Evidence-Based Practice of Early Post-Operative Mobilization for Whipple Surgery Patients' Selected Outcomes

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Abstract

Background: Early postoperative mobilization is an important aspect of postoperative care, as it has been demonstrated to improve a range of patient-reported outcomes. **Aim of the study:** The present study aims to evaluate the effect of evidence-based practice of early post-operative mobilization for Whipple surgery patients' selected outcomes**. Subjects and method: Design**: A quasi-experimental research design was used to achieve the purpose of the present study**. Subjects:** convenience sample consists of 60 subjects who underwent Whipple surgery and were assigned randomly into two equal groups (study and control), thirty patients in each group. **Tools of data collection:** The researchers used four tools to achieve the study aim and collect the required data as follows: Tool I: Structured interview. Tool II: Visual analog pain scale (VAS). Tool III: Six-Minute Walking Test. Tool IV**:** Evaluation of the incidence of postoperative complications. **Results:** There were statistically significant differences between the control and study groups on the 6th day indicating that the study group had a higher mean distance walk than the control group (14.4 $\pm$ 2.4 & 3.8 $\pm$ 0.6) respectively. The study group had lower mean pain scores than control group (3.9 $\pm$ 0.9 &4.7 $\pm$ 1) respectively. Also, there were statistically significant differences between the control and study groups in relation to occurrence of falls during the 2nd week (X^2=4.320, p-value=0.038). **Conclusion:** the impact of implementing evidence-based mobilization on patient care outcomes corroborates those documented in scholarly works. **Recommendation:** post-operative Whipple surgery early mobilization according to the patient individual abilities and hemodynamic stabilization should started to be done by surgical nurses for improving patients' outcomes as falls, distance patient able to walk as well as pain.

Keywords: Evidence-based practice, Patients' selected outcomes, Post-operative mobilization, Whipple Surgery.

Introduction

Despite technical breakthroughs and progress in patient care, major abdominal surgery is one of the surgical applications that result in a considerable loss of functional capacity and complications for patients. In randomized controlled trials (RCTs), the complication rate after major abdominal surgery has been reported as between 30% and 60% **(Schwab, Brindl, Studier-Fischer, Tu, Gsenger, et al., 2020).** The Whipple procedure is the preferred surgical treatment for resectable and borderline resectable pancreatic ductal adenocarcinoma patients **(Jarnagin, Chapman, Dematto, and Vauthey, 2022)**.

The pancreaticoduodenectomy is the only cure for pancreatic cancer **(Koyuncu & Iyigun, 2022).**

Because of the complicated and difficult intra-abdominal dissection and digestion system restoration, this surgical treatment presents

enormous challenges. This technique has generally been associated with increased mortality and perioperative morbidity due to its complexity. The effectiveness of pancreaticoduodenectomy is dependent on a careful screening for surgical patients' resectability using an abdominal computed tomography scan. Nurses, physiotherapists, counselors, and oncologists all play critical roles in providing the best possible care to cancer patients **(D'Cruz, Misra, and Shamsudeen, 2023).**

Nurse care is focused on assessing weight, general aches, symptoms, and vital signs. A loss of weight, balance of fluids, nausea, fecal, and urine color must all be checked for patients. Because of the forced loss of pancreatic enzymes, it is critical to check the fatty stool's existence to guarantee optimal lipid intake adjustment. A medical nursing team should ensure that dietary balance is properly assessed before and after surgical therapy. Early postoperative mobility may reduce complications associated with surgery by avoiding prolonged rest in bed **(Pederson, Padwal, Warkentin, Holroyd-Leduc, Wagg, et al., 2020).** Mobilization procedures are required to achieve early participation. The care plan emphasizes the significance of rigorous preoperative assessment, education, and preparation, as well as meticulous postoperative monitoring and assistance. Nurses have an important role in partnering with the healthcare team, offering comfort and reassurance to individuals and their families, and supporting a quick recovery. The treatment plan also addresses early mobilization protocols to minimize the risks of Whipple operation problems such as infection, pancreatic fistula, and gastrointestinal issues. Effective nursing interventions are required to recognize and address these problems as soon as possible **(Sarwar, 2023).**

Complications as wound dehiscence (where a wound fails to heal, whereby the wound re-opens in the days following surgery may be caused by poor tissue perfusion), local pain, accidental dislodgment, and short-term re-admission are among post-operative complications that commonly occur post Whipple surgery (**Rosen & Manna, 2023)**. Perioperative care guidelines strongly encourage early mobilization as a crucial component of enhanced recovery After surgery. Numerous advantages of early mobilization have been shown by evidence (**Fagevik Olsen, Becovic, and Dean, 2021; Ni, Li, Zhou, and Gong, 2023)**.

Evidence-based practice (EBP) contributes significantly to closing knowledge-action gaps, lowering health disparities, and improving the delivery of safe, high-quality healthcare for patients. It also lowers unnecessary expenses. EBP integrates patient preferences, values, and the knowledge of healthcare professionals with the best available evidence from the pertinent literature (**Portela Dos Santos, Melly, Hilfiker, Giacomino, Perruchoud, et al., 2022)**.

By implementing evidence-based practice of mobilization protocol, it helps manage the mobilization procedure during the postoperative period of patients who underwent Whipple surgery. According to **Dikmen and Dal Yılmaz (2019),** the nursing process approach provides high-quality post-surgery care for patients based on a careful assessment which in turn leads to good planning this planning is reflected in excellent implementation and finally with accurate evaluation and reassessment to provide high quality and best practice care based on evidence-based research, especially for patient post-Whipple surgery. However, post-operative mobilization based on the patient individual abilities should be assessed in the pre and postoperative period. It might involve shifting from sitting to standing and then walking. On POD 1, successful

mobilization was defined as remaining upright for more than six hours, and on POD 2, walking for at least thirty meters. Prior to surgery, discuss the postoperative objectives with the patients and their carers and emphasize the advantages of the mobilization protocol with an illustrated pamphlet. Following surgery, the investigator highlights to the patients the advantages of early mobilization. The researcher was in charge of carrying out the mobilization protocol, and by reminding the patients of the necessary time to be mobilized, the patient's choice was also incorporated into this procedure **(Tang, Liu, Ma, Lv, Jiang, et al., 2020; Chan, Wang, Tan, Chow, Ong, et al., 2021)**.

Perioperative care including the mobilization protocols can reduce complications, expedite recovery, shorten hospital stays, and keep expenditures under control. At some of the busiest hospitals, pancreaticoduodenectomy (PD) has specifically shown effective in preventing medical error, coordinating care, and reducing the length of hospital stay (LOS) to as little as 7 to 8 days. Furthermore, many studies have found that about 10% of patients can be discharged in a safe manner as early as a postoperative day (POD) 5, implying that faster recovery is achievable in a post-PD patient **(Lavu, McCall, Winter, Burkhart, Pucci, et al., 2019).**

Significance of the study

Whipple (pancreatoduodenectomy) surgery, the preferred treatment for treatable malignancies of the periampullary has over 40% morbidity and nearly 5–8% mortality in highly specialized centers of tertiary care **(Fan, Li, Zhang, Fu, Qiu, et al., 2023).** After a Whipple procedure, patients may experience pain and weakness. weakness post-surgery could potentially contribute to an increased risk of falls. Nurses have a pivotal role in the prevention of falls after surgery. Also, wound dehiscence has a crucial relation with a patient's movement after surgery **(D'Cruz et al., 2023).** One of the nursing interventions that significantly enhances patient care outcomes is postoperative early mobilization **(Koyuncu & Iyigun, 2022).** However, no supporting data for the effect of evidence-based practice of early post-operative mobilization following Whipple surgery on patients' outcomes, the recent study was aimed to evaluate the effect of evidence-based practice of early post-operative mobilization for Whipple surgery patients' selected outcomes in terms of early mobilization, postoperative pain score, and the incidence of postoperative complications.

Operational definition

Whipple Surgery (pancreatoduodenectomy):

Whipple operationally defined as surgery of the pancreas, stomach, duodenum, and biliary duct systems with a duration of less than two hours and with an expected loss of blood of less than 500 ml.

Evidence-based practice of early Mobilization

It's operationally defined as mobility assessment and intervention to mobilize patients earlier from day 0 postoperative. This also included information on the significance of early mobilization in the postoperative period, how to mobilize, potential scenarios that may arise during mobilization, etc. It might involve shifting from sitting to standing and then walking.

Early mobilization: is operationally defined as spending more than six hours on postoperative day one (POD 1) sitting up.

Selected outcomes

Operationally defined as early mobilization, patient perception of postoperative ambulation, postoperative pain score, and incidence of postoperative complications.

Postoperative complications: is defined as the frequency of falls, accidental

dislodgement of the drain, wound dehiscence, and readmission rate.

Aim of the study

Evaluate the effect of evidence-based practice of early post-operative mobilization for Whipple surgery patients' selected outcomes in terms of early mobilization, postoperative pain score, and the incidence of postoperative complications.

Hypotheses:

To accomplish the objectives of the study, two hypotheses were formulated:

Hypothesis I: The study group of patients who perform mobilization will be expected to mobilize early and will have a reduction of pain feeling score, decrease number of re-admissions, no wound dehiscence, no accidental drain dislodgement, and no falls than the control group.

Hypothesis 2: The mean 6MDW test scores will be significantly higher among the study group of patients who perform early mobilization than the control group.

Subjects & Method

Research design

Quasi-experimental research design was used.

Research setting

The study was conducted in surgical department, Menoufia Liver Institute, Menoufia Governorate, Egypt. It's located on the 4th floor. The hepatopancreatobiliary unit consists of 10 rooms, two wide corridors, and a wide patient reception area.

Sample

Convenience sample consists of 60 subjects who underwent Whipple surgery and were assigned randomly into two equal groups (study and control) thirty patients in each group:

Study group (I): received the mobilization protocol about Whipple surgery with hospital care routine.

Control group (II): exposed only to hospital care routine**.**

Eligibility criteria

Inclusion criteria

Patients aged 18 years and older, open surgical procedure, time of operation not more than 2 hours, using postoperatively pain control analgesia. Didn't have a communication problem, consented to participate in the study and didn't have a disease that would restrict their mobility (such as gonarthrosis, joint arthritis, or platinum in the leg).

Exclusion criteria

Emergent surgery, mentally unfit to complete the postoperative assessment protocols, or the immobile patients preoperatively. Patients with postoperative problems (bleeding, cardiovascular problems) were removed from this study.

Sample size calculations

The sample size was estimated using the G*Power 3.1.9.7 software application with alpha error probability 0.05, 90% power of the study, and 0.82 effect size **(Abdelmowla, Abdelmowla, Taha, Elkoussy, and Sayed, 2023)**. The calculated sample size was 27 patients for each group and added 10% because of dropout to be 30 patients for each group.

Tools of data collection

Four tools were used by the researchers for collecting the data and achieving the aim of the study as following:

Tool I: Structured interview:

It was developed by the researchers to collect baseline data to achieve the aim of the study and included the

Demographic and clinical data: It consisted of the following items which related to age, gender, work status, education level and marital status, and number of attached drains.

Tool II: The visual analogue pain scale (VAS):

The scale was adopted by **Bain, Ondimu, Hallam, and Ashwood (2005)**. It shows a simple way to record estimates of subjectively of the intensity of pain. Pain intensity was assessed using a 10-centimeter VAS. Participants marked a line on the scale rating

from 0 (no pain) to 10 (worst possible pain). The distance in millimeters from the '0' mark to the participant's mark was recorded as the VAS score.

Scoring system

The measurement parameters include five items:

- The grade (0) means no pain.
- The grade (1-3) denoted mild pain.
- The grade (4-6) indicated moderate pain.
- The grade (7-9) illustrated severe pain.
- The grade (10) means worst pain.

Reliability and validity

Bjelkaroy, Benth, Simonsen, Siddiqui, Cheng et al., (2024) tested the reliability of the scale and found that the intraclass correlation coefficient of the VAS was 0.97 and reported that the VAS had excellent test-retest reliability. The scale validity was assessed using Pearson's correlation coefficients of the baseline scores of VAS and it was a valid and reliable scale with the smallest errors in the measurement of acute pain.

Tool III: Six-Minute Walking Test

It was developed in the 1960s by Balka to examine the functional capacity of healthy individuals **(Koyuncu & Iyigun, 2022).** Also, the test was utilized to examine the functional capacity of patients in the preoperative period. It measures the distance the individual can walk over a total of 6 minutes on a flat hard surface. The individual is allowed to self-pace and rest as needed as they move back and forth along a designated route.

Scoring system

Scoring can vary from 0 meters or feet for patients who are unable to walk to maximum biophysical limits for normal healthy people (approximately 900 meters or 2953 feet) **(Morbach, Moser, Cejka, Stach, Sahiti et al., 2024)**.

Reliability and validity

The intraclass correlation coefficient of repeated 6WD was 0.89 and excellent test-retest reliability **(Tosic, Goldberger, Maldaner, Sosnova, Zeitlberger et al., 2020).**

Tool IV: Evaluation of incidence of postoperative complications in terms of:

- **Falls:** are measured through reviewing incident reports that contain the following items:

Date: [Date of incident] **Time:** [Time of Incident] **Location:** [Location of Fall (e.g., Patient Room, Bathroom)] **Reporting Staff:** [Name and Title].

The incident report is documented on the patient's chart during the period of hospitalization.

Scoring system: Divide the number of patients who fell by the total number of patients, then multiply by 100 to express as a percentage.

- **Accidental drain dislodgement**: is measured through documentation of incident reports of accidental drain removal that contain frequency, setting, and patient factors.

Scoring system: Divide the number of patients who documented incident reports of accidental drain removal on the patient's chart by the total number of patients, then multiply by 100 to express as a percentage.

- **Wound dehiscence:** partial or complete splitting of wound edges as documented on the wound care notes.

  Scoring system: Divide the number of patients who have wound dehiscence by the total number of patients, then multiply by 100 to express as a percentage.

- **Readmission rate:** Track readmission data within 30 days after discharge through collaboration with follow-up clinics.

  Scoring system: Divide the number of readmitted patients within the 30 days after discharge by the total number of patients, then multiply by 100 for a percentage.

  This tool was developed by researchers for evaluation of the incidence of postoperative complications after reviewing the recent related literatures **(Dewulf, Verrips, Coolsen, Olde Damink, Den Dulk et al., 2021; Koyuncu & Iyigun 2022).** The

timeframe for measuring these outcomes (30 days post-surgery).

Validity and reliability: (5) academics in the field of medical and surgical nursing evaluated the tool (IV) for the face & content validity. Internal consistency test was used to test the tool IV reliability. Cronbach's alpha coefficient's reliability of 0.902 proved to be strong.

Pilot study

It was performed prior to data collection on 6 patients (10%) to test the clarity, feasibility, objectivity, and applicability of all tools. The necessary modifications were done, and pilot study participants were excluded from the study.

Ethical Considerations

- A written approval was obtained from the Menoufia University Faculty of Nursing's Ethical and Research Committee. The written approval No:893 date (21/9/2022).
- Permission was obtained officially from the director of the hospital and the head of the surgical department.
- Written consent was obtained from all the participants to participate in the study after clarifying the study's aim, and participants were assured about the confidentiality of the data which would be used only to achieve the aim of the current study. The nature of all tools will not cause any physical or emotional harm to participants. Furthermore, the researchers highlighted that the participation is completely voluntary, and the secrecy of the participants was maintained through coding all data and putting all the files in a closed cabinet. Also, the participants informed that the refusal of participation in the present study would not influence their care. The study would cause no harm to the patients. Patient privacy and confidentiality will be assured.
- Permission to implement the study was obtained officially from the director of setting after submitting an official letter from the Faculty of Nursing Dean explaining the purpose of the study and data collection methods.
- After reviewing the literature **(D'Cruz et al., 2023; Ni et al., 2023; Chan et al., 2021)** the researchers developed the first and fourth tool, while the second was developed by **Bain et al., (2005)** and the third tool was developed by **Balka in the 1960s**.
- The collection of data was carried out over a period of six months from 21/9/2022 to the end of March 2023) with the following phases:

Assessment phase

- The patients attending the hospital setting were checked by the researchers after receiving clarification about the study process and were assessed for appropriateness for the study criteria and provided written and verbal consent. Each patient of both groups was assessed individually for sociodemographic data using tool one.

Planning phase

- After reviewing literature **(Koyuncu & Iyigun 2022; Chan et al., 2021; Lavu et al., 2019)**. Arabic training colored brochure was developed by the researchers about mobilization after surgery and distributed to the patients of the study group. The first part of the brochure presents guidance about the value of early mobilization postoperatively. The second part comprises various stages of mobilization images, including incremental position adjustments. The final part includes a table outlining the mobilization process. The researchers designed four nursing educational sessions to be provided for the patient and to be conducted for each patient individually.
- The final part includes a table outlining the mobilization management process.

Implementation phase

- The researchers designed four nursing educational sessions provided for the patient

and to be conducted for each patient individually; each session duration was 45- to 60 minutes through face-to-face interview to help improve the patient's performance of mobilization. At the end of each session, the researchers review the previously learned information.

- **The first training session (theoretical)**: The intervention group patients were contacted by the researchers in their rooms on the day of admission and information was presented about the training brochure of mobilization. This included information about Whipple surgery, the value of early mobilization, and supporting the incision site in the postoperative period issues that may occur during mobilization and postoperative complications.
- **The second session (practical)** patients were provided training about the evidence-based mobilization protocol and how to do mobilization post-surgery which included: Starting from day zero in which the patient was still confined to bed, the mobilization in this phase was positioning (every two hours' side lying, high fowler and supine position. Furthermore, the range of motion exercises of each joint as flexion, extension, internal and external rotation, and dorsiflexion. repeated five times for each joint. At the end of the session allow patient time for revision and reinforcement. Also, the researchers enabled each patient to redemonstrate the previously learned exercise.
- **The third training session (practical):** once patients stabilized on day one postoperatively in the intermediate care unit, started sitting in bed and dangling their legs as follows:
- Instruct the patient to bend both knees and place his/her feet firmly on the bed. Turn to the side and keep the shoulders and hips straight. the bowed knees should be towards the edge of the bed and push the upper hand down into the mattress, bringing the lower elbow underneath his/herself. Then push down on his/her arms while lowering the legs on the side of the bed to sit up. Sit at the edge of the bed, hands on the mattress for support. Repeat five times as tolerated.
- Also, perform belly breathing exercises and support the incision site as follows: belly breathing exercises: patient educated to inhale deeply and gently through the nose, widening the lower rib cage and allowing the abdominal (belly) to travel forward. Hold for three to five seconds. Then exhale gently and completely through pursed lips. Moreover, not to force his/her breath out. Repeat once every hour.
- from day two till discharge patients can start sitting on a chair beside the bed, walking around inside the room then walking in the corridor of the unit starting by 10 -15-minute walk and then increasing gradually. At the end of the session allow the patient time for revision and reinforcement along with redemonstration of previously learned exercises.
- **The fourth session:(practical session)**
- **Pelvic tilt exercise:** The patient is trained to sleep flat supine with knees bent then gently rock the pelvis up and flatten his/her back on the bed.

  also, rock back to the starting point and repeat 5 times, 2-3 times a day in the first two weeks after surgery.
- Ankle pumped exercise: The patient was educated to move his/her ankles up and down for one minute and then relax both feet. Instruct the patient to repeat five times and then relax.
- Redemonstrate all exercises learned in the previous sessions. At the end of the session allow the patient to freely ask questions and answer them.

- **Evaluation**
- At day zero postoperatively, mobilization was assessed and recorded for each patient of both groups using tools II and III.
- Moreover, for both groups, data regarding the mobilization training and the process, time of passage of flatus, and postoperative pain.
- Each patient of both groups was assessed for the development of postoperative complications using tool IV.
- A comparison was made between both groups regarding mobilization, pain, and postoperative complications.

Statistical Methods

Numerical data were collected and computerized using the SPSS program, update 22. Values were expressed as frequencies (percentages) and means ± SDs. A paired t-test was employed to compare the preoperative and postoperative mean variations in data. McNemar's test is employed to compare frequencies used on paired nominal data. A significant difference was considered when the P value was ≤ 0.05 at a confidence interval of 95 %.

Results

Table (1) shows that the highest percentage among control and study groups had ages ranging between 50 to 60 years (70%) and (63.3%) respectively, the male was the dominant gender among control and study groups (66.7%) and (76.7 %) respectively, additionally all the study participants were married. Regarding educational level, the highest percentage among the control group patients either can read & write or had primary education (26.7 %), while the greatest percentages were among the study group had secondary education (33.3%), moreover, 73.3% of the control group and 83.3% of the study group were working. Finally, there were however no statistically significant variations between the control and study groups in any demographic variables.

Figure (1) shows that 93.3% of the control group and 86.7% of the study group had three abdominal drains with no significant statistical variations between both groups (X^2= 0.741, p-value= 0.389).

Table (2) shows that both the control and the study groups were unable to walk on the first day, and the control group was unable to walk until the third day, while the study group started walking on the second day. Moreover, there were significant statistical variations between both groups on 2nd day (t-test=8.515, p-value=0.000) till the last day of the study on the 6th day (t-test=23.376, p-value=0.000), indicating that the study group had higher mean distance walk than the control group

Table (3) shows that there was no statistically significant difference between control and study groups during the 1st and 2nd days of the study. There was a statistically significant difference between the control and study groups since 3rd day (t-test=4.181, p-value=0.000) till the last day of the study at the 6th day (t-test=3.500, p-value=0.001), indicating that the study group had lower mean pain scores than the control group.

Table (4) shows that there were significant statistical variations between both groups regarding the occurrence of falls during 1st week (X^2=5.934, p-value=0.015) and 2nd week (X^2=4.320, p-value=0.038). Additionally, there were no significant statistical differences between both groups about the incidence of accidental drain dislodgment and wound dehiscence. However, the control group had a greater readmission rate than the study group, which is statistically significant at p-value=0.02

Table (1): Frequency and percentage distribution regarding demographic characteristics of the control and study groups (n=60).

	No	%	No	%		
Age						
30 - < 40	1	3.3	2	6.7	t-test= 0.140	0.890
40 - < 50	8	26.7	9	30		
50 - ≤ 60	21	70	19	63.3		
Mean ± SD	**52.4 ± 6.3**		**52.6 ± 6.2**			
Gender						
-Male	20	66.7	23	76.7	X^2 = 0.739	0.390
-Female	10	33.3	7	23.3		
Marital status						
-Single	0	0	0	0	-	-
-Married	30	100	30	100		
The educational level	6	20	5	16.7		
-Illiterate	8	26.7	6	20		
-Read and write	8	26.7	7	23.3		
-Primary education	7	23.3	10	33.3	X^2 = 1.306	0.860
-Secondary education	1	3.3	2	6.7		
-University education						
Work status						
Working	22	73.3	25	83.3	X^2 = 0.884	0.347
not working	8	26.7	5	16.7		

X^2: Chi-square test **Significant at $P \leq 0.05$*

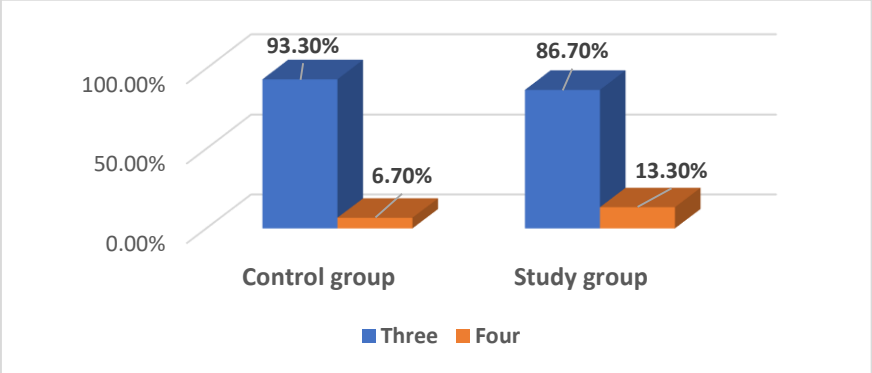

Figure (1): Percentage distribution of the numbers of abdominal drains among control and study groups (n=60).

Table (2): Comparison of mean scores of 6min distance walk among the control and study groups along the study period (n=60).

Study periods	Control group	Study group	t-test	p-value
	Mean ± SD	Mean ± SD		
1st day	0	0	-	-
2nd day	0	1 ± 0.6	8.515	0.000*
3rd day	0	2.5 ± 1	13.321	0.000*
4th day	1.6 ± 0.5	6.2 ± 2.5	9.883	0.000*
5th day	2.3 ± 0.6	9.5 ± 2.4	16.093	0.000*
6th day	3.8 ± 0.6	14.4 ± 2.4	23.376	0.000*

**Significant at P ≤ 0.05*

Table (3): Comparison of mean scores of pain among the control and study groups along the study period (n=60).

Study periods	Control group	Study group	t-test	p-value
	Mean ± SD	Mean ± SD		
1st day	8.2 ± 1.3	8.6 ± 1.2	1.583	0.119
2nd day	8.2 ± 0.5	8.1 ± 1.4	0.126	0.900
3rd day	8.7 ± 1.3	7.3 ± 1.3	4.181	0.000*
4th day	7.9 ± 0.5	6.4 ± 1.5	5.218	0.000*
5th day	5.3 ± 1.7	4.6 ± 1.1	2.217	0.031*
6th day	4.7 ± 1	3.9 ± 0.9	3.500	0.001*

**Significant at P ≤ 0.05*

Table (4): Comparison of incidence of postoperative complications among the control and study groups along the study period (n=60).

Variables	Control group		Study group		X^2	p-value
	No.	%	No.	%		
Falls						
1st week	15	50	6	20	5.934	0.015*
2nd week	8	26.7	2	6.7	4.320	0.038*
3rd week	2	6.7	1	3.3	0.351	0.554
Accidental drain dislodgement	2	6.7	0	100	2.069	0.150
Wound dehiscence	0	100	0	100	-	-
Re-admission	9	30	2	6.7	5.455	0.020*

**Significant at P ≤ 0.05*

Discussion

One of the most important components of protocols for improved recovery following surgery is early postoperative mobilization. Prompt postoperative mobilization techniques have the potential to improve patient mobilization, which in turn can shorten the recovery time and minimize complications (**Willner, Teske, Hackert, and Welsch, 2023)**.

Research evidence concluded that early postoperative mobilization has been linked to significantly lower complication rates and better postoperative outcomes (**Nishijima, Baba, Murotani, Tokai, Watanabe et al., 2020; Rosowicz, Brody, Lazar, Bangla, Panahi et al., 2022)**. Also, the present study aimed to evaluate the effect of evidence-based practice of early post-operative mobilization for Whipple surgery patients' selected outcomes in terms of early mobilization, postoperative pain score, and the incidence of postoperative complications.

The study results proved that all medical and demographic variables did not have significant change statistically between both groups, with male patients primarily in the fifty- and sixty-year-old age range dominating both categories. The findings were consistent with Egyptian research conducted by **Abdelmowla et al., (2023)** on patients undergoingpancreatoduodenectomy. The study examined the effect of nursing instructions and oral postoperative nutritional supplementation on patient outcomes and found there was no significant statistical difference in both medical data and demographics of the two groups, with a predominance of male patients in both groups between the ages of fifty and sixty years. Additionally, **Zubair, Khan Sherwani, Ahmad, Tahir, Khalil, et al., (2022)** reported that the mean age of the patients they evaluated was fifty-three years in their retrospective study about the spectrum of postoperative complications and outcomes after pancreaticoduodenectomy. In contrast, **Lavu et al., (2019)** found that the mean of the studied patients age was sixty-five years. This may be attributed to variations in the study sample and setting.

Moreover, **Takagi, Yoshida, Yagi, Umeda, Nobuoka, et al. (2019)** discovered that there were more males than females in both groups performing pancreaticoduodenectomy in their controlled randomized trial regarding the effect of an enhanced recovery after surgery protocol. Also, **Lof, Benedetti Cacciaguerra, Aljarrah, Okorocha, Jaber, et al. (2020)** reported that

no significant statistical variations were seen between both groups regarding their demographics, with more male patients than female patients. Additionally, **Jamal et al., (2020)** found that the median age of the studied patients was fifty-three years with more males than females. In contrast, **Dalgatov, Kozodaeva, Titkova, Smirnova, and Sazhin (2021)** showed that in both groups, there are more female patients than male patients.

The present results of the study demonstrated that whereas the study group began walking on the second day, the control group was unable to walk on the first day and remained unable to walk until the third day. Also, a significant statistical difference was observed between the control and study groups from the second day of the study to the sixth, suggesting that the study group had a higher mean distance walk than the control group. This comes to **Koyuncu & Iyigun's (2022)** findings, which indicated that the structured early mobilization protocol manages mobilization effectively and improves outcomes of patient health care as patients in the intervention group began mobilizing earlier than those of the control group, based on a postoperative comparison of the two groups. Additionally, **Fukushima, Adachi, Hanada, Tanaka, Oikawa, et al. (2021)** emphasized the importance of early mobilization for patients undergoing pancreatoduodenectomy in their retrospective cohort study about the role of early mobilization on the clinical course of patients who underwent pancreatoduodenectomy.

Similarly, **Vermişli, Çakmak, Muezzinoğlu, Aslan, and Baydur (2021)** discovered that the intervention group had a mean mobilization time that was higher than the control group in the first twenty-four hours following surgery and that this difference was statistically significant. Additionally, **Melloul, Lassen, Roulin, Grass, Perinel et al., (2020)** stated that from day zero, early and active mobilization should be promoted. Furthermore, according to **Gustafsson, Scott, Hubner, Nygren, Demartines, Francis, et al. (2019)**, patients should be mobilized as soon as possible after surgery because prolonged immobilization is linked to several negative consequences. Early mobilization through patient education and encouragement is a crucial part of improved recovery after surgery programs. Also, **Nelson, Bakkum-Gamez, Kalogera, Glaser, Altman, et al. (2019)** reinforced early mobilization within twenty-four hours of surgery.

Concerning postoperative pain, the study's findings revealed that there was no statistically significant difference between control and study groups during 1st and 2nd days of the study. There was a statistically significant difference between the control and study groups from the 3rd day till the last day of the study at the 6th day, indicating that the study group had lower mean pain scores than the control group. Along the same lines, **Ni et al., (2022)** highlighted the significance of early mobilization when they discovered that, from the fourth postoperative day, the pain scores of the early standardized activity group were lower significantly than those of the control group.

Similarly, **Okul & Oral (2023)** discovered that the intervention group's mean pain severity scores at 24 hours and fifteen days postoperatively were significantly lower than those of the control group, supporting their conclusion that early mobilization lowers the level of pain.

In terms of postoperative complications following Whipple surgery, the researchers discovered a significant statistical difference between both control and study groups concerning the incidence of falls during the first and second week, with the control group experiencing more falls than the study group.

Additionally, the control group had a greater readmission rate than the study group which is statistically significant at p-value=0.020. It

agreed with **Pederson et al. (2020)** who discovered that delayed mobilization was associated with an increased risk of short-term readmission. Similarly, **Schwab et al., (2020)** said that postoperative mobilization has been postulated to decrease postoperative complications in abdominal surgery. Furthermore, **Fukushima et al. (2021)** stressed the importance of early mobilization for the prevention of postoperative complications for patients who underwent pancreatoduodenectomy. Also, **Tazreean, Nelson, and Twomey (2022)** discovered that early postoperative mobilization significantly accelerates clinical recovery. The current study also found that, concerning the incidence of both wound dehiscence and accidental drain dislodgment, there were no significant statistical differences between the control and study groups; that is, neither the study group nor the control group had any patients experience wound dehiscence, and only 6.7% of the control group experienced accidental drain dislodgment. It is agreed with a systematic review and meta-analysis study conducted by **Willner et al. (2023)** who concluded that early postoperative mobilization enhances gastrointestinal recovery but does not significantly reduce the morbidity rate in randomized trials.

Considering the importance of early mobilization in improving the clinical outcomes following the Whipple surgery, the application of mobilization protocol was shown to be effective in improving the patients' selected outcomes after the surgery through improving the mean distance walk, alleviating the postoperative pain, and reducing the incidence of postoperative complication.

Conclusion:

The current research study has revealed a significant statistical improvement between the control and study groups on the 6th day indicating that the study group had a higher mean distance walk than the control group. Also, the study group had lower mean pain scores than the control group respectively. Moreover, there were significant statistical differences between the control and study groups about the occurrence of falls during the 2nd week.

Recommendations

According to the findings of the present study, it recommended the following points:

Recommendations for clinical practice

These recommendations are made considering the study's findings. Post-operative Whipple surgery early mobilization according to the patient individual abilities and hemodynamic stabilization should start to be done by surgical nurses for improving patient outcomes such as falls, distance patient able to walk as well as pain.

Future recommendations

-The mobilization protocols for Whipple patients should be implemented regularly for patients and caregivers

-Further research studies on large sample size to confirm the results and promote generalizability of it.

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Conflict of interest

No conflict of interest

References

Abdelmowla, R., Abdelmowla, H., Taha, A., Elkoussy, A. & Sayed, H.(2023).Pancreaticoduodenectomy: Effect of Nursing Instructions and Oral Postoperative Nutritional Supplementation on Patients Outcomes. *Tanta Scientific Nursing Journal, 92 (2), 85-103.*

Bain, G. I., Ondimu, P., Hallam, P., & Ashwood, N. (2009). Radioscapholunate

arthrodesis—a prospective study. *Hand Surgery, 14(02n03)*, 73-82.

Bjelkaroy, M. T., Benth, J. S., Simonsen, T. B., Siddiqui, T. G., Cheng, S., Kristoffersen, E. S., & Lundqvist, C. (2024). Measuring pain intensity in older adults. Can the visual analogue scale and the numeric rating scale be used interchangeably?. *Progress in Neuro-Psychopharmacology and Biological Psychiatry, 130*, 1109 25.

Chan, K. S., Wang, B., Tan, Y. P., Chow, J. J. L., Ong, E. L., Junnarkar, S. P., Low, J. K., Huey, C. W. T., & Shelat, V. G. (2021). Sustaining a Multidisciplinary, Single-Institution, Postoperative Mobilization Clinical Practice Improvement Program Following Hepatopancreatobiliary Surgery During the COVID-19 Pandemic: Prospective Cohort Study. *JMIR perioperative medicine, 4(2)*, e304 73. https: //doi. Org /10. 21 96 /30473.

Dalgatov, K. D., Kozodaeva, M. V., Titkova, S. M., Smirnova, O. A., & Sazhin, A. V. (2021). Safety of enhanced recovery after surgery (ERAS) protocol in the treatment of patients undergoing pancreatoduodenectomy. *Pirogov Russian Journal of Surgery, (11)*, 19–26. https:// doi.org/10. 17116/hirurgia202111119

D'Cruz JR, Misra S, Shamsudeen S. (2023): Pancreaticoduodenectomy. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Retrieved from: https://www.ncbi.nlm.nih.gov/books/NBK 560747/

Dewulf, M., Verrips, M., Coolsen, M. M. E., Olde Damink, S. W. M., Den Dulk, M., Bongers, B. C., Dejong, K., & Bouwense, S. A. W. (2021). The effect of prehabilitation on postoperative complications and postoperative hospital stay in hepatopancreatobiliary surgery a systematic review. *HPB : the official journal of the International HepatopancreatobiliaryAssociation*, 23(9), 1299–1310. https://doi.org/10.1016/j.hpb.2021.04.021

Dikmen, B. T., & Dal Yılmaz, U. (2019). Postoperative Respiratory System Complications and Nursing Care, Postoperative Complications and Nursing Care. 1st ed. Ankara. Turkiye Clinics; p.1-7.

Fagevik Olsén, M., Becovic, S., & Dean, E. (2021). Short-term effects of mobilization on oxygenation in patients after open surgery for pancreatic cancer: a randomized controlled trial. *BMC surgery, 21 (1)*, 185. https://doi.org/10.1186 /s12893-021-01187-2

Fan, Y., Li, N., Zhang, J., Fu, Q., Qiu, Y., & Chen, Y. (2023). The Effect of immunonutrition in patients undergoing pancreaticoduoden-ectomy: a systematic review and meta-analysis. *BMC cancer, 23(1)*, 351. https://doi.org/10.1186/s128 85-023-10820-7

Fukushima, T., Adachi, T., Hanada, M., Tanaka, T., Oikawa, M., Nagura, H., Eguchi, S., & Kozu, R. (2021). Role of early mobilization on the clinical course of patients who underwent pancreaticoduodenectomy:A Retrospective Cohort Study. The *Tohoku journal of experimental medicine, 254(4)*,287–294. https://doi.org/10.1620/tjem.254.287

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

Jamal, A., Shakeel, O., Mohsin, J., Malik, A. A., Haq, I. U., Begum, S., Khan, S. M., Hanif, F., Kabir, S. I., & Syed, A. A. (2020). Pancreaticoduodenectomy: Outcomes of a complex surgical procedure from a developing country. *Pancreatology: official journal of the International Association of Pancreatology (IAP), 20(7)*,1534–1539. https://doi.org/10.1016/j.pan.2020.08.013

Jarnagin,W.,Chapman,A., Dematto ,D.,Vauthey,K.,(2022). Blumgart's Surgery of the Liver, Biliary Tract and Pancreas,Whipple surgery,7 th ed, Elsevier,vol (1) part 3 ,E-Book. https://evolve.elsevier.com/cs/product/9780323697842?role=student

Koyuncu, F., & Iyigun, E. (2022). The effect of mobilization protocol on mobilization start time and patient care outcomes in patients undergoing abdominal surgery. *Journal of clinical nursing, 31(9-10),* 1298–1308. https://doi.org/10.1111/jocn.15986

Lavu, H., McCall, N. S., Winter, J. M., Burkhart, R. A., Pucci, M., Leiby, B. E., Yeo, T. P., Cannaday, S., & Yeo, C. J. (2019). Enhancing Patient Outcomes while Containing Costs after Complex Abdominal Operation: A Randomized Controlled Trial of the Whipple Accelerated Recovery Pathway. *Journal of the American College of Surgeons, 228(4)*,415–424. https://doi.org/10.1016/j.jamcollsurg.2018.12.032

Lof, S., Benedetti Cacciaguerra, A., Aljarrah, R., Okorocha, C., Jaber, B., Shamali, A., Clarke, H., Armstrong, T., Takhar, A., Hamady, Z., & Abu Hilal, M. (2020). Implementation of enhanced recovery after surgery for pancreatoduodenectomy increases the proportion of patients achieving textbook outcome: A retrospective cohort study. *Pancreatology: official journal of the International Association of Pancreatology (IAP) , 20(5)*,976–983. https://doi.org/10.1016/j.pan.2020.05.018

Melloul, E., Lassen, K., Roulin, D., Grass, F., Perinel, J., Adham, M., Wellge, E. B., Kunzler, F., Besselink, M. G., Asbun, H., Scott, M. J., Dejong, C. H. C., Vrochides, D., Aloia, T., Izbicki, J. R., & Demartines, N. (2020). Guidelines for perioperative care for pancreatoduodenectomy: Enhanced Recovery After Surgery (ERAS) Recommendations 2019. *World journal of surgery, 44(7),* 2056–2084. https://doi.org/10.1007/s00268-020-05462-w

Morbach, C., Moser, N., Cejka, V., Stach, M., Sahiti, F., Kerwagen, F., ... & Störk, S. (2024). Determinants and reference values of the 6-min walk distance in the general population—results of the population-based STAAB cohort study. *Clinical Research in Cardiology,1-11.*Doi: 10.1007/s00392-023-02373-3.

Nelson, G., Bakkum-Gamez, J., Kalogera, E., Glaser, G., Altman, A., Meyer, L. A., Taylor, J. S., Iniesta, M., Lasala, J., Mena, G., Scott, M., Gillis, C., Elias, K., Wijk, L., Huang, J., Nygren, J., Ljungqvist, O., Ramirez, P. T., & Dowdy, S. C. (2019). Guidelines for perioperative care in gynecologic/oncology: Enhanced Recovery After Surgery (ERAS) Society recommendations-2019 update. *International journal of gynecological cancer: official journal of the International Gynecological Cancer Society, 29(4),* 651–668. https://doi.org/10.1136/ijgc-2019-000356

Ni, C. Y., Hou, G. J., Tang, Y. Y., Wang, J. J., Chen, W. J., Yang, Y., Wang, Z. H., & Zhou, W. P. (2022). Quantitative study of

the effects of early standardized ambulation on sleep quality in patients after hepatectomy. *Frontiers in surgery, 9*,941158. https://doi.org/10.3389/fsurg.2022.941158

Ni, Y. X., Li, Z., Zhou, L. L., & Gong, S. (2023). Factors influencing early mobilization for patients undergoing pancreatic surgery from multiple perspectives: a qualitative descriptive study. *BMJ open, 13(12),* e077419. https://doi.org/10.1136/bmjopen-2023-077419

Nishijima, M., Baba, H., Murotani, K., Tokai, R., Watanabe, T., Hirano, K., Shibuya, K., Hojo, S., Matsui, K., Yoshioka, I., Okumura, T., & Fujii, T. (2020). Early ambulation after general and digestive surgery: a retrospective single-center study. *Langenbeck's archives of surgery, 405(5),* 613–622. https://doi.org/10.1007/s0042 3-020-01925-9

Okul, I & Oral, S. (2023). The Effects of Early Mobilization on Pain and Quality of Recovery in Patients Undergoing Laparoscopic Cholecystectomy Surgery. *International Journal of Traditional and Complementary Medicine Research, 4 (3),* 153-161. DOI: 10.53811/ijtcmr.1342768

Pederson, J. L., Padwal, R. S., Warkentin, L. M., Holroyd-Leduc, J. M., Wagg, A., & Khadaroo, R. G. (2020). The impact of delayed mobilization on post-discharge outcomes after emergency abdominal surgery: A prospective cohort study in older patients. *PloSone, 15(11).* https://doi.org/10.1371/journal.pone.0241554

Portela Dos Santos, O., Melly, P., Hilfiker, R., Giacomino, K., Perruchoud, E., Verloo, H., & Pereira, F. (2022). Effectiveness of Educational Interventions to Increase Skills in Evidence-Based Practice among Nurses: The EDIT care Systematic Review. *Healthcare (Basel, Switzerland), 10*(11), 2204. https://doi.org/10 .3390/healthcare1011220

Rosen, R. D., & Manna, B. (2023). Wound Dehiscence. In *StatPearls*. StatPearls Publishing. Available at :https://pubmed.ncbi.nlm.nih.gov/31869176/, Accessed on 1/12/2023.

Rosowicz, A., Brody, J. S., Lazar, D. J., Bangla, V. G., Panahi, A., Nobel, T. B., Dexter-Meldrum, J., & Divino, C. M. (2022). Early Ambulation is Associated with Improved Outcomes Following Colorectal Surgery. The American surgeon, 31348221142590. Advance online publication. https://doi.org/10.1177/00031348221142590

Sarwar, A. (2023). Nursing care plan for Whipple surgery.Retrived from: https://www.madeformedical.com/nursing-care-plan-for-whipple-surgery/.

Schwab, M., Brindl, N., Studier-Fischer, A., Tu, T., Gsenger, J., Pilgrim, M., Friedrich, M., Frey, P. E., Achilles, C., Leuck, A., Bürgel, T., Feisst, M., Klose, C., Tenckhoff, S., Dörr-Harim, C., & Mihaljevic, A. L. (2020). Postoperative complications and mobilisation following major abdominal surgery with vs. without fitness tracker-based feedback: study protocol for a student-led multicenter randomized controlled trial *Trials, 21(1),* 293. https://doi.org/10.1186/s13063-020-4220-8

Takagi, K., Yoshida, R., Yagi, T., Umeda, Y., Nobuoka, D., Kuise, T., Hinotsu, S., Matsusaki, T., Morimatsu, H., Eguchi, J., Wada, J., Senda, M., & Fujiwara, T. (2019). Effect of an enhanced recovery after surgery protocol in patients undergoing pancreaticoduodenectomy:A randomized controlled trial. *Clinical nutrition (Edinburgh, Scotland), 38(1),* 174–181. https://doi.org/10.1016/j.clnu.2018.01.002

Tang, J., Liu, X., Ma, T., Lv, X., Jiang, W., Zhang, J., ... & Tang, W. (2020). Application of enhanced recovery after surgery during the perioperative period a multi-center randomized clinical trial. *Clinical Nutrition, 39(7),* 2062-2069.

Tazreean, R., Nelson, G., & Twomey, R. (2022). Early mobilization in enhanced recovery after surgery pathways: current evidence and recent advancements. *Journal of comparative effectiveness research, 11(2),* 121–129. https://doi.org/10.2217/cer-2021-0258

Tosic, L., Goldberger, E., Maldaner, N., Sosnova, M., Zeitlberger, A. M., Staartjes, V. E., Gadjradj, P. S., Eversdijk, H. A. J., Quddusi, A., Gandía-González, M. L., Sayadi, J. J., Desai, A., Regli, L., Gautschi, O. P., & Stienen, M. N. (2020). Normative data of a smartphone app–based 6-minute walking test, test-retest reliability, and content validity with patient-reported outcome measures. *Journal of Neurosurgery: Spine SPI, 33(4),* 480-489. https://doi.org /10.3171/2020.3.SPINE2084.

Vermişli, S., Çakmak, O., Muezzinoğlu, T., Aslan, G. & Baydur, H. (2021). The Effect of Postoperative Early Mobilization on Healing Process and Quality of Life Following Radical Cystectomy and Ileal Conduit: A Randomized Prospective Controlled Trial. *Journal of Urological Surgery*, *9(1),* DOI: 10.4274/jus.galenos.2021.2021.0065

Willner, A., Teske, C., Hackert, T., & Welsch, T. (2023). Effects of early postoperative mobilization following gastrointestinal surgery: systematic review and meta-analysis. *BJS open, 7(5),* zrad102. https://doi.org/10.1093/bjsopen/zrad102

Zubair, A. B., Khan Sherwani, I. A. R., Ahmad, M., Tahir, M. A., Khalil, M. I., Bukhari, M. M., Sabir, M., Bhatti, A. A., Afzal, N., & Kaneez, M. (2022). The Spectrum of Postoperative Complications and Outcomes After Pancreaticoduodenectomy: A retrospective outlook from a developing country. *Cureus, 14(2),* e22218. https ://doi. org/ 10.77 59 /cureus.22218