Original Article

Effectiveness of a Supportive Educational Intervention on Pain and Physical Function among Patients undergone Abdominal Surgery: A Randomized Controlled Trial

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Abstract
Background: Improved results and increased mobilization following abdominal surgery are achieved by pain management and early mobilization strategies.
Objective: The study aimed to assess the effectiveness of supportive educational intervention on the level of pain and physical function of patients who had undergone abdominal surgery in both the experimental and control groups.
Methodology: A randomized control experiment was conducted in sixty post-operative patients. Thirty patients each were assigned to an experimental group and a control group. The experimental group received supportive educational intervention, whereas the control group received routine care. The Barthel index for daily living activities and the numerical pain rating scale were evaluated following the nursing intervention in each group.
Results: Following the intervention, in the experimental group, 70% of patients had mild pain and 90% had independent physical function, whereas in the control group, 40% had mild pain and 46% had independent physical function. Comparing the experimental group of patients to the control group, there was a significant increase in physical function and a significant reduction in pain ($p<0.001$).
Conclusions: The results of the study demonstrated that to reduce postoperative patients' pain and enhance their physical performance, nurses working in a clinical setting should implement a supportive educational intervention as a follow-up treatment. More research in randomized controlled trials with a larger sample size is required to validate these findings.

Keywords: Supportive educational intervention, Pain, Physical function, Abdominal Surgery

Introduction

Surgery is a branch of medicine in which patients are operated on to investigate or cure pathological conditions, including diseases or injuries, improve physical appearance or function, and repair areas that have been surgically ruptured. Surgery, anesthetic management, or both are necessary for 11% of the world's disease load. This burden may be as much as 30%, according to some research. According to estimates from the Lancet Commission for Global Surgery (LCoGS), 5,000 surgeries are needed in low- and middle-income countries (LMICs) to treat the surgical burden of disease for 100,000 people. There are few studies in LMICs that

assess surgical burden based on surgery counts (Bhandarkar et al., 2021).

Postoperative pain can be experienced by most patients who have undergone various surgical procedures. Effective postoperative pain management is crucial to promote patient return to baseline functioning and mitigate the negative physiological and psychological consequences associated with sudden and uncontrolled pain. Multiple strategies, such as the use of interventional procedures, pharmaceuticals, and routes of administration, can be employed to treat postoperative analgesia (Pirie et al., 2022). This reduces preoperative anxiety and reduces the duration of hospital stays after surgery.

Early mobilization techniques can facilitate an early and better recovery, improve quality of life, and reduce hospital stays for patients recovering from surgery. Massage therapy is considered an integrated and supplementary medical system that can improve circulation, reduce postoperative pain, increase relaxation, and lower tension. These days, supportive interventions have begun to be used in addition to pharmaceutical therapies. Educational intervention in pain and physical function can translate to postoperative recovery, reduced pain, and improved physical and psychological well-being.

There is a dearth of studies in India describing the importance of supportive educational intervention for patients undergoing abdominal surgery regarding pain and physical function, which prompted us to conduct the research. Our study shows the importance of supportive educational intervention for patients undergoing abdominal surgery regarding pain and physical function.

Methodology

Research design and approach: A randomized control design (Tume et al., 2022) and quantitative study methodology were used to assess the impact of the supportive educational intervention for patients undergoing abdominal surgery regarding pain and physical function.

The supportive educational intervention: The support education intervention is the application of massage therapy, which includes the use of longitudinal, Criss-Cross, Palm, Effleurage Du Poing, and Thumb techniques by the investigator. It also involves using a powerpoint presentation and video on the experimental group to help patients with early ambulation, including getting into and out of bed, sitting on the bed, and walking among themselves after abdominal surgery. To better meet the needs of the postoperative patients in the intervention group, a virtual educational video titled "Early Ambulation" focused on the instructional and practice aspects.

The control group was asked to adhere to daily routine hospital care, while the experimental group received education on early ambulation, 20–30-minute massage therapy sessions for two days in a row, and daily hospital treatment. The pre-test was completed by the patients on the first and second postoperative days, whereas the post-test was completed on the same day over two days by the experimental and control groups.

Participants and settings: Research was carried out from 1 February 2018 to 31 March 2018 in K.C. General Hospital, Bengaluru, India. The study comprised 60 postoperative patients who had abdominal surgery in the hospital. All patients who had undergone abdominal surgery were the target population. Both male and female patients, between the ages of 21 and 60, were the inclusion criteria that were used to enrol the participants. Participants with English or Kannada reading and writing skills, as well as those on the first and second postoperative days, were also included. Patients who are hemodynamically unstable or do not wish to participate in the study were excluded from consideration.

Recruitment and sampling: A total of 60 individuals were enrolled, with 30 members in each group. The cover slip method was combined with the probability method of the simple random sampling methodology (Fekede et al., 2023). **Figure 1** shows the flow chart of the randomized process.

Measurements and Results: The Barthel index for activities of daily life, the neurological pain rating scale, and demographic factors were the tools used to collect the data. The level of pain was evaluated using the numerical pain rating scale (Lee et al., 2021). The scale ranges from

0 to 10, where no pain (0), mild pain (1-3), moderate pain (4-6), and severe pain (7–10) were categorized based on the score. The Barthel ADL Index was used, consisting of 10 items and including bladder, bowels, bathing, feeding, toilet use, grooming, mobility, stairs, transfer, and dressing (Uchinaka et al., 2022). To evaluate the physical function, the Barthel index scale was utilized. There is a 0–20 scoring range. The interpretation of the Barthel index scale is 0-10=Dependent, 11-20= Independent. The following demographic factors are included: age, sex, religion, level of education, occupation, marital status, monthly income of the family, kind of surgery, length of stay in the hospital after surgery, and history of previous surgeries.

Six nursing professionals with expertise in medical-surgical nursing and one biostatistician reviewed the tool developed with the objectives. Using the correlation coefficient and the inter-rater method, the reliability was determined. The tools developed were determined to be statistically reliable; the Barthel index, which measures physical function, had a reliability of 0.94, and the numerical pain rating scale had a reliability of 0.99.

Ethical Considerations: Before collecting data, the researcher obtained approval from the Medical Superintendent of K.C. General Hospital, Bengaluru, India. The study was approved by the Institutional Review Board (ACA/DCD/PIN-B/PG/2016-2017), and it was carried out in compliance with the Declaration of Helsinki. The study was carried out in K.C. General Hospital, Bengaluru, India. The patients who were recruited for the study gave their informed consent verbally and in writing. Participants will have their privacy and confidentiality protected. Participants were free to leave the study at any point, both during and after it were conducted, with no negative effects on clinical results or patient care.

Statistical Analysis: The data was analyzed using IBM Corp.'s (Armonk, NY) Statistical Package for Social Sciences, version 25.0. The data were analyzed using the Mann-Whitney U test, Karl Pearson's correlation, Wilcoxon's test, and the Chi-square test. A result was considered statistically significant if it was $p<0.05$.

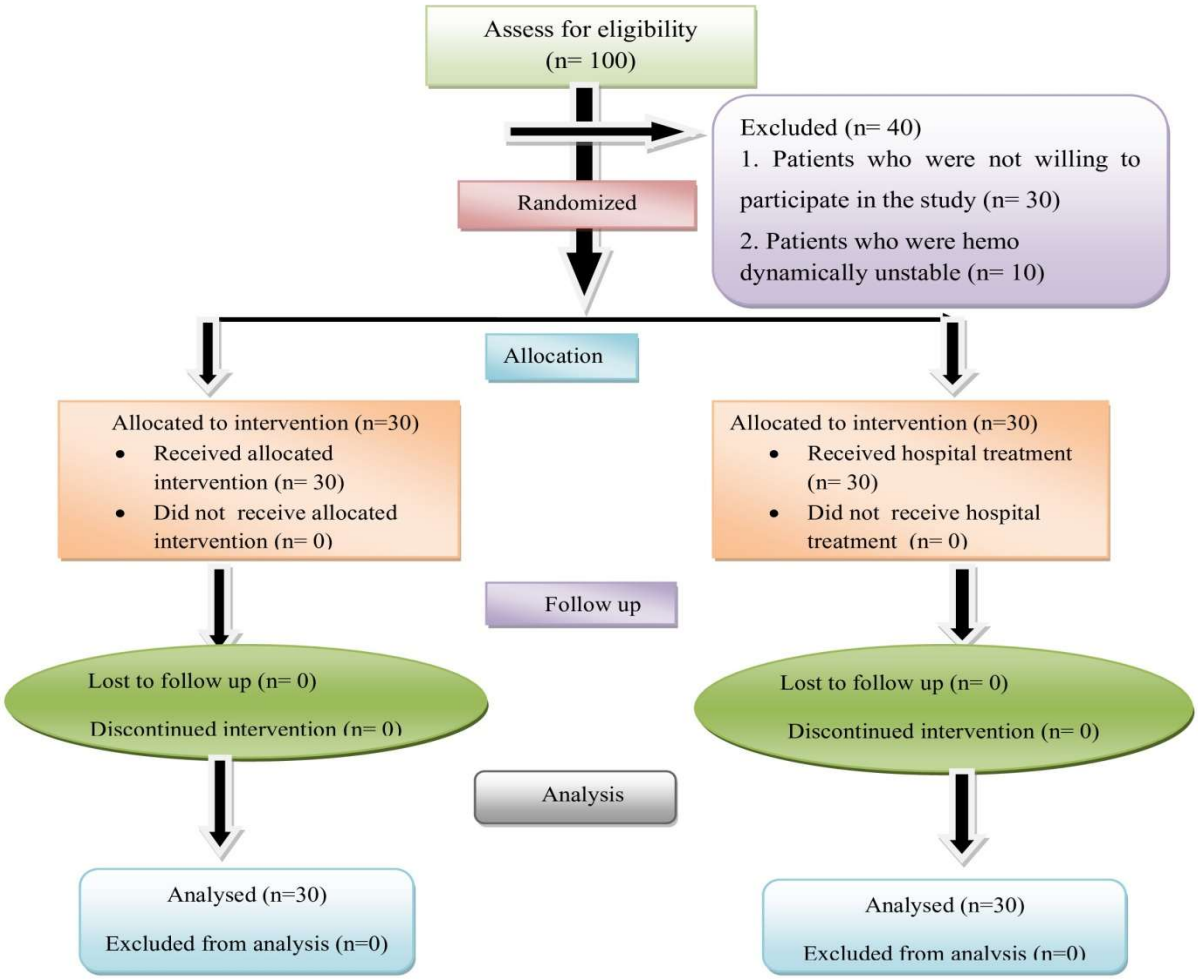

Figure 1: Flow chart of the randomization process

Results

A) Sample characteristics

Regarding the age group of the patients, the majority 12(40%) belonged to 41-50 years in the experimental group and the majority of patients 14(46.7%) belonged to the age group of 31-40 years in the control group. The gender distribution revealed that in the experimental group, 24 (80%) of the individuals were male and 6 (20%) were female. In the control group, the proportion of male and female subjects was equal, with 15 (50%) being male. The majority of patients in the experimental group (n = 24; 80%) were Hindu, while the majority of subjects in the control group (n = 22; 73.3%) were Hindu. In context with educational background, the majority of the patients 9(30%) had secondary education in the experimental group, and the majority of the patients 9(30%) had secondary education in the control group. In terms of occupational status, the majority of patients 10(33.3%) were daily gamblers or coolies in the experimental group. In the control group, most of the patients 9 (30%) were self-employed or businessmen.

Regarding the income of the household in both the experimental and control groups, most of the 14 (46.7%) individuals had incomes between 10,001 to15,000 Rs. In terms of marital status, the majority of 20 (66.7%) subjects were married in the experimental group, and the majority of 22 (73.3%) were married in the control group. Regarding the types of surgery, the majority

25 (83.3%) had undergone gastrointestinal surgery in the experimental group, and the majority 22 (73.33%) had undergone gastrointestinal surgery in the control group. Regarding the postoperative day in the hospital, an equal percentage of 15 (50%) subjects belong to the first day and the second day in the experimental group, and the majority of 20 (66.7%) subjects belong to the first day in the control group. In both the experimental and control groups, most of the 26 (86.7%) participants do not have a history of previous surgery.

B) Effectiveness of supportive educational intervention on pain and physical function among patients who underwent abdominal surgery in the experimental group

Table 1 shows the level of pain experienced by the experimental group and indicates that of the majority of subjects, 21 (70%) had moderate pain at the pre-test, while 21 (70%) had mild pain after the intervention. Most of the control group reported having moderate pain in the pre-test 21(70%) and in the post-test 18(60%).

Table 2 shows the level of physical function in the experimental group, which shows that 27 participants (90.9%) had independent physical function after the intervention, compared to the majority of subjects in the pre-test, 22 (73.3%), who had dependent physical function. In the control group, 16 (53.3%) of them had independent physical function in the post-test, while the majority of them in the pre-test, 25 (83.3%) had dependent physical function.

Table 3 presents a comparison of the mean scores before and after the test. The mean score for the experimental group was 4.77 ± 1.40 in the pre-test and 3.03 ± 1.15 in the post-test, indicating a change of 1.74 in the mean scores. The Z value is 4.45. It demonstrates a statistically significant difference at the $p<0.05$ level. The mean score of the control group was 5.2 ± 1.47 in the pretest and 3.80 ±1.42 in the posttest, indicating a 1.4 change in mean scores. The Z value is 0.501. It demonstrates that, at the $p>0.05$ level, no statistical significance was found.

When the pain level of the experimental group was compared to that of the control group, the pain level of the experimental group was lower, indicating that the intervention had an impact on minimizing pain levels among patients who underwent abdominal surgery.

Table 4 presents the comparison of the pre-test and post-test mean scores. The mean score for the experimental group was 8.40 ± 2.89 in the pre-test and 12.77±2.28 in the post-test, indicating a 4.77 change in the mean scores. The Z value is 4.48. It demonstrates a statistically significant difference at the $p<0.05$ level. The mean score for the control group was 8.16± 3.30 in the pretest and 10.36±3.32 in the post-test, indicating a 2.2 change in mean scores. The Z-value is 1.67. It demonstrates that, at the $p>0.05$ level, no statistical significance was found.

By comparing the physical function levels of the experimental and control groups, it was found that the experimental group had improved more than the control group, indicating that the supportive intervention was successful in raising the physical function levels of patients who had undergone abdominal surgery.

Table 5 above illustrates the difference between the mean post-test scores of the experimental and control groups for physical function and pain among patients who had abdominal surgery; the test value for pain was 0.639. The value of the physical function test was 3.08, and it was discovered that there was no statistically significant difference at the $p>0.05$ level. At the $P<0.05$ threshold, statistical significance was discovered. Supportive educational intervention is statistically significant in improving physical function in patients who have had abdominal surgery, but not in lowering pain levels.

Table 6 shows that there was little relationship in both the experimental and control groups between the degree of pain before the test and physical function. Pain and physical function had a correlation value of -0.28 at $p>0.05$ in the experimental group and -0.36 in the control group. It demonstrates that there was a negative relationship between physical function and the pre-test pain level.

Table 1: Level of pain among patients undergone abdominal surgery in the experimental and control groups (n = 30).

SL. NO.	Level of Pain	Experimental group				Control group			
		Pre-test		Post-test		Pre-test		Post-test	
		Frequency	%	Frequency	%	Frequency	%	Frequency	%
1.	No Pain 0	-	-	-	-	-	-	-	-
2.	Mild Pain (1-3)	6	20.0	21	70.0	3	10	12	40
3.	Moderate Pain (4-6)	21	70.0	9	30.0	21	70	18	60
4.	Severe Pain (7-10)	3	10	-	-	6	20	-	-
Total		**30**	**100**	**30**	**100**	**30**	**100**	**30**	**100**

Table 2: Level of physical function among patients who underwent abdominal surgery in the experimental and control groups (n = 30).

SL. NO.	Level of physical function	Experimental group				Control group			
		Pre-test		Post-test		Pre-test		Post-test	
		Frequency	%	Frequency	%	Frequency	%	Frequency	%
1.	Dependent (0-10)	22	73.3	3	10.0	25	83.3	16	53.3
2.	Independent (11-20)	8	26.7	27	90.9	5	16.7	14	46.7
Total		**30**	**100**	**30**	**100**	**30**	**100**	**30**	**100**

Table 3: Comparison of the level of pain among patients who underwent abdominal surgery in the experimental and control groups (n = 60).

Sl. no.	Groups	Max score	Pre-test				Post-test				Wilcoxon's test	
			Range	Mean	SD	Mean %	Range	Mean	SD	Mean %	Z value	P value
1	Experimental Group (n=30)	10	2-8	4.77	± 1.40	47.7	1-6	3.03	±1.15	30.3	4.45	p<0.05
2	Control Group (n=30)	10	3-8	5.2	±1.47	52	1-6	3.80	±1.42	38.0	0.501	p>0.05

Table 4: Comparison of the level of physical function among patients who underwent abdominal surgery in the experimental and control groups (n = 60).

Sl. no.	Groups	Max score	Pre-test				Post-test				Wilcoxon's test	
			Range	Mean	SD	Mean %	Range	Mean	SD	Mean %	Z value	P value
1	Experimental Group (n=30)	10	1-13	8.40	±2.89	42.0	6-16	12.77	±2.28	63.8	4.48	p<0.05
2	Control Group (n=30)	10	3-15	8.16	±3.30	40.8	4-16	10.36	±3.32	51.8	1.67	p>0.05

Table 5: Difference in post-test level of pain and physical function between patients who underwent abdominal surgery between the experimental and control groups (n = 60).

Sl. no.	Pain and physical function	Max score	Post-test differences between the groups			Mann-Whitney U test	p-value
			Mean Difference	SD Difference	% of increase		
1.	Pain	10	0.77	± 0.43	7.7	0.639	p> 0.05

2.	Physical function	20	2.41	± 0.68	12.1	3.08	P< 0.05

Table 6: Correlation between pain and physical function in both the experimental and control groups (n = 60).

Sl. No.	Groups	Pain		Physical Function		Correlation	
		Mean	SD	Mean	SD	r value	p- value
1.	Experimental Group (n= 30)	4.77	± 1.40	8.40	± 2.89	-0.28	p>0.05
2.	Control Group (n= 30)	5.2	± 1.47	8.16	± 3.30	-0.36	p> 0.05

Discussion

It's significant to note that poor outcomes, such as extended hospital stays, sleep disorders, delayed return to activities, and higher opioid use, are linked to inadequate postoperative pain management (Liu et al., 2022). According to the findings, the supportive educational intervention had a stronger effect on the ability of postoperative patients to perform physically and reduce discomfort after surgery. This indicates that the intervention group had better results in terms of pain and physical functioning. From the pretest to the posttest, the educational intervention group for pain management progressively decreased. This implies that patients who underwent abdominal surgery experienced less postoperative discomfort as a result of the helpful educational intervention. In the control group of postoperative patients, normal care resulted in a slight alteration in their daily activities (e.g., food, transfer, grooming, dressing, stairs, bowel, toilet use, mobility, bladder, bathing, etc.) or a return to the pre-test post-test state. Patients recovering from abdominal surgery respond well to educational interventions on the importance of massage therapy and early ambulation after surgery. According to another study, patients who wore binders had better 6MWT distances (80%) than those in the control group (48%). Pain and symptoms related to distress did not change after surgery when binder use was used; The only group that experienced a significant increase ($p<0.05$) was the non-binder group. According to the study findings, patients recovering from major abdominal surgery can improve postoperative walking performance (mobility), pain perception, and lung function by using an elasticized abdominal binder as non-invasive support for their incision (Cheifetz et al., 2010). The results of a different study showed that patients' perceptions of pain, tension, and anxiety decreased considerably after receiving a 20-minute postoperative massage, although overall satisfaction remained the same. According to the findings of the study, patients who undergo abdominal colorectal surgery may benefit from massage therapy during their recovery period (Dreyer et al., 2015). In a different study, it was shown that patients receiving hand and foot massages required significantly less analgesic

medication than those in the control group (Sözen et al., 2020).

In the intervention group, the supportive educational intervention was statistically as well as clinically significant in reducing pain and improving physical function scores from the pre-test to the post-test. This indicates that improved strategies are needed to help postoperative abdominal surgery patients perform daily tasks more independently, including using the restroom, eating, dressing, climbing stairs, and washing. Following abdominal surgery, patients who received the supportive educational intervention improved their level of self-sufficiency, which improved their daily living activities and continuity of care. In a Tamil Nadu tertiary care hospital, a study was carried out that included one hundred patients with acute appendicitis between 2001 and 2002. According to the results, of the 100 patients, 55% were men and 45% were women. Approximately 71% of the patients were in the 15–30 age range. 75% of the people had vomited, 81% had a fever, and 100% had abdominal pain. Three percent of the patients experienced postoperative complications.

Acute appendicitis is frequently diagnosed in younger age groups, according to the study conclusion, which implies that any time a young patient presents acute abdominal pain, it can be acute appendicitis (Babu et al., 2017). The "prevalence of acute postoperative pain in patients in the adult age group undergoing inpatient abdominal surgery and the correlation of intensity of pain and satisfaction with analgesic management" was the subject of a second single-institute cross-sectional study carried out in an academic tertiary care government center in India. One hundred and twenty patients were evaluated for their level of pain using a numerical rating scale on the second, third, and fifth postoperative days. Research revealed that on the fifth, second, and third postoperative days, the prevalence of pain following surgery was 84.17%, 92.66%, and 92.5%, respectively. On the third postoperative day, fewer patients reported high-intensity of pain, while more patients reported mild pain compared to the fifth postoperative hour. The study concludes that patients who receive inpatient abdominal surgery at the institute have a significant incidence of acute postoperative pain. The degree of satisfaction with pain management and the severity of pain have a weak relationship (Singh et al., 2016).

The impact of preoperative and postoperative resistance exercise therapies on the recovery from physical function in patients having abdominal surgery for cancer was examined using a systematic review of randomized controlled trials. This review adhered to the recommended reporting items for systematic reviews and meta-analyses for systematic review guidelines. The review included two appropriate studies that satisfied the inclusion criteria, while 24 articles that met the requirements were accessed to evaluate the complete text of the article. These findings are reported in the study results. One exercise program was carried out preoperatively and the other postoperatively, before hospital discharges. Five and eight sessions, respectively, were dedicated to exercise interventions in the included studies. In both studies, there were no variations between the groups. The study revealed that the two trials were conducted to find out whether resistance muscle strengthening exercise programs before or after surgery had a positive or negative impact on patients' physical function outcomes after abdominal cancer surgery results (Stephensen et al., 2018). In a tertiary hospital in South Korea, a simple interrupted time series design study on the "Effect of evidence-based postoperative pain guidelines via the Web for patients undergoing abdominal surgery" was carried out to investigate the effects on patient pain levels and nurses' knowledge of postoperative pain management.

First, a tertiary hospital created online evidence-based guidelines for pain management. Second, after content validation by experts, a special training course on evidence-based pain guidelines was developed for nurses. Third, before providing patients with evidence-based pain guidelines, nurses received three weeks of instruction through the created educational program. The experimental and control groups were assigned to the patients. The outcome demonstrates that the patients in the

experimental group experienced a significantly reduced level of pain. Following the implementation of evidence-based recommendations, nurses' understanding of postoperative pain management increased significantly. Based on the study findings, nurses' understanding of pain management improved, and patients' pain levels were successfully reduced using evidence-based pain guidelines (Hong et al., 2014).

A multicenter descriptive study on "Investigation of postoperative pain levels and nursing interventions after gynecologic surgery" was conducted in the gynecologic surgical departments of the University and the state hospital in Samsun. The study included 221 patients who underwent surgery within the first 48 hours after surgery. A visual analog scale (VAS) and questionnaire were used to collect data, and Mann-Whitney U, Kruskal-Wallis, percentage, and mean tests were used to assess the results. The study findings indicate that there was a significant correlation between patient pain levels and their marital status, smoking habits, and duration of surgery. It was found that creating a calm and pleasant environment and providing information on the side effects of the medication were the most commonly used nursing pain management interventions. According to the study findings, the patients had excruciating pain in the early post-gynecological surgery phase, and the nurses rarely used non-pharmacological pain management techniques (Öztürk et al., 2018).

The following conclusions have been drawn by the investigator and are crucial for the fields of nursing practice, administration, research, and education. To determine the necessity of implementing evidence-based treatment in the cost-effective management of pain and physical function, health professionals such as nurses and students may participate in continuing and in-service education programs. Educational institutions can organize workshops, symposiums, debate programs, and demonstrations on the management of pain thresholds and physical function. Public education should be the responsibility of all health professionals, including nurses and students. The number of books and journals in the library on the efficacy of supportive educational interventions, as well as the funds to maintain suitable working conditions in hospital settings, should be facilitated by the nurse administrator. Replicating the study can help make the findings more broadly applicable. The effective application of the research findings will be facilitated by their dissemination through professional publications and the Internet. To optimize physical, psychological, and social functioning, supportive educational programs must include setting goals and a commitment to change. To better generalize the results, a comparable study can be carried out among older age groups with a larger sample size. More studies can be executed to investigate the knowledge of healthcare personnel about the use of supportive educational interventions for patients with abdominal surgery.

Limitations of the study: The study has a few limitations. The biggest obstacle to collecting more research findings was time and funding constraints. The number of patients was restricted to 60 who underwent abdominal surgery.

Conclusions: In conclusion, based on the aforementioned results, the current investigation indicated that supportive intervention can treat affective, cognitive, behavioral, and sociocultural dimensions while also promoting the general health of the patient. Massage therapy can help people manage pain and activities of daily living, including getting out of bed, standing, and walking long distances. One of the greatest achievements in the acquisition of knowledge and the development of health behaviors was an educational intervention that made the individual aware of pain and physical function. Therefore, nurses have a great responsibility to help increase physical function and lower pain levels.

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References

Bhandarkar, P., Gadgil, A., Patil, P., Mohan, M., & Roy, N. (2021). Estimation of the National Surgical Needs in India by Enumerating the Surgical Procedures in an Urban Community

Under Universal Health Coverage. World J Surg, 45(1): 33-40.

Cheifetz, O., Lucy, SD., Overend, TJ., & Crowe J. (2010). The effect of abdominal support on functional outcomes in patients following major abdominal surgery: a randomized controlled trial. Physiother Can, 62(3) :242-53.

Dreyer, NE., Cutshall, SM., Huebner, M., Foss, DM., Lovely, JK., Bauer, BA., & Cima, RR. (2015). Effect of massage therapy on pain, anxiety, relaxation, and tension after colorectal surgery: A randomized study. Complement Ther Clin Pract. 21(3) :154-9.

Fekede, L., Temesgen, WA., Gedamu, H., Kindie, S., Bekele, TG., Abebaw, A., Baymot, A., & Difer, M. (2023). Nurses' pain management practices for admitted patients at the Comprehensive specialized hospitals and its associated factors, a multi-center study. BMC Nurs, 22(1) :366.

Hong, SJ., & Lee, E. (2014). Effect of evidence-based postoperative pain guidelines via web for patients undergoing abdominal surgery in South Korea. Asian Nurs Res (Korean Soc Nurs Sci), 8(2) :135-42.

Babu, KS., & Savitha, S. (2017). A study on acute appendicitis in a tertiary care hospital in Tamil Nadu, India. International Surgery Journal. Int Surg J, 4(3) :929-31.

Lee, HJ., Cho, Y., Joo, H., Jeon, JY., Jang, YE., & Kim, JT. (2021). Comparative study of verbal rating scale and numerical rating scale to assess postoperative pain intensity in the post anesthesia care unit: A prospective observational cohort study. Medicine (Baltimore), 100(6) :e24314.

Liu, C., Chen, X., & Wu, S. (2022). The effect of massage therapy on pain after surgery: A comprehensive meta-analysis. Complement Ther Med, 71 :102892.

Öztürk, R., Sevil, Ü., Sargin, A., & Yücebilgin, MS. (2018). The effects of reflexology on anxiety and pain in patients after abdominal hysterectomy: A randomised controlled trial. Complement Ther Med, 36 :107-12.

Pirie, K., Traer, E., Finniss, D., Myles, PS., & Riedel, B. (2022). Current approaches to acute postoperative pain management after major abdominal surgery: A narrative review and future directions. Br J Anaesth, 129(3) :378-93.

Singh, PK., Saikia, P., & Lahakar, M. (2016). Prevalence of acute post-operative pain in patients in adult age-group undergoing inpatient abdominal surgery and correlation of intensity of pain and satisfaction with analgesic management: A cross-sectional single institute-based study. Indian J Anaesth, 60(10) :737-43.

Sözen, KK., & Karabulut, N. (2020). Efficacy of Hand and Foot Massage in Anxiety and Pain Management Following Laparoscopic Cholecystectomy: A Controlled Randomized Study. Surg Laparosc Endosc Percutan Tech, 30(2) :111-16.

Stephensen, D., Hashem, F., Corbett, K., Bates, A., George, M., Hobbs, RP., Hopkins, M., Hutchins, I., Lowery, DP., Pellatt-Higgins, T., Stavropoulou, C., Swaine, I., Tomlinson, L., Woodward, H., & Ali, H. (2018). Effects of preoperative and postoperative resistance exercise interventions on recovery of physical function in patients undergoing abdominal surgery for cancer: a systematic review of randomised controlled trials. BMJ Open Sport Exerc Med, 4(1) :e000331.

Tume, LN., McEvoy, NL., & Vollam, S. (2022). Randomized controlled trials in critical care nursing: Essential to move practice forward. Nurs Crit Care, 27(4) :477-9.

Uchinaka, EI., Hanaki, T., Morimoto, M., Murakami, Y., Tomoyuki, M., Yamamoto, M., Tokuyasu, N., Sakamoto, T., Hasegawa, T., & Fujiwara, Y. (2022). The Barthel Index for Predicting Postoperative Complications in Elderly Patients Undergoing Abdominal Surgery: A Prospective Single-center Study. In Vivo, 36(6) :2973-80.