cardiovascular events, falls, mobilization-related adverse events, and unplanned return to the operating room. Each complication was recorded according to its type, occurrence, timing, treatment, and outcome. For occurrence analysis, 0 indicated no postoperative complication and 1 indicated the presence of one or more postoperative complications. The severity of complications was classified using the Clavien–Dindo classification, in which Grade I represents a deviation from the normal postoperative course without the need for pharmacological, surgical, endoscopic, or radiological intervention; Grade II represents complications requiring pharmacological treatment; Grade III represents complications requiring surgical, endoscopic, or radiological intervention, subdivided into Grade IIIa without general anesthesia and Grade IIIb with general anesthesia; Grade IV represents life-threatening complications requiring intensive care, subdivided into Grade IVa single-organ dysfunction and Grade IVb multiorgan dysfunction; and Grade V represents death.

Part II recorded the length of hospital stay in actual number of days, calculated according to the hospital's admission and discharge records. Length of stay was retained as a continuous numerical variable rather than converted into arbitrary categories, allowing direct statistical comparison between study measurements or groups.

Validity

The validity of the data collection tools was established to ensure that they adequately measured the intended study outcomes. The tools were submitted to a panel of five experts in the fields of Medical-Surgical Nursing, Surgery, and related specialties. The experts reviewed the tools for content validity, clarity, relevance, comprehensiveness, appropriateness of the items, and suitability for patients undergoing major abdominal surgery. Their recommendations were considered, and necessary modifications were made accordingly. The QoR-15 and Cumulated Ambulation Score (CAS) were selected because they are established, validated instruments that have been previously used to assess postoperative recovery and functional mobility, respectively. The final versions of all tools were reviewed to ensure their applicability to the study population and consistency with the study objectives.

Reliability

The reliability of the study tools was assessed to determine their internal consistency and stability of measurement. For the researcher-developed components, **Cronbach's alpha coefficient** was used to assess internal consistency where applicable, particularly for multi-item scales. A Cronbach's alpha coefficient of ≥ 0.70 was considered acceptable. For the observational **CAS**, inter-rater reliability was considered based on its established reliability in postoperative patients, and standardized instructions were provided to ensure consistent scoring among assessors. The QoR-15 has previously demonstrated satisfactory reliability and measurement properties in postoperative populations.

Pilot Study

A pilot study was conducted on approximately 10% of the calculated sample size to assess the feasibility, clarity, applicability, and practicality of the study tools and intervention procedures before commencement of the main study. The pilot participants were selected from the same study population and met the same eligibility criteria as the main study participants. The pilot study was conducted to determine the time required to complete the assessment tools, identify any ambiguous or difficult questions, assess the availability and completeness of required clinical information, and evaluate the feasibility of postoperative mobility and recovery assessments. Any necessary modifications in wording, sequence, or administration procedures were made based on the findings of the pilot study. The pilot participants were excluded from the final study sample if their participation could influence the subsequent intervention or assessment procedures.

Ethical Considerations

Before initiating the study, official approval was obtained from the Scientific Research Ethics Committee of the Faculty of Nursing, Sohag University, as well as permission from the relevant hospital authorities. The purpose and procedures of

the study were explained clearly to each eligible patient, including the nature of the assessments, postoperative mobility evaluation, expected benefits, and any potential risks or discomforts. Written informed consent was obtained from each participant before enrollment. Participation was completely voluntary, and participants were informed that they had the right to withdraw from the study at any time without affecting the medical or nursing care they received. Confidentiality and privacy were maintained throughout the study by coding the collected data rather than using participants' names and by restricting access to the research data to the research team.

Phases of the Intervention, Sessions, and Duration

The intervention was implemented through four sequential phases: preparation and baseline assessment, implementation of the nurse-led postoperative recovery program, reinforcement and follow-up, and final evaluation. The intervention was designed according to the principles of Enhanced Recovery After Surgery (ERAS), with emphasis on early and safe mobilization, adequate symptom control, patient education, prevention of postoperative complications, and progressive return to functional independence. The program was delivered by trained nurses in coordination with the surgical team, and all mobilization activities were adapted to the patient's clinical condition.

Phase I: Preparation and Baseline Assessment

This phase was conducted before surgery or immediately after admission, according to the patient's clinical condition. Eligible patients were identified, informed consent was obtained, and baseline demographic, clinical, and surgical data were collected using Tool I (Structured Patient Assessment Tool). Baseline postoperative recovery, functional mobility, and relevant clinical outcomes were assessed using the QoR-15, CAS, and postoperative complications record when applicable. The researcher also assessed the patient's baseline pain, mobility limitations, presence of drains or catheters, and ability to participate safely in postoperative mobilization. The patient and family were introduced to the objectives of the program and the importance of progressive mobilization and participation in recovery activities.

Phase II: Implementation of the Nurse-Led Postoperative Recovery Program

The main intervention was delivered during the postoperative hospital stay, beginning after the patient was clinically stable and continuing progressively until discharge. The program consisted of four structured sessions, with each session lasting approximately 30–45 minutes, in addition to brief bedside reinforcement according to the patient's needs.

Session 1: Postoperative Recovery Orientation and Early Mobilization Preparation

The first session focused on postoperative education and preparation for safe recovery. The researcher explained the expected postoperative recovery pathway, the importance of early mobilization, appropriate breathing and coughing techniques, pain reporting, adequate hydration and nutrition according to the surgical plan, prevention of complications, and the importance of active participation in care. The patient was instructed on safe positioning, bed exercises, ankle-pumping exercises, deep-breathing exercises, and techniques for changing position in bed. The researcher also assessed barriers to mobilization such as pain, weakness, fear, dizziness, and the presence of drains or catheters.

Session 2: Assisted Bed Mobility and Transfer Training

The second session emphasized progressive movement from bed-level activities to sitting and standing. The researcher demonstrated and supervised turning in bed, sitting at the bedside, sit-to-stand transfer, and safe movement while maintaining surgical precautions. Mobilization was performed according to the patient's tolerance and clinical stability. Pain and vital signs were assessed before and after activity, and assistance was gradually reduced as the patient's functional ability improved.

Session 3: Progressive Ambulation and Functional Recovery

The third session focused on progressive ambulation. Patients were encouraged to stand, walk beside the bed, and progressively increase walking distance according to their clinical condition. The researcher monitored tolerance, pain, dizziness, oxygenation when indicated, heart rate, and other signs of intolerance. The patient was encouraged to perform basic activities of daily living as tolerated and to increase independence in mobility. The Cumulated Ambulation Score (CAS) was used to document progress in bed mobility, sit-to-stand transfer, and walking.

Session 4: Self-Management, Complication Prevention, and Discharge Preparation

The final session focused on maintaining functional recovery and preparing the patient for safe discharge. The researcher reinforced progressive ambulation, breathing exercises, appropriate activity levels, wound care, medication adherence, nutrition and hydration according to the surgical plan, recognition of warning signs, and strategies for continuing recovery at home. Patients and caregivers were instructed to report symptoms suggestive of infection, respiratory problems, bleeding, thromboembolic events, persistent vomiting, worsening abdominal symptoms, or inability to mobilize. The importance of gradually resuming normal activities was emphasized.

Phase III: Reinforcement and Follow-Up During Hospitalization

Throughout the postoperative period, nurses provided daily reinforcement and individualized bedside support in addition to the structured sessions. Patients were encouraged to practice the mobility techniques repeatedly during the day according to their tolerance. Functional mobility was monitored using the CAS, while postoperative recovery was assessed using the QoR-15 at the predetermined assessment points. The occurrence, type, and severity of postoperative complications were documented using the postoperative complications record and classified according to the Clavien–Dindo system. Any deterioration, intolerance to mobilization, or clinically significant complication was immediately reported to the responsible medical team.

Phase IV: Final Evaluation

The final evaluation was conducted before hospital discharge. The same assessment procedures were repeated to determine changes in postoperative recovery and functional mobility and to document postoperative complications and hospital length of stay. The QoR-15 was used to assess the patient's overall quality of recovery, while the CAS assessed functional mobility. The postoperative complications record was reviewed to determine whether complications had occurred and their severity according to Clavien–Dindo classification. Length of

hospital stay was recorded in actual days from admission/surgery according to the hospital record.

Duration of the Intervention

The overall intervention extended throughout the patient's postoperative hospitalization period, with four structured nursing sessions, each lasting approximately 30–45 minutes, supported by brief daily reinforcement. The exact number of postoperative days varied according to the patient's surgical procedure, clinical condition, and discharge date. This flexible duration allowed the intervention to remain patient-centered while maintaining standardized core educational and mobility components. Assessment was performed at baseline and at predefined postoperative points, with the final outcome assessment completed before discharge.

Summary of the Intervention Schedule

Phase		Main activities	Sessions	Duration
Phase Preparation baseline assessment	I: &	Eligibility, consent, baseline assessment, orientation	—	20–30 min
Phase Intervention	II:	Education, breathing exercises, bed mobility, transfers, progressive ambulation, complication prevention	4 sessions	30–45 min/session
Phase Reinforcement	III:	Daily bedside practice, mobility monitoring, individualized support	Daily	10–20 min reinforcement
Phase IV: Final evaluation	IV:	QoR-15, CAS, complications, discharge assessment and length of stay	1 assessment	20–30 min

Statistical Analysis

The collected data were coded, entered, checked for completeness, and analyzed using the Statistical Package for the Social Sciences (SPSS), version 26.0. Categorical variables were presented as frequencies and percentages, whereas continuous variables were summarized using means and standard deviations (Mean $\pm$ SD) for normally distributed data and medians with interquartile ranges (IQR) for non-normally distributed data. The distribution of continuous variables was assessed before selecting the appropriate statistical test. Changes in the **QoR-15 and CAS scores** across postoperative assessments were analyzed using the **paired t-test** for normally distributed paired data or the **Wilcoxon signed-rank test** when distributional assumptions were not met. When more than two repeated measurements were available, **repeated-measures ANOVA** was applied as appropriate. Categorical postoperative outcomes, including complication occurrence and recovery or mobility categories, were analyzed using the **McNemar test, chi-square test**, according to the nature and distribution of the data. **Length of hospital stay** was analyzed as a continuous variable using the

appropriate parametric or non-parametric comparative test. Relationships between continuous or ordinal variables were examined using **Pearson's correlation coefficients**, respectively. Statistical significance was considered at **p < 0.05**, while **p < 0.001** was considered highly statistically significant. All tests were **two-tailed**, and the results were presented with the corresponding test statistic and p-value.

Results:

Table (1): Distribution of the Studied Patients According to Their Socio-Demographic Characteristics (N = 100)

Socio-demographic characteristics	No.	%
Age (years)		
20–<30	22	22.0
30–<40	56	56.0
≥40	22	22.0
Mean ± SD	35.4 ± 7.8	
Sex		
Male	52	52.0
Female	48	48.0
Marital status		
Married	71	71.0
Single	24	24.0
Widowed/Divorced	5	5.0
Educational level		
Illiterate/Read & write	18	18.0
Basic/Secondary education	47	47.0
University education	35	35.0
Occupation		
Manual worker	29	29.0
Employee	31	31.0
Housewife	25	25.0
Other/Retired	15	15.0
Residence		
Rural	62	62.0
Urban	38	38.0
BMI (kg/m ²)		
<18.5	4	4.0
18.5–<25	34	34.0

Socio-demographic characteristics	No.	%
25–<30	39	39.0
≥30	23	23.0
Mean ± SD	27.3 ± 4.6	

Table (1) shows that more than half of the studied patients (56.0%) were aged 30–<40 years, with a mean age of 35.4 ± 7.8 years. Males constituted 52.0% of the sample, while 48.0% were females. Most patients were married (71.0%) and had basic/secondary education (47.0%). Regarding residence, 62.0% lived in rural areas. Concerning BMI, 39.0% were overweight and 23.0% were obese, with a mean BMI of 27.3 ± 4.6 kg/m².

Table (2): Distribution of the Studied Patients According to Their Clinical Characteristics (N = 100)

Clinical characteristics	No.	%
Main diagnosis		
Colorectal disease	31	31.0
Gastric/upper GI disease	19	19.0
Hepatobiliary disease	18	18.0
Intestinal disease	17	17.0
Other abdominal conditions	15	15.0
Comorbidities		
None	39	39.0
One comorbidity	44	44.0
≥2 comorbidities	17	17.0
Previous abdominal surgery		
No	68	68.0
Yes	32	32.0
Preoperative functional status		
Independent	72	72.0
Partially dependent	23	23.0
Dependent	5	5.0
Preoperative mobility		
Independent walking	76	76.0
Walking with assistance	20	20.0
Limited/non-ambulatory	4	4.0
Hemoglobin (g/dL), Mean ± SD	11.8 ± 1.6	

Table (2) indicates that colorectal diseases represented the most common diagnostic category (31.0%). Forty-four percent of patients had one comorbidity, whereas 17.0% had two or more comorbidities. Most patients were functionally independent before surgery (72.0%) and were able to walk independently (76.0%). The mean preoperative hemoglobin level was 11.8 ± 1.6 g/dL.

Table (3): Distribution of the Studied Patients According to Surgical and Immediate Postoperative Characteristics (N = 100)

Surgical/postoperative characteristics	No.	%
Type of surgery		
Colorectal resection	31	31.0
Gastric surgery	19	19.0
Hepatobiliary surgery	18	18.0
Small/large bowel surgery	17	17.0
Other major abdominal surgery	15	15.0
Surgical status		
Elective	70	70.0
Emergency	30	30.0
Anesthesia		
General	100	100.0
Surgical approach		
Open	56	56.0
Laparoscopic	44	44.0
Surgical drains		
No	39	39.0
Yes	61	61.0
Urinary catheter		
No	28	28.0
Yes	72	72.0
Supplemental oxygen immediately postoperatively		
No	36	36.0
Yes	64	64.0

Table 3 illustrates that the majority of operations were performed electively (70.0%), while 30.0% were emergency procedures. Open surgery accounted for 56.0% of operations compared with 44.0% performed laparoscopically. Postoperative drains and urinary catheters were present in 61.0% and 72.0% of

patients, respectively. Supplemental oxygen was required immediately after surgery in 64.0% of patients.

Table (4): Mean Scores of QoR-15 Before and After the Intervention (N = 100)

QoR-15 measure	Pre-intervention Mean $\pm$ SD	Post-intervention Mean $\pm$ SD	Paired t-test	p-value
QoR-15 total score	70.3 $\pm$ 10.8	108.7 $\pm$ 14.3	-36.65	<0.001

Table 4 reveals a marked improvement in postoperative recovery was observed following the intervention. The mean QoR-15 score increased from 70.3 $\pm$ 10.8 before the intervention to 108.7 $\pm$ 14.3 after the intervention. This improvement was statistically highly significant (paired t = -36.65, p < 0.001).

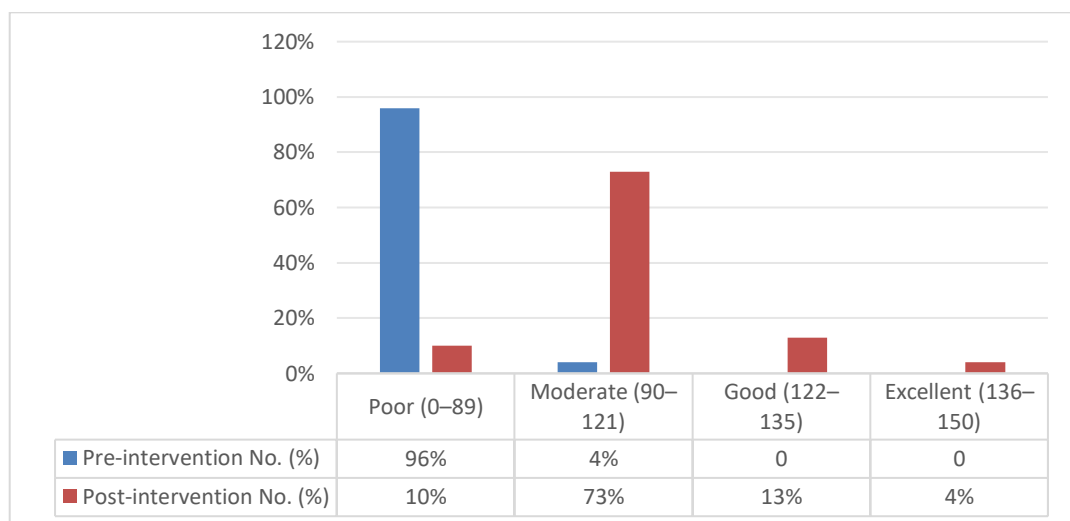


Figure (1): Distribution of the Studied Patients According to QoR-15 Recovery Level Before and After the Intervention (N = 100)

Figure (1): shows a marked improvement in the QoR-15 recovery levels among the studied patients after the intervention. Before the intervention, the majority of patients (96.0%) had poor recovery, while only 4.0% had moderate recovery and none had good or excellent recovery. After the intervention, the proportion of patients with poor recovery decreased to 10.0%, whereas 73.0% achieved moderate recovery, 13.0% achieved good recovery, and 4.0% achieved excellent recovery.

Table (5): Mean Scores of Cumulated Ambulation Score Components Before and After the Intervention (N = 100)

CAS component	Pre-intervention Mean $\pm$ SD	Post-intervention Mean $\pm$ SD	Wilcoxon test	p-value
Getting in/out of bed	0.91 $\pm$ 0.72	1.49 $\pm$ 0.61	-6.82	<0.001
Sit-to-stand	0.77 $\pm$ 0.69	1.42 $\pm$ 0.64	-7.41	<0.001
Walking	0.75 $\pm$ 0.68	1.41 $\pm$ 0.65	-7.55	<0.001
Total CAS	2.43 $\pm$ 1.06	4.32 $\pm$ 1.17	-8.54	<0.001

Table (5) reveals that all components of functional mobility improved after implementation of the intervention. The total CAS increased from 2.43 ± 1.06 before the intervention to 4.32 ± 1.17 afterward.

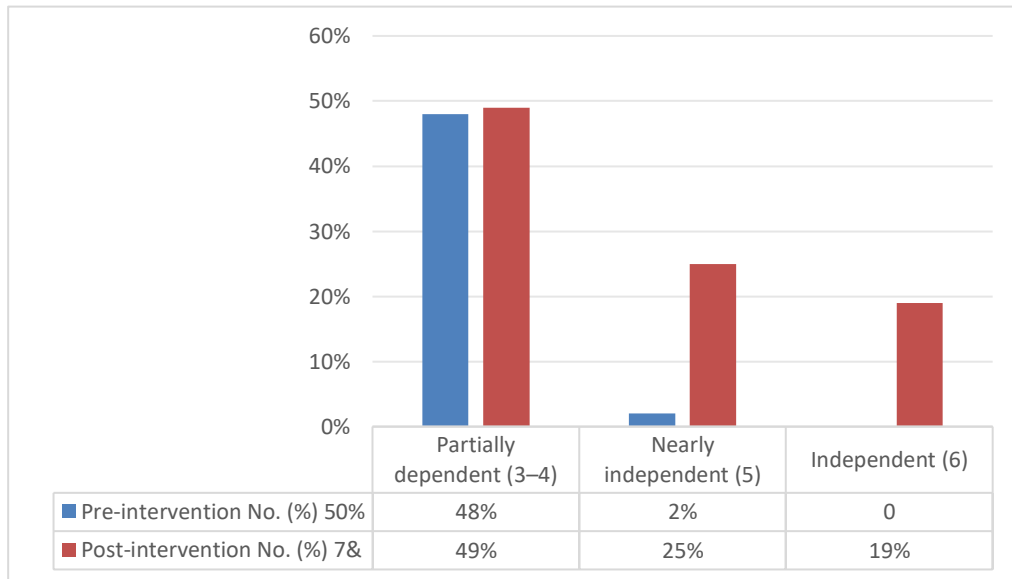
**Figure (2): Distribution of the Studied Patients According to Functional Mobility Level Before and After the Intervention (N = 100)**

Figure (2) shows a marked improvement in the mobility level of the studied patients after the intervention. Before the intervention, 50.0% of patients were severely impaired and 48.0% were partially dependent, while only 2.0% were nearly independent and none were independent. Following the intervention, severe impairment decreased substantially from 50.0% to 7.0%, whereas nearly independent patients increased from 2.0% to 25.0% and independent patients increased from 0.0% to 19.0%.

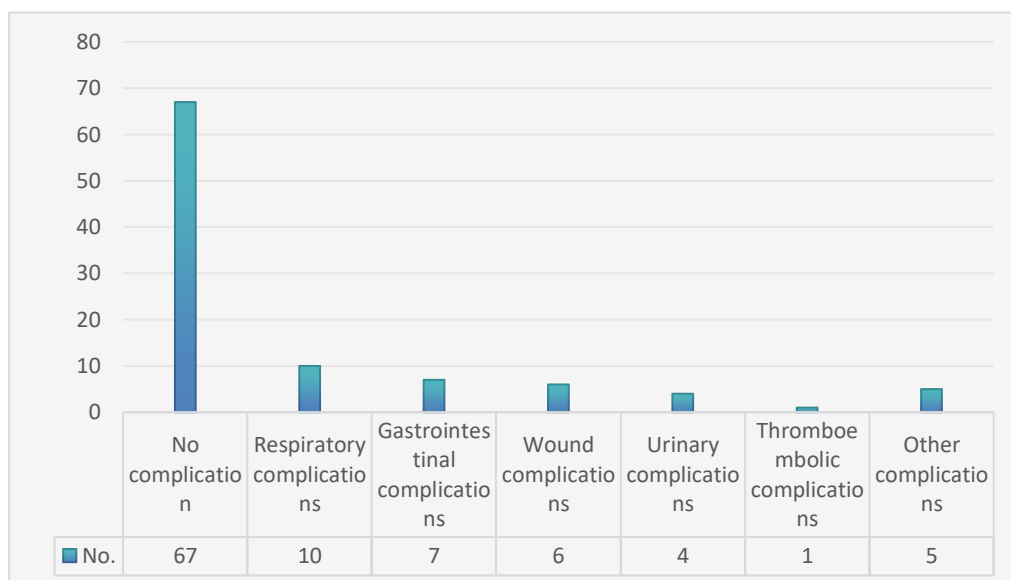


Figure (3): Distribution of the Studied Patients According to Postoperative Complications (N = 100)

Figure (3) demonstrates that two-thirds of the studied patients (67.0%) experienced no postoperative complications. Among patients who developed complications, respiratory complications were the most frequently observed (10.0%), followed by gastrointestinal (7.0%) and wound complications (6.0%). Overall, 33.0% experienced at least one postoperative complication.

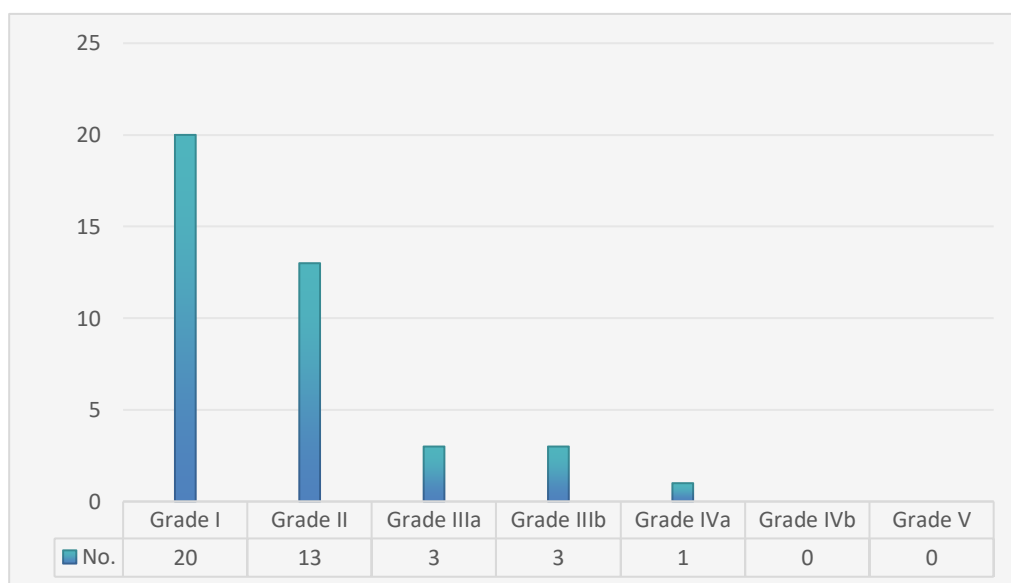


Figure (4): Distribution of Patients with Postoperative Complications According to Clavien-Dindo Classification (N = 100)

Figure (4) illustrates the distribution of postoperative complications according to the Clavien–Dindo Classification among the 100 studied patients. Overall, 40 patients (40.0%) experienced postoperative complications, whereas 60 patients (60.0%) had no recorded complications. Grade I complications were the most frequently reported, occurring in 20 patients (20.0%), followed by Grade II complications in 13 patients (13.0%). Together, Grades I and II accounted for 33 of the 40 complication events (82.5%), indicating that the majority of complications were of lower severity. Grade IIIa and Grade IIIb complications were each observed in 3 patients (3.0%), while Grade IVa complications occurred in only 1 patient (1.0%). No Grade IVb or Grade V complications were reported.

Table (6): Distribution of the Studied Patients According to Length of Hospital Stay (N = 100)

Length of hospital stay	No.	%
≤5 days	6	6.0
6–10 days	73	73.0
>10 days	21	21.0
Mean ± SD	9.33 ± 1.67 days	
Median (IQR)	9 (8–10) days	
Range	5–14 days	

Table 6 shows the distribution of the studied patients according to length of hospital stay. The majority of patients, 73 (73.0%), stayed in the hospital for 6–10 days, while 21 patients (21.0%) had a prolonged hospital stay of more than 10 days. Only 6 patients (6.0%) were discharged within 5 days or less. The mean hospital stay was 9.33 ± 1.67 days, with a median of 9 days (IQR: 8–10 days). The overall duration ranged from 5 to 14 days.

Table (7): Correlation between Postoperative Recovery, Functional Mobility, and Length of Hospital Stay (N = 100)

Variables	Correlation coefficient (r)	p-value
Post-intervention QoR-15 vs. post-intervention CAS	-0.124	0.219
Post-intervention QoR-15 vs. length of stay	0.023	0.818
Post-intervention CAS vs. length of stay	-0.442	<0.001

Table (7) portrays that a statistically significant moderate negative correlation was observed between postoperative CAS and length of hospital stay ($r = -0.442$, $p < 0.001$). No statistically significant correlation was observed between QoR-15 and CAS ($r = -0.124$, $p = 0.219$) or between QoR-15 and length of stay ($r = 0.023$, $p = 0.818$).

Table (8): Relationship between Selected Clinical/Surgical Characteristics and Postoperative Outcomes (N = 100)

Characteristic	QoR-15 Mean $\pm$ SD	p- value	CAS Mean $\pm$ SD	p- value	Length of stay Mean $\pm$ SD	p- value
Age		0.760		0.047		0.007
20–<30 years	109.8 $\pm$ 13.2		4.6 $\pm$ 1.0		8.6 $\pm$ 1.4	
30–<40 years	109.2 $\pm$ 14.1		4.4 $\pm$ 1.1		9.1 $\pm$ 1.5	
$\geq$ 40 years	106.9 $\pm$ 15.2		3.8 $\pm$ 1.3		10.1 $\pm$ 1.9	
Comorbidity		0.266		0.007		<0.001
None	111.2 $\pm$ 13.0		4.7 $\pm$ 1.0		8.5 $\pm$ 1.3	
One	108.3 $\pm$ 13.9		4.2 $\pm$ 1.1		9.4 $\pm$ 1.5	
$\geq$ 2	104.7 $\pm$ 16.0		3.7 $\pm$ 1.3		10.5 $\pm$ 1.8	
Surgical status		0.008		<0.001		<0.001
Elective	111.1 $\pm$ 13.4		4.6 $\pm$ 1.0		8.8 $\pm$ 1.4	
Emergency	103.0 $\pm$ 14.5		3.7 $\pm$ 1.2		10.6 $\pm$ 1.8	
Surgical approach		0.017		0.002		<0.001
Laparoscopic	112.5 $\pm$ 12.7		4.7 $\pm$ 1.0		8.5 $\pm$ 1.3	
Open	105.7 $\pm$ 14.8		4.0 $\pm$ 1.2		9.9 $\pm$ 1.7	

Statistical tests: One-way ANOVA was used for age and comorbidity comparisons, while independent-samples t-test was used for surgical status and surgical approach.

Table (8) shows statistically significant differences in postoperative CAS according to age ($p = 0.047$), comorbidity status ($p = 0.007$), surgical status ($p < 0.001$), and surgical approach ($p = 0.002$). Length of hospital stay also differed significantly according to age ($p = 0.007$), comorbidity status ($p < 0.001$), surgical status ($p < 0.001$), and surgical approach ($p < 0.001$). QoR-15 differed significantly according to surgical status ($p = 0.008$) and surgical approach ($p = 0.017$), whereas differences according to age and comorbidity status were not statistically significant.

Discussion

Major abdominal surgery is associated with substantial physiological stress and may adversely affect patients' physical function, mobility, comfort, psychological well-being, and overall quality of recovery. Postoperative complications and delayed functional recovery may further contribute to prolonged hospitalization and increased healthcare needs. Consequently, enhanced recovery approaches emphasize coordinated, evidence-based perioperative care, early mobilization, effective symptom management, complication prevention, and active nursing involvement to facilitate safe and timely recovery (**Ljungqvist et al., 2017; Oodit et al., 2022**). In this context, the present study was conducted to evaluate the effect of a structured nursing intervention on quality of recovery, functional mobility, postoperative complications, and length of hospital stay among patients undergoing major abdominal surgery. Assessment of patient-reported recovery using the Quality of Recovery-15 (QoR-15) provides a multidimensional assessment of postoperative recovery, while objective assessment of basic functional mobility provides complementary information regarding the patient's progression toward functional independence (**Stark et al., 2013; Castellino et al., 2016**).

The present study demonstrated a marked improvement in postoperative quality of recovery following the nursing intervention. The mean total QoR-15 score increased after the intervention, with a highly statistically significant difference. **This result is consistent with Myles et al. (2022)**, who demonstrated that the QoR-15 has excellent validity, reliability, and responsiveness for assessing postoperative recovery. Their meta-analysis also showed that QoR-15 can discriminate between patients with and without postoperative complications, supporting its usefulness as a comprehensive patient-reported outcome measure. The categorical distribution of QoR-15 further demonstrated a substantial shift toward better postoperative recovery. The significant Marginal Homogeneity test indicates that the distribution of recovery categories changed significantly after the intervention. **The present findings correspond with Kleif et al. (2018)**, who reported that QoR-15 is a responsive instrument capable of detecting clinically meaningful changes in postoperative recovery, with a minimal clinically important difference of approximately 8 points.

The findings concerning functional mobility showed significant improvement in all assessed components. with all comparisons reaching statistical significance. **The current evidence supports the ERAS recommendations of Treacy et al. (2022)**, which emphasize early restoration of physical function and mobilization as important components of enhanced postoperative recovery.

A similar pattern was found when postoperative mobility was categorized according to the CAS levels. Before the intervention, half of patients had severe mobility impairment and less than half were partially dependent, compared with only two percent who were nearly independent and none who were independent. The significant Marginal Homogeneity test confirms a significant shift toward improved functional mobility. **These results are comparable to the findings of Yolcu et al. (2016)**, whose systematic review identified early postoperative mobilization as an important component of enhanced recovery following gastrointestinal surgery. However, their meta-analysis also showed heterogeneity

among mobilization protocols and did not demonstrate a consistent independent effect on all postoperative outcomes.

Regarding postoperative complications, the majority of the studied patients experienced no recorded complication. This finding can be viewed in the context of evidence supporting structured postoperative recovery strategies. **Kokotovic et al. (2021)** reported that postoperative respiratory and mobilization interventions are important components of efforts to prevent complications following abdominal surgery, particularly pulmonary complications. Similarly, **Hajibandeh et al. (2020)** found that Enhanced Recovery After Surgery (ERAS) protocols were associated with lower risks of total, major, pulmonary, paralytic ileus, and surgical-site complications in patients undergoing emergency abdominal surgery. However, the occurrence and distribution of postoperative complications may differ according to the type and complexity of surgery, patient-related risk factors, and the perioperative care pathway implemented.

The Clavien–Dindo findings showed that most recorded complication events were lower-grade events. **The present distribution is compatible with the framework proposed by Dindo et al. (2004)**, in which postoperative complications are classified according to the treatment required to correct them, with increasing grades representing increasing severity and therapeutic requirements.

The length-of-stay findings showed that most patients stayed in hospital for 6–10 days. The mean duration was 9.33 ± 1.67 days, with a median of 9 days and a range of 5–14 days. **This pattern is consistent with the principles described by Gustafsson et al. (2019)**, who identified timely functional recovery, early mobilization, effective pain management, adequate nutrition, and coordinated discharge planning as important components of enhanced recovery pathways. However, length of stay is a multifactorial outcome and may also be influenced by surgical complexity, emergency status, comorbidities, and postoperative complications.

The correlation analysis revealed that QoR-15 was not significantly correlated with CAS, and there was no significant correlation between QoR-15 and length of hospital stay. In contrast, CAS demonstrated a significant moderate negative correlation with length of hospital stay, indicating that higher functional mobility was associated with shorter hospitalization. This finding is consistent with observations from **Jönsson et al. (2018)**, who reported that postoperative physical performance and mobility were important aspects of recovery following acute high-risk abdominal surgery, with poorer functional status being associated with less favorable postoperative recovery. However, the present correlation should be interpreted as an association rather than evidence of a direct causal relationship, because length of hospital stay may also be influenced by surgical complexity, postoperative complications, comorbidities, discharge planning, and institutional practices.

Age was significantly associated with CAS and length of hospital stay, whereas no significant association was identified between age and QoR-15. Patients aged 20–<30 years had the highest mean CAS score (4.6 ± 1.0) and the shortest mean

hospital stay (8.6 ± 1.4 days), while patients aged ≥ 40 years had the lowest CAS score (3.8 ± 1.3) and the longest mean hospital stay (10.1 ± 1.9 days). This pattern may be related to the greater influence of functional status and postoperative complications on recovery among older surgical patients. **Balentine et al. (2016)**, in a large study of patients undergoing major abdominal surgery, highlighted the interaction between advanced age, preoperative functional status, and postoperative complications in determining postacute outcomes. Their findings support interpreting age as one factor within a broader functional-recovery context rather than as an independent explanation for delayed mobility or prolonged hospitalization. Therefore, the present findings indicate an association between older age, lower postoperative mobility, and longer hospital stay, but they do not establish that age itself directly caused poorer functional recovery.

Comorbidity was significantly associated with CAS and length of hospital stay. Patients without comorbidities had the highest mean CAS score (4.7 ± 1.0) and the shortest mean hospital stay (8.5 ± 1.3 days), whereas patients with two or more comorbidities had the lowest CAS score (3.7 ± 1.3) and the longest hospital stay (10.5 ± 1.8 days). However, QoR-15 did not differ significantly according to comorbidity. The observed association between greater comorbidity burden and poorer postoperative mobility may reflect the increased vulnerability of patients with multiple chronic conditions to functional decline following major abdominal surgery. **Tan et al. (2019)**, in a prospective cohort of older patients undergoing emergency abdominal surgery, reported that the Charlson Comorbidity Index was significantly associated with subsequent loss of functional independence in univariate analysis, although premorbid frailty remained the only significant independent predictor after multivariable adjustment. This supports the interpretation that comorbidity may contribute to reduced functional recovery, while its effect may be closely interrelated with other patient-related factors such as baseline frailty and functional reserve. Therefore, the present findings indicate an association between comorbidity burden, postoperative mobility, and hospital stay, without suggesting that comorbidity alone determines overall postoperative recovery.

Surgical status was significantly associated with all three outcomes. Patients undergoing elective surgery had higher mean QoR-15 scores (111.1 ± 13.4), higher CAS scores (4.6 ± 1.0), and shorter hospital stays (8.8 ± 1.4 days) than patients undergoing emergency surgery, whose corresponding values were 103.0 ± 14.5 , 3.7 ± 1.2 , and 10.6 ± 1.8 days. The poorer postoperative recovery observed among patients undergoing emergency surgery may be related to differences in the clinical circumstances surrounding emergency procedures, including limited opportunity for preoperative assessment and optimization and the acute condition prompting surgery. **Peden et al. (2021)** emphasized that emergency laparotomy patients represent a high-risk surgical population requiring rapid diagnosis, optimization, and structured perioperative management, while noting that enhanced recovery principles can also be applied in emergency settings. Therefore, the lower QoR-15 and CAS scores and longer hospitalization observed among emergency patients in the present study should be interpreted as associations with surgical status within a broader clinical context rather than as evidence that emergency surgery alone caused poorer postoperative recovery.

Surgical approach was significantly related to QoR-15, CAS, and length of hospital stay. Patients undergoing laparoscopic surgery had a higher mean QoR-15 score (112.5 ± 12.7) than those undergoing open surgery (105.7 ± 14.8), as well as higher CAS scores (4.7 ± 1.0 versus 4.0 ± 1.2) and a shorter mean hospital stay (8.5 ± 1.3 versus 9.9 ± 1.7 days). **These results are comparable to the minimally invasive approach emphasized within contemporary enhanced recovery pathways by** Gustafsson et al. (2019), although differences in patient selection, type of operation, disease severity, and surgical complexity may contribute to the observed associations.

Conclusion

The nurse-led early mobilization and functional recovery program was associated with significant improvement in postoperative quality of recovery and functional mobility among patients undergoing major abdominal surgery. Most patients achieved better recovery and mobility levels after the intervention, while higher functional mobility was significantly associated with shorter hospital stay. These findings highlight the importance of structured nursing care, early mobilization, and systematic postoperative monitoring.

Recommendations

Based on the findings of the present study, the following recommendations are suggested:

- Implementing structured nursing protocols to support postoperative recovery following major abdominal surgery.
- Promoting early and progressive mobilization according to patients' clinical condition.
- Using QoR-15 and standardized mobility assessment to monitor postoperative recovery.
- Strengthening early detection and prevention of postoperative complications.
- Providing continuous nurse education on enhanced recovery and postoperative mobilization.
- Conducting larger controlled and multicenter studies to confirm these findings.

References

- Balentine, C. J., Naik, A. D., Berger, D. H., Chen, H., Anaya, D. A., & Kennedy, G. D. (2016). Postacute Care After Major Abdominal Surgery in Elderly Patients: Intersection of Age, Functional Status, and Postoperative Complications. *JAMA surgery*, 151(8), 759–766. <https://doi.org/10.1001/jamasurg.2016.0717>
- Castelino, T., Fiore, J. F., Jr, Niculiseanu, P., Landry, T., Augustin, B., & Feldman, L. S. (2016). The effect of early mobilization protocols on postoperative outcomes following abdominal and thoracic surgery: A systematic review. *Surgery*, 159(4), 991–1003. <https://doi.org/10.1016/j.surg.2015.11.029>
- Dindo, D., Demartines, N., & Clavien, P. A. (2004). Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and

- results of a survey. *Annals of surgery*, 240(2), 205–213. <https://doi.org/10.1097/01.sla.0000133083.54934.ae>
- Ferriero, G., Kristensen, M. T., Invernizzi, M., Salgovic, L., Bravini, E., Sartorio, F., & Vercelli, S. (2018). Psychometric properties of the Cumulated Ambulation Score: A systematic review. *European Journal of Physical and Rehabilitation Medicine*, 54(5), 766–771. <https://doi.org/10.23736/S1973-9087.18.04822-0>
- Gustafsson, U. O., Scott, M. J., Hubner, M., Nygren, J., Demartines, N., Francis, N., Rockall, T. A., Young-Fadok, T. M., Hill, A. G., Soop, M., de Boer, H. D., Urman, R. D., Chang, G. J., Fichera, A., Kessler, H., Grass, F., Whang, E. E., Fawcett, W. J., Carli, F., Lobo, D. N., ... Ljungqvist, O. (2019). Guidelines for Perioperative Care in Elective Colorectal Surgery: Enhanced Recovery After Surgery (ERAS®) Society Recommendations: 2018. *World journal of surgery*, 43(3), 659–695. <https://doi.org/10.1007/s00268-018-4844-y>
- Jønsson, L. R., Ingelsrud, L. H., Tengberg, L. T., Bandholm, T., Foss, N. B., & Kristensen, M. T. (2018). Physical performance following acute high-risk abdominal surgery: a prospective cohort study. *Canadian journal of surgery. Journal canadien de chirurgie*, 61(1), 42–49. <https://doi.org/10.1503/cjs.012616>
- Kleif, J., Waage, J., Christensen, K. B., & Gögenur, I. (2018). Systematic review of the QoR-15 score, a patient-reported outcome measure measuring quality of recovery after surgery and anaesthesia. *British journal of anaesthesia*, 120(1), 28–36. <https://doi.org/10.1016/j.bja.2017.11.013>
- Kokotovic, D., Berkfors, A., Gögenur, I., Ekeloef, S., & Burcharth, J. (2021). The effect of postoperative respiratory and mobilization interventions on postoperative complications following abdominal surgery: a systematic review and meta-analysis. *European journal of trauma and emergency surgery : official publication of the European Trauma Society*, 47(4), 975–990. <https://doi.org/10.1007/s00068-020-01522-x>
- Ljungqvist, O., Scott, M., & Fearon, K. C. (2017). Enhanced Recovery After Surgery: A Review. *JAMA surgery*, 152(3), 292–298. <https://doi.org/10.1001/jamasurg.2016.4952>
- Myles, P. S., Shulman, M. A., Reilly, J., Kasza, J., & Romero, L. (2022). Measurement of quality of recovery after surgery using the 15-item quality of recovery scale: A systematic review and meta-analysis. *British Journal of Anaesthesia*, 128(6), 1029–1039. <https://doi.org/10.1016/j.bja.2022.03.009>
- Oodit, R., Biccard, B. M., Panieri, E., Alvarez, A. O., Sioson, M. R. S., Maswime, S., Thomas, V., Kluyts, H.-L., Peden, C. J., de Boer, H. D., Brindle, M., Francis, N. K., Nelson, G., Gustafsson, U. O., & Ljungqvist, O. (2022). Guidelines for perioperative care in elective abdominal and pelvic surgery at primary and secondary hospitals in low-middle-income countries (LMICs): Enhanced Recovery After Surgery (ERAS) Society recommendation. *World Journal of Surgery*, 46(8), 1826–1843. <https://doi.org/10.1007/s00268-022-06587-w>
- Pashikanti, L., & Von Ah, D. (2012). Impact of early mobilization protocol on the medical-surgical inpatient population: an integrated review of literature. *Clinical nurse specialist CNS*, 26(2), 87–94. <https://doi.org/10.1097/NUR.0b013e31824590e6>
- Peden, C. J., Aggarwal, G., Aitken, R. J., Anderson, I. D., Bang Foss, N., Cooper, Z., Dhesi, J. K., French, W. B., Grant, M. C., Hammarqvist, F., Hare, S. P., Havens, J. M., Holena, D. N., Hübner, M., Kim, J. S., Lees, N. P., Ljungqvist, O., Lobo, D. N., Mohseni, S., Ordoñez, C. A., ... Scott, M. (2021). Guidelines for

- Perioperative Care for Emergency Laparotomy Enhanced Recovery After Surgery (ERAS) Society Recommendations: Part 1-Preoperative: Diagnosis, Rapid Assessment and Optimization. *World journal of surgery*, 45(5), 1272–1290. <https://doi.org/10.1007/s00268-021-05994-9>
- Rababa, M., Al Sabbah, S., & Hayajneh, A. A. (2021). Nurses' perceived barriers to and facilitators of pain assessment and management in critical care patients: A systematic review. *Journal of Pain Research*, 14, 3475–3491. <https://doi.org/10.2147/JPR.S332423>
- Reaza-Alarcón, A., & Rodríguez-Martín, B. (2019). Effectiveness of nursing educational interventions in managing post-surgical pain. Systematic review. *Investigacion y educacion en enfermeria*, 37(2), e10. <https://doi.org/10.17533/udea.iee.v37n2e10>
- Stark, P. A., Myles, P. S., & Burke, J. A. (2013). Development and psychometric evaluation of a postoperative quality of recovery score: The QoR-15. *Anesthesiology*, 118(6), 1332–1340. <https://doi.org/10.1097/ALN.0b013e318289b84b>.
- Tan, H. L., Chia, S. T. X., Nadkarni, N. V., Ang, S. Y., Seow, D. C. C., & Wong, T. H. (2019). Frailty and functional decline after emergency abdominal surgery in the elderly: a prospective cohort study. *World journal of emergency surgery : WJES*, 14, 62. <https://doi.org/10.1186/s13017-019-0280-z>
- Treacy, D., Hassett, L., Schurr, K., Fairhall, N. J., Cameron, I. D., & Sherrington, C. (2022). Mobility training for increasing mobility and functioning in older people with frailty. *The Cochrane database of systematic reviews*, 6(6), CD010494. <https://doi.org/10.1002/14651858.CD010494.pub2>
- Yolcu, S., Akin, S., & Durna, Z. (2016). The evaluation of mobility levels of postoperative patients and associated factors. *Journal of Education and Research in Nursing*, 13(2), 129–138. DOI: 10.5222/HEAD.2016.129