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# Enhancing recovery in older patients undergoing abdominal surgery: Examining the effect of a preoperative preparation program using a quasi-experimental design

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## Abstract

**Background:** Older adult patients often experience delayed postoperative recovery due to a lack of self-efficacy in engaging in physical activities during early rehabilitation. Concurrently, family caregivers play a crucial role in caring for older adults. However, the extent of family involvement in improving self-efficacy and facilitating recovery following major abdominal surgeries in older adults remains largely unexplored.

**Objective:** This study aimed to examine the effect of a preoperative preparation program on the recovery of older patients undergoing major abdominal surgeries.

**Methods:** A quasi-experimental study with a two-group, pretest-posttest design was conducted. The participants included 60 older adult patients undergoing abdominal surgeries at Thammasat University Hospital, Thailand, between September 2019 and March 2020. Participants were selected by purposive sampling with the inclusion criteria and were assigned to the experimental ($n$ = 30) or the control ($n$ = 30) groups using matched pair according to the type of operation. The control group received standard care, while the intervention group underwent a two-week preoperative preparation program developed based on self-efficacy theory and family support. Data were collected using validated tools. Recovery was assessed at one week and two weeks after surgery. Descriptive statistics, as well as dependent and independent t-tests, were used for data analysis.

**Results:** The results revealed that the intervention group had significantly higher mean recovery scores than the control group at one week (M = 56.93, SD = 16.42; M = 44.60, SD = 16.30, $t$ = -2.92, df = 58, $p$ <0.01) and two weeks after surgery (M = 66.64, SD = 8.63; M = 61.68, SD = 7.86, $t$ = -2.33, df = 58, $p$ <0.05) when comparing between the two groups.

**Conclusion:** The preoperative preparation program effectively enhanced recovery one week and two weeks after surgery. The study findings can be valuable for nurses in implementing the preoperative preparation program to facilitate recovery among older adult patients undergoing abdominal surgeries.

## Keywords

recovery; preoperative preparation program; older adults; abdominal surgery; family support; self-efficacy; Thailand

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## Background

In most countries, individuals 65 years old and above are considered older adults (United Nations, 2017). This older adult population accounts for 16% of the global population and is projected to grow by 3% annually (United Nations, 2017). In Thailand, individuals aged 60 and above are classified as older adults, comprising 17.2% of the total Thai population in 2020 ((Population Reference Bureau, 2020). Among the Association of Southeast Asian Nations (ASEAN) countries, Thailand has the second-highest proportion of older adults (Population Reference Bureau, 2020).

Older adults experience various physiological changes in their bodies (Dumic et al., 2019; Shilpa et al., 2018; Thailand Division of Non Communicable Diseases, 2021), including degeneration, as described by multiple supporting theories such as the wear and tear theory, the accumulation of harmful substances, and the loss of elasticity in extracellular proteins (Shilpa et al., 2018). Moreover, improper self-care behaviors can lead to various health issues among older adults, particularly concerning the gastrointestinal tract (Dumic et al., 2019). In Thailand, gastrointestinal cancer is the most prevalent among older adult males and the third-most common among older adult females (Thailand Division of Non Communicable Diseases, 2021). Additionally, conditions like infection and perforation of abdominal organs are frequently observed in older adults, necessitating surgical intervention for management.

Major abdominal surgery in older adult patients carries a significant risk due to the body's deterioration and preexisting comorbidities (Etele et al., 2019). The impact of anesthesia during abdominal surgery can have long-lasting effects, while blood loss can affect the muscular, respiratory, and circulatory systems, leading to anemia, fatigue, and delirium (Bettelli & Neuner, 2017). These conditions can impede the recovery period. Following surgery, older adult patients frequently experience acute and severe pain (Hudspith, 2016), which results in reduced physical activity. Additionally, the medication used during surgery, such as muscle relaxants, can affect the mobility of older adult patients. Prolonged exposure to muscle relaxants can lead to changes in muscle function in older adult patients (Miskovic & Lumb, 2017).

Furthermore, general anesthesia and opioid analgesics have been shown to diminish cognitive function in older adult patients after surgery (van Steenbergen et al., 2019). Alongside altering the brain's neurotransmitters, a decline in perception has been observed in older adult patients (Handra et al., 2019). Moreover, inadequate pain management can cause older patients to reduce their postoperative rehabilitation activities, which leads to complications within the first and second weeks after surgery (Dajenah et al., 2022). Existing research has consistently shown that older adult patients are more susceptible to postoperative complications than other patient groups (Chinuntuya & Chutitorn, 2016; Dajenah et al., 2022). These complications encompass infections, confusion, ileus, and gastroparesis (Dajenah et al., 2022), which can result in an extended duration of hospitalization for patients (Etele et al., 2019).

Postoperative recovery refers to the process in which a patient returns to a normal or near-normal state following surgery (Hollenbeck et al., 2008). There are four domains that encompass recovery after abdominal surgery: 1) pain management, 2) gastrointestinal function, 3) cognition, and 4) activities. A recovery scale can be used to assess postoperative recovery progress. Encouraging appropriate behaviors after surgery can expedite the restoration of normal organ function, shorten the recovery period, and improve the overall quality of life for patients undergoing major abdominal surgeries (Li et al., 2020; Phamornpon, 2016). Notably, older adult patients, who often experience reduced cognitive function and frailty, may face additional challenges in adopting these behaviors, potentially leading to a higher risk of postoperative complications.

Thammasat University Hospital (TUH), a leading tertiary hospital in Thailand, has observed a significant increase in admissions of older adult patients undergoing gastrointestinal surgery. The number of older adult patients undergoing gastrointestinal surgery increased by 50.72% in 2015, which rose to 52.46% in 2019 (Medical Record and Statistics Department TUH, 2018). Despite the availability of various clinical practice guidelines for preoperative and postoperative care, the occurrence of complications following abdominal surgery remains a concern among older adult patients (Chobarunsitti et al., 2008). Consequently, the treatment duration and length of hospital stay have been extended from 4-6 days to 15-22 days ((Medical Record and Statistics Department TUH, 2018). These complications often stem from inadequate and improper rehabilitation due to a lack of self-efficacy in ambulating after surgery (Brembo et al., 2017).

Prior researchers have developed a postoperative rehabilitation program to promote recovery in adult patients, which has shown positive outcomes (Chobarunsitti et al., 2008). However, limitations have been observed, specifically in older adult patients following surgery. A study conducted by Tan et al. (2019) discovered a significant association between older adults with comorbidities and frailty and the loss of functional activity after abdominal surgery. Similarly, Simões et al. (2018) reported that older patients experienced a higher incidence of complications (9.5% surgical infection, 9.1% cardiovascular complications, and 4.5% respiratory complications) following abdominal surgery compared to younger patients (63.3 ± 12.5 years vs. 57.8 ± 14.5 years). They also had significantly longer hospital stays (17 days) compared to younger or non-frail patients (10 days). These postoperative complications among older adult patients have been linked to low self-efficacy in engaging in early rehabilitation (Brembo et al., 2017). A previous study demonstrated that applying the self-efficacy theory to enhance perceived self-efficacy can increase physical activities in older adults (Resnick, 2018). There are four sources identified for improving perceived self-efficacy: 1) mastery experience, 2) vicarious experience, 3) verbal persuasion, and 4) emotional and physiological state (Bandura, 1997).

Furthermore, a study in Spain revealed that involving family members in a preoperative preparation program can improve postoperative patients' recovery (Cardoso-Moreno & Tomás-Aragones, 2017). Family involvement serves as a vital source of social support, aligning with the social support theory (House et al., 1988), which categorizes social support into four dimensions: emotional, support, information, and instrumental support. In the Thai healthcare context, it is common for patients to be admitted to hospitals a few days prior to major abdominal surgeries. A systematic review by Launay-Savary et al. (2017) recommended a preoperative preparation program for better surgical recovery in older patients.

Given the crucial role of family caregivers, involving family members in the preoperative program has the potential to enhance patients' self-efficacy in engaging in physical activities. Thus, this study aimed to examine the effect of a preoperative preparation program integrated with family support on the recovery of older adults following abdominal surgery. This research holds particular importance in the nursing field due to the crucial roles of nurses in facilitating the surgical recovery process for older patients.

## Methods

### Study Design

The study utilized a quasi-experimental design employing a two-group, pretest-posttest approach, with measurements conducted one week and two weeks after the surgical procedure.

### Samples/Participants

The study sample consisted of individuals aged 60 years and above who underwent prescheduled open abdominal surgeries, including procedures on the stomach, liver, pancreas, spleen, small intestine, large intestine, and rectum. The patients were admitted to the male and female surgical wards of Thammasat University Hospital in Thailand between September 2019 and March 2020.

The sample size was determined by setting a 95% confidence interval and a statistical power of 0.80 while considering an effect size of 4.15 from a previous study (Chobarunsitti et al., 2008), which was deemed excessively large and inappropriate. Therefore, an effect size of 0.80 was chosen for calculation purposes (Cohen, 1988). Using G*Power application version 3.1.9.2, with a one-tailed test, a minimum of 21 participants per group was required. However, considering the literature indicating the risk of extubation failure, reintubation, or repeated surgery within 72 hours after the procedure for older adult patients (Thille et al., 2013), the researchers added extra participants to account for potential dropouts. Ultimately, the total sample size for this study was 60 participants, with 30 participants assigned to each group.

Purposive sampling was employed to select the participants, who were then assigned to either the experimental group or the control group using a matched pair approach based on the type of operation (gastric, pancreatic, hepatobiliary, spleen, small intestine, large intestine, and anus). This matching process was continued until there were 30 participants in each group. The inclusion criteria included: 1) being 60 years of age or older, 2) undergoing their first prescheduled open abdominal operation, 3) having a family member as a caregiver, and 4) having proficiency in the Thai language (listening and reading). Exclusion criteria encompassed: 1) acute cognitive impairment, 2) development of postoperative complications that could be potentially harmful to continue in the study (e.g., hypertension, arrhythmia, massive internal bleeding), 3) unavailability of a family member for a two-week period, and 4) admission to the intensive care unit (ICU) within three days after surgery.

**Instruments**

Several instruments were used in this study as follows:

1) General information questionnaire to collect patients' personal information, medical history, details about their surgery, and information about their family members.

2) The Convalescence and Recovery Evaluation (CARE) questionnaire, initially developed by Hollenbeck et al. (2008), was utilized in this study. A Thai version of the CARE questionnaire was available, which had been translated using the back-translation technique by Kritsanabud et al. (2012). Permission to use the Thai version was obtained from the Thai authors, Kritsanabud et al. (2012). The reliability of the Thai version was assessed using Cronbach's alpha coefficient, which yielded a value of 0.91 (Kritsanabud et al., 2012). The CARE consisted of 27 questions covering four dimensions: 1) pain, 2) gastrointestinal symptoms, 3) cognitive function, and 4) activities. Responses were provided on a rating scale with six levels (0-5) for pain, stomach and intestines, and perception, as well as five levels (1-5) for activities. The total possible score ranged from 0 to 100, with higher scores indicating better recovery after surgery and lower scores indicating poorer recovery. In this study, the CARE's reliability was tested among 30 older adults who underwent abdominal surgery, yielding a Cronbach's alpha coefficient of 0.81.

3) The Barthel Index for Activities of Daily Living (ADL) is a self-report instrument consisting of 10 items. It was originally developed by Mahoney and Barthel (1965) and was available in the Thai version by Arunsaeng (2017). In this study, the Thai version of the Barthel Index was used with permission from the respective Thai author, Arunsaeng (2017). The instrument assesses ten components of ADL utilizing a rating scale of three levels (0, 1, and 2) or four levels (0, 1, 2, and 3) for each item, resulting in a final score ranging from 0 to 20 points. A higher score indicates better performance and greater independence, while a lower score suggests a higher degree of dependence. A score of 12 or more means the patient's ability to perform activities independently and meet the criteria. The reliability of the ADL instrument was assessed in this study among 30 older adults who underwent abdominal surgery, with a Cronbach's alpha coefficient of 0.87.

4) The Short Portable Mental Status Questionnaire (SPMSQ) was originally developed by Pfeiffer (1975), as cited in Arunsaeng (2017), and a Thai version of the questionnaire was available. In this study, the Thai version of the SPMSQ was used with permission from the respective Thai author, Arunsaeng (2017). The questionnaire consists of 10 questions assessing various cognition aspects, including knowledge of the date, time, place, people, and basic calculations. Each correct response is assigned 1 point. A higher score indicates better cognitive function, while a lower score suggests cognitive impairment. A total score of 8 or more indicates good cognition and the ability to understand the program. The reliability was assessed using the test-retest method, with the retest administered three days later among 30 older adults who underwent abdominal surgery. The analysis yielded a Cohen's kappa coefficient of 0.82, indicating good reliability of the SPMSQ instrument.

5) The Perceived Self-Efficacy Scale (PSES) was originally developed by Oetker-Black and Kauth (1995) and subsequently translated into Thai by Chobarunsitti et al. (2008). In this study, the Thai version of the PSES was utilized with permission from the Thai author, Chobarunsitti et al. (2008). The PSES is a self-report instrument consisting of 16 items designed to assess the patient's perceived ability to engage in activities such as deep breathing exercises, turning, sitting, walking, applying relaxation techniques, and managing pain following surgery. Participants rated each item on a 10-point scale, ranging from 0 (indicating low confidence) to 10 (indicating high confidence). The internal reliability of the PSES was established using a sample of 100 adults, resulting in a Cronbach's alpha coefficient of 0.91 (Chobarunsitti et al., 2008). A higher score on the PSES indicates greater confidence in performing the specified activities, while a lower score suggests a lack of confidence. If any dimensions with low scores were identified, the researchers provided additional instruction on that particular component. In this study, the reliability of the PSES was evaluated among 30 older adults who underwent abdominal surgery, yielding a Cronbach's alpha coefficient of 0.93, indicating good internal consistency of the PSES instrument. It is also noted that the PSES was used as an additional analysis to explain the program's effects in this study. A high PSES was described as a cognitive mediator in emphasizing the patient's behavior with conditions after surgery (Resnick, 2018).

**Interventions**

The control group received standard care, which involved nurses in the surgical departments providing education to older adult patients on various health-related topics the day before their surgeries. This education covered areas such as general health information, treatment details, surgical planning (e.g., clothing, fasting, and skin preparation), and potential surgical complications. In contrast, the intervention group received the preoperative preparation program outlined in **Table 1**. The implementation of the intervention is visually presented in **Figure 1**.

The researchers delivered the preoperative preparation program through face-to-face sessions with each participant one day before their scheduled surgery. They subsequently followed up with the participants for a duration of 14 days postoperatively. The program was developed based on self-efficacy theory (Bandura, 1997) and social support theory (House et al., 1988). To implement the program, a handbook of postoperative behavior and a 10-minute video clip were utilized, as described below:

1) Handbook of Postoperative Behavior: The researchers created a comprehensive handbook that outlined the program's details, duration, and activities that patients should be able to perform independently. These activities included effective breathing, coughing, turning, turning upside-down, sitting, standing, walking, and performing body scans. The content validity of the handbook was assessed by five experts, including two surgical nursing lecturers, two surgical nursing professionals, and one gastrointestinal surgeon, resulting in a content validity index (CVI) of 1.00. Prior to the main study, a pilot study involving five older adult patients with similar characteristics was conducted to ensure the feasibility and suitability of the handbook.

2) 10-Minute Video Clip: The researchers developed a 10-minute video clip demonstrating the performance of rehabilitation activities by a case model. The video showcased the proper techniques for effective breathing, coughing, turning, turning upside down, sitting, standing, and walking. The content of the video clip was evaluated for content validity by the same panel of five experts, resulting in a CVI of 1.00. Additionally, a pilot study involving five older adult patients with similar characteristics to those in the main study was conducted to validate the effectiveness and appropriateness of the video clip.

The online engagement of the handbook and video can be seen at http://surl.li/gosvx.

**Table 1** Intervention for the experimental group

| Day | Objective | Activity | Family |
|---|---|---|---|
| Day 1 before surgery (60 min) | Screening Assessment | A rationale and overview of the intervention were introduced, after which the researcher evaluated the participants using the questionnaire.<br>- Evaluation of ability to perform ADL<br>- Evaluation of cognition using the SPMSQ<br>- Assessment of the pretest of perceived self-efficacy by the PSES | Learning with the participants |
| | Program processing | The program was conducted based on self-efficacy theory integrated with social support theory and included four sources:<br>1) Enactive mastery experience – The participants were led through a breathing exercise, coughing, using the incentive spirometer device, exercising on the bed, sitting, standing, walking, and performing body scan meditation after surgery by themselves.<br>2) Vicarious experience – The participants and family members watched a video of models demonstrating how to perform the activity as item 1.<br>3) Verbal persuasion – The researcher and family members persuaded the participants to encourage or empower them; positive reinforcement was given to build confidence in their ability to perform.<br>4) Physiological and affective states – The participants and family members learned about evaluating and reporting abnormal symptoms (pain, bloating, abdominal distension, nausea, and vomiting).<br>Afterward, the participants and family members reverse-demonstrated the activities and raised questions. | Learning with the participants and helping them while performing |
| | Assessment | After the intervention, the researcher again assessed the post-test of perceived self-efficacy using the PSES. If the patients were found to have low perceived self-efficacy, the researcher encouraged them to perform activities in that domain. | Helping the participants while performing |
| Days 1–14 after surgery (30 min) | Assessment | Every morning, the researcher followed up and assessed the readiness to perform an activity, including vital signs, perception, pain management, vomiting, drainage, vertigo, and bleeding. If any item was missed, it was deemed unsafe to perform, and the activity was stopped, resolved, and re-evaluated. If the patient was admitted to the ICU after surgery, the researcher recorded this in the report (not over three days). | Assess with the researcher and ask questions or address problems |
| | Promoting consistency of the program | If the participants met all criteria and were deemed safe, family members helped them perform with the activity guidelines. In the case of discharge 14 days after surgery, the researcher followed up daily and encouraged them by phone. | Helping the participants while performing |
| Day 7 and day 14 after surgery (30 min) | Outcome evaluation | The researcher assessed the participants' recovery using the CARE questionnaire. If the participants were discharged prior to 14 days after surgery, the researcher evaluated them in their homes, marking the end of the program. | Evaluation with the researcher, asking questions, and taking suggestions |


**Figure 1** Intervention implementation (published with permission)

### Data Collection

The study was conducted between September 2019 and March 2020. Upon receiving approval from the ethics committee, the researcher approached the head nurse of the surgical department to explain the study's purpose and select potential participants. Subsequently, the researchers met with all eligible participants who agreed to participate in the study one day before their scheduled surgeries. Informed consent forms were provided and signed by participants in both the experimental and control groups. Before receiving the preoperative preparation program and usual care, participants in the experimental group were asked to complete three questionnaires as part of the pretest assessment. Similarly, participants in the control group completed the pretest questionnaires before receiving the usual care from the surgical staff. At one and two weeks after surgery, participants in the intervention group were asked to complete a questionnaire assessing their recovery progress. Likewise, the control group completed a similar questionnaire on recovery at the end of week 1 and week 2 following their surgeries.

### Data Analysis

Descriptive statistics were employed to analyze the demographic data, including gender, age, smoking history, comorbidity, diagnosis, and surgical details, of the older adult patients and their families. Frequencies, means, standard deviations, and percentages were calculated for these variables. The chi-square and likelihood ratio tests were used to compare the demographic characteristics between the experimental and control groups. The study hypothesized that the experimental group, receiving the preoperative preparation program, would have higher recovery scores (CARE) compared to the control group at one week and two weeks after surgery. A one-tailed test with a significance level of 0.05 was considered statistically significant. Assumptions of normality and homogeneity of variance for the CARE scores one and two weeks after surgery were not violated. Therefore, dependent and independent sample t-tests were conducted using SPSS version 23 to analyze the data. Additionally, self-efficacy scores were included as an additional analysis to explore the effects of the program. One-tailed tests with a significance level of 0.05 were used. The assumptions of normality and homogeneity of variance for the self-efficacy scores were not violated. Independent t-tests were performed on the samples.

### Ethical Considerations

This research received approval from the Human Research Ethics Committee at Thammasat University, Thailand (CoA No.107/2562). Prior to participating in the study, all participants provided informed consent by signing a consent form. This article is a part of the thesis entitled "The effect of a preoperative preparation program, integrated with family support, on the recovery and pulmonary complications among older adult patients undergoing major abdominal surgery." The preliminary study (Penphumphuang et al., 2020) described the recovery at one-week post-abdominal surgery among older adults receiving usual care. It is important to note that the samples used in the preliminary and present studies were totally different.

## Results

### General Information about the Participants

Male patients were predominant in the control (73.3%) and experimental (63.3%) groups. The average ages for the control and experimental groups were 69.40 (SD = 7.34) and 68.43 (SD = 6.28), respectively. The majority of participants in both groups had a preoperative illness, with colon cancer being the most common diagnosis, accounting for 60.0% in the control group and 63.3% in the experimental group. This aligns with the prevalence of colorectal surgery, followed by hepatobiliary surgery. Epidural analgesia was the primary method of pain control for most participants in both groups (60.0%), followed by intravenous patient-controlled analgesia (26.7%). The chi-square test and Fisher's exact test were used to compare the general data, and no significant differences in characteristics were found between the two groups (*p* >0.05), as presented in **Table 2**.

**Table 2** General participant information (*N* = 60)

| Variable | Control Group *n* (%) | Experimental Group *n* (%) | $x^2/t$ | *p* |
|---|---|---|---|---|
| **Gender** | | | | |
| Male | 22 (73.3) | 19 (63.3) | 0.69[a] | 0.405 |
| Female | 8 (26.7) | 11 (36.7) | | |
| **Smoking History** | | | | |
| No | 15 (50.0) | 22 (73.4) | 3.82[b] | 0.134 |
| Yes, quit smoking | 11 (36.7) | 7 (23.3) | | |
| Yes, still smoking | 4 (13.3) | 1 (3.3) | | |
| **Comorbidity** | | | | |
| No | 8 (26.7) | 10 (33.3) | 0.32[a] | 0.573 |
| Yes | 22 (73.3) | 20 (66.7) | | |
| **Diagnosis** | | | | |
| CA colon | 18 (60.0) | 19 (63.3) | 0.38[b] | 0.993 |
| CA hepatobiliary | 10 (33.3) | 9 (30.0) | | |
| CA stomach | 2 (6.7) | 2 (6.7) | | |
| **Operation** | | | | |
| Colon surgery | 18 (60.0) | 19 (63.3) | 0.38[b] | 0.993 |
| Hepatobiliary surgery | 8 (26.7) | 7 (23.3) | | |
| Stomach surgery | 2 (6.7) | 2 (6.7) | | |
| Whipple's procedure | 2 (6.7) | 2 (6.7) | | |
| **Pain Control Method** | | | | |
| Epidural anesthesia (EA) | 20 (66.7) | 16 (53.3) | 1.19[a] | 0.550 |
| Intravenous patient control analgesia (IVPCA) | 7 (23.3) | 9 (30.0) | | |
| Intravenous (IV) | 3 (10.0) | 5 (16.7) | | |
| **Age** [c] | | | | |
| Mean (SD) | 69.40 (1.34) | 68.43 (1.10) | 0.55 | 0.747 |
| Range | 60–84 years | 60–84 years | | |

a = chi-square; b = Fisher's exact test; c = continuous variable; the values representing mean, SD, and *t*-test

In both the control and experimental groups, the majority of family members were female (83.3% and 76.7%, respectively), with mean ages of 56.50 (SD = 10.05) and 56.70 (SD = 10.34), respectively. The most common relationship was spouses, accounting for 53.3% in the control group and 63.3% in the experimental group. Additionally, most family members had no prior experience in caring for patients undergoing abdominal surgery. Chi-square and Fisher's exact tests indicated no significant differences in family member characteristics between the two groups (*p* >0.05).

### Information on Perceived Self-Efficacy

The mean score of perceived self-efficacy in the experimental group significantly increased to 105.60 (SD = 17.69) after participating in the program, compared to the mean score of 83.20 (SD = 19.73) for patients in the control group receiving standard care (*t* = -4.64, df = 58, *p* <0.01).

### Convalescence and Recovery

It was observed that both the control and experimental groups showed an increase in recovery scores in week two compared to week one. The control group had a mean recovery score of 61.68 (SD = 7.86) in week two, significantly higher than the mean score of 44.60 (SD = 16.30) in week one (*t* = -7.06, df = 29, *p* <0.01). Similarly, the experimental group had a mean recovery score of 66.64 (SD = 8.63) in week two, significantly higher than the mean score of 56.93 (SD = 16.42) in week one (*t* = -4.05, df = 29, *p* <0.01) (**Table 3**).

**Table 3** Comparison of recovery scores at one week and two weeks after surgery within the experimental and control groups

| | Week 1 | | Week 2 | | *t* | df | *p* |
|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | | | |
| Control | 44.60 | 16.30 | 61.67 | 7.86 | -7.06 | 29 | 0.000** |
| Experiment | 56.93 | 16.42 | 66.64 | 8.63 | -4.05 | 29 | 0.000** |

***p* <0.01, *t* = dependent sample *t*-test

When comparing the differences in postoperative recovery mean scores between the experimental and control groups (intergroup comparison) at weeks 1 and 2, it was found that in week one, the experimental group had a mean recovery score of 56.93 (SD = 16.42), significantly higher than the control group's mean score of 44.60 (SD = 16.30) (*t* = -2.92, df = 58, *p* <0.01). In week two, the experimental group had a mean recovery score of 66.64 (SD = 8.63), which was also significantly higher than the control group's mean score of 61.68 (SD = 7.86) (*t* = -2.33, df = 29, *p* <0.05) (**Table 4**).

**Table 4** Comparison of convalescence and recovery between the control and experimental groups one week and two weeks after surgery

| Convalescence and Recovery | Control group (*n* = 30) | | Experimental group (*n* = 30) | | *t* | df | *p* |
|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | | | |
| **Week 1 after surgery** | **44.60** | **16.30** | **56.93** | **16.42** | **-2.92** | **58** | **0.003**** |
| 1) Pain domain | 56.81 | 8.96 | 62.54 | 9.51 | -2.40 | 58 | 0.010** |
| 2) Gastrointestinal domain | 47.96 | 22.80 | 64.83 | 22.09 | -2.91 | 58 | 0.003** |
| 3) Cognition domain | 39.28 | 21.91 | 50.98 | 20.36 | -2.14 | 58 | 0.018* |
| 4) Activity domain | 34.36 | 17.42 | 49.37 | 17.38 | -3.34 | 58 | 0.001** |
| **Week 2 after surgery** | **61.68** | **7.86** | **66.64** | **8.63** | **-2.33** | **58** | **0.012*** |
| 1) Pain domain | 66.37 | 8.25 | 71.78 | 7.06 | -2.73 | 58 | 0.004** |
| 2) Gastrointestinal domain | 66.84 | 9.81 | 72.18 | 12.10 | -1.88 | 58 | 0.033* |
| 3) Cognition domain | 50.48 | 11.59 | 52.81 | 13.83 | -0.71 | 58 | 0.242 |
| 4) Activity domain | 63.02 | 11.48 | 69.80 | 11.69 | -2.27 | 58 | 0.014* |

** $p$ <0.01, * $p$ <0.05, $t$ = independent sample $t$-test

# Discussion

The study revealed that the experimental group had significantly higher recovery scores than the control group in postoperative weeks 1 and 2. These findings align with the principles of perceived self-efficacy theory and the influence of family support. Despite facing potential obstacles, the experimental group demonstrated increased confidence and higher perceived self-efficacy scores, leading to their proactive engagement in activities that fostered recovery. Consistent with the findings of Chobarunsitti et al. (2008), patients undergoing abdominal surgery with heightened perceived self-efficacy scores achieved significantly better recovery outcomes than the control group. Additionally, the presence of family support further contributed to the patient's confidence and facilitated their engagement in recovery-promoting activities. These results align with the study conducted by Cardoso-Moreno and Tomás-Aragones (2017), which demonstrated that patients undergoing abdominal surgery who reported significant support from their families had superior recovery scores compared to the control group.

When analyzing each recovery domain, significant differences were observed between the experimental and control groups in the pain domain in both week 1 and week 2, with the experimental group having higher recovery scores. This outcome can be attributed to the experimental group's engagement in movement exercises facilitated by their relatives, effectively reducing abdominal muscle contractions and enhancing pain control, subsequently minimizing the impact on the surgical wound. As a result, the experimental group experienced less pain and demonstrated better recovery in the pain domain. This finding aligns with a systematic review by Fan and Chen (2020), highlighting the effectiveness of non-pharmacological interventions and the utilization of videos for pain relief following orthopedic surgery. Furthermore, the involvement of family support in practicing relaxation techniques can influence the limbic system and stimulate the release of endorphins by the hypothalamus, leading to pain reduction through a mechanism similar to morphine. This finding also supports the gate control theory, which aids in pain reduction. Effective pain control enables patients to engage in a broader range of activities, further contributing to their overall recovery process.

Regarding the activity domain, significant improvements were observed for the experimental group compared to the control group in both weeks 1 and 2. This outcome can be attributed to effective pain control, as discussed earlier, and the experimental group's enhanced confidence in performing activities. The experimental group had a higher average score in activity accomplishment after participating in the program, significantly superior to the control group receiving standard care as described previously. This finding aligns with a study conducted by Hayashi et al. (2018), which revealed that postoperative aneurysm patients with increased self-efficacy demonstrated significantly improved activity performance, measured by the six-minute walk distance. Additionally, receiving support from family members played a significant role in promoting activity performance. Wirojyuti et al. (2014) found that older adult patients who received social support had significantly higher scores in postoperative activity performance than in the control group receiving standard care. Engaging in activities postoperatively can stimulate various body systems and contribute to better recovery outcomes following abdominal surgery.

For the gastrointestinal domain, significant improvements were observed for the experimental group than the control group in week 1, but no significant difference in week 2. In week 1, the experimental group engaged in early ambulation, which stimulated intestinal activity and reduced the persistence of secretions. Furthermore, the experimental group received appropriate pain control, which involved the administration of painkillers, specifically opioids. It is worth noting that opioids can have side effects such as nausea, vomiting, and a negative impact on intestinal motility, leading to constipation (Lhoawchai et al., 2018). Rogers et al. (2013) reported that opioid use can inhibit bowel function in 9-80% of older adults. Support from family members can also play a role in promoting activities and aiding in eating-related care. Conceição et al. (2020) found that patients with high social support awareness scores also exhibited improved eating behaviors after abdominal surgery. Early initiation of eating after surgery stimulates bowel movements and reduces abdominal distension (Bragg et al., 2015). In the second week of the postoperative phase, nerve fibers and intestinal tissue require an average recovery time (Tu et al., 2014). During this normal recovery period, the bowel can regain its effective movement, which explains the absence of a significant difference in this domain during the second week.

Regarding the cognition domain, significant improvements were observed for the experimental group compared to the control group in week 1, but no significant difference was found in week 2. In week 1, the experimental group engaged in practices that used various tools, such as books, videos, and reverse demonstrations, to enhance understanding. The family played a crucial role in supporting and emphasizing these cognitive exercises. Research by Wang et al. (2014) supports diverse strategies to prevent and treat cognitive impairment and promote postoperative consciousness. Constant stimulation, including activities that promote awareness of dates, times, places, and people (such as relatives or family members), can contribute to improved cognitive function in older adult patients during the postoperative period (Kotekar et al., 2018). Moreover, practicing relaxation techniques, such as body scans, can help patients concentrate and effectively manage pain, leading to enhanced cognitive perception and reduced symptoms of forgetfulness during the postoperative period (Rekatsina et al., 2022). However, no significant difference in cognitive recovery was observed between the groups during the second week of the postoperative period. This finding may be due to the average recovery process and reduced exposure to drugs, which could have a negative impact on cognition. Specifically, the correlation between pain perception and opioid exposure may decrease during this period, thereby alleviating potential cognitive impairment.

**Limitations of the Study**

This study included participants who underwent various types of abdominal surgeries, which could have led to different complicating factors and limited the generalizability of the findings to specific surgical procedures. Furthermore, the study's limitations include its single-setting nature and quasi-experimental design, which may have introduced potential selection biases. However, to address this issue, the researchers utilized the Chi-square test to examine the differences in participant characteristics between the control and experimental groups. The analysis indicated no statistically significant differences were observed in these characteristics, mitigating potential biases to some extent.

**Implications for Nursing Practice**

The findings of the study confirm the initial hypotheses and provide evidence supporting the positive effects of the preoperative preparation program on self-efficacy and post-surgical recovery. This outcome aligns with the research objective. The program shows promise in improving self-efficacy, convalescence, and overall recovery among older adult patients in the intervention group. The program's effectiveness can be attributed to the integration of self-efficacy theory, which focuses on cognitive factors influencing rehabilitation, and family support theory, which addresses the challenges faced by older adult patients in recognizing and implementing appropriate recovery practices. Nurses can play a crucial role in improving the recovery outcomes of these patients by implementing this program.

Considering the global trend of population aging and the increasing number of older adult patients undergoing abdominal surgery, it is crucial for nurses also to prioritize and provide comprehensive recovery support in various aspects. These include pain management, gastrointestinal recovery, cognitive stimulation, and physical activity. Implementing the preoperative preparation program in these areas can significantly benefit patients and improve their recovery.

Future research should consider conducting studies in multiple settings and employing a true experimental design to validate the program's effectiveness for specific types of surgeries. Additionally, long-term evaluations of the program's impact on recovery should be emphasized, particularly in the home setting. Such research will provide further evidence and guidance for nurses and healthcare professionals to optimize recovery outcomes for older adult patients undergoing major abdominal surgeries.

In addition, it is essential to acknowledge the limitations of the study, such as the limited generalizability to specific surgical procedures due to the inclusion of various abdominal surgeries and the potential biases associated with a single-setting quasi-experimental design. Nurses should be mindful of these limitations when applying the study findings to their practice and recognize the need for further research in different settings and surgical populations to strengthen the evidence base.

# Conclusion

The study findings indicate that enhancing self-efficacy and incorporating family support can facilitate recovery in multiple dimensions for older adult patients undergoing abdominal surgeries. The intervention group, which had significantly higher levels of self-efficacy, demonstrated greater confidence in performing pre- and postoperative practices than the control group. Consequently, the recovery (CARE) intervention yielded significantly higher recovery scores compared to the control group. Healthcare providers and nurses can utilize this program to improve the recovery outcomes of vulnerable populations undergoing abdominal surgeries.

## Declaration of Conflicting Interest

The authors declared no conflict of interest in this study.

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## Authors' Contributions

IP: research conception and design, data collection, analysis, discussion of results, and draft manuscript preparation; YM reviewed the results and revised the draft; PM has made substantial contributions to the conception and design. TB revised and drafted the manuscript preparation. All authors approved the final version of the manuscript.

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## Data Availability

Datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

## Declaration of Use of AI in Scientific Writing

None.

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