CPQ Medicine (2023) 15:2
Pilot Study

Perioperative Physical Therapy in the Context of Protocols Eras Abdominal Patients: A Pilot Study

Georgia Kabaroudi[1*], Ballas Konstantinos[2], Ilias Kallistratos[3], Hristara-Papadopouloy Alexandra[3] & Chalkia Anna[3]

[1]*MSc PT Academic Scholar of Physiotherapy International Hellenic University (IHU), Greece*

[2]*MD Professor of Aristotle University of Thessaloniki Greece (AUTH), Greece*

[3]*PT PhD Department of Physical Therapy, International Hellenic University, Greece*

[*]**Correspondence to:** Dr. Georgia Kabaroudi, MSc PT Academic Scholar of Physiotherapy International Hellenic University (IHU), Greece.

Copyright

Received: 07 September 2023

Published: 12 September 2023

Keywords: *Perioperative Physiotherapy; Preoperative Physiotherapy; Post-Operative Physiotherapy Addiction; ERAS Protocol; Surgical Intervention*

Abstract

Introduction: Preoperative stress and emotional distress have been to be associated with higher complication rates, greater postoperative pain, cognitive impairment, and delayed recovery. ERAS, (Enhanced Recovery After Surgery), is a protocol developed to improve the recovery outcomes of patients undergoing surgery. It is a multimodal approach that includes a combination of preoperative, intraoperative, and postoperative interventions that promote rapid recovery to reduce postoperative stress and its effects.

Purpose: Research studies to date have focused on the benefits of post-operative physiotherapy without including pre-operative physiotherapy according to the ERAS principles. They have also mainly focused on surgeries involving orthopedic patients or thoracic surgeries or patients

hospitalized in the ICU. The review of the literature indicates the need to consider a holistic intervention according to the principles of ERAS that will address preoperative and postoperative physiotherapy in patients with abdominal surgery using tools that assess the functional recovery of these patients.

Method: This is a pilot study where the patients who participated were from the University Surgical Clinics of Thessaloniki. Fifty-one patients participated in the study, the patients were randomly allocated to an intervention group and a control group, after their signed consent. The control group followed an inpatient postoperative physical therapy program while the intervention group followed a specific preoperative and postoperative physical therapy program. The measurement methods used were a questionnaire created by the researcher and related to data on the patient's current health status, the functional independence scale F. I.M, digital goniometer, algometer measurement Wagner and VAS was used to analyze the data Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria at version 4.2.3 via her RStudio platform and _ _ specifically the live libraries stats, tidyverse, rstatix, gtsummary, samplesizeCMH, lme4.

Results: Recorded variables were either categorical or numerical. The residence time variable converted to a numerical variable. Categorical variables summarized as absolute and relative frequencies. For the numerical variables, normal distribution was checked with the Shapiro – Wilks test with a significance level of 5% and based on the result for each one, they were summarized with median value and interquartile range (IQR). Comparisons between groups made by Wilcoxon test Mann Whitney for numerical variables and by x 2 test or Fisher 's exact test based on expected frequencies test.). The primary outcomes (FIM, algometer value, VAS scale and Oxford scale) were also checked for their difference in relation to the basic preoperative measurement. All individual comparisons showed statistically significant differences.

Conclusion: In the present study it was found that a perioperative physical therapy program can improve postoperative indicators for patients, such as faster functional recovery of the patient contributing to the reduction of hospital stay as well as hospitalization costs. Patients belonging to the ERAS group reach their preoperative level faster compared to patients in the non - ERAS group. These results suggest that ERAS rehabilitation may improve the patient's postoperative condition and achieve clinical requirements for hospital discharge more quickly Research should continue to demonstrate that a perioperative physical therapy program within the ERAS protocol can contributes to the rapid functional recovery of patients.

Contribution of the Paper

- Informing about the ERAS protocol
- Understanding the importance of preoperative physical therapy according to ERAS principles
- Usefulness of perioperative physical therapy in abdominal surgery.

Introduction

Surgery, according to archaeological findings, was one of the first forms of medicine. It was developed in countries such as India, China, Egypt, etc. In Greece, Hippocrates, for the first time, approaches medicine in general and surgery in particular, with a scientific basis and the foundations of medical science are laid. Modern surgery begins to be born in the 18th century, presenting a geometric evolution in the second half of the 20th century and in our days [1,2].

Although the main purpose and goal of any surgical intervention is to restore or improve the health of the patient, all surgical procedures involve the risk of complications at a different rate depending on many factors, such as the age, the general condition of the patient, the type of surgery, perioperative preparation and care, etc [3]. Some of the complications are independent of the type of surgery and can appear after any operation and are characterized as general complications, while others are related to the anatomical location and type of operation and are characterized as special - local [4,5]. Simultaneously with the development of surgical techniques, the effect of their complications was also understood and the effort to continuously reduce them began. Sterile technique, aseptic postoperative care, antibiotics, use of the WHO surgical safety checklist, and careful postoperative monitoring are factors that significantly reduce the risk of complications. Through this effort the ERAS protocols were developed, first described for use in colon surgery and their value has been proven to be useful in many types of surgery offering significant benefits to patients and hospitals. These programs attempt to modify the physiological and psychological responses of patients to major surgery and have been shown to lead to a reduction in complications and hospital stay, promoting early return of bowel function and immediate mobilization resulting in early functional restoration. Physiotherapy plays a key role in these programs [6-10].

Physical therapy helps surgical patients regain fitness, improve muscle strength, posture, mobility, restore functional skills such as walking, and better manage pain and trauma-related with surgery. The benefits are multiple, and permanent, as each patient can receive help and guidance tailored to their individual needs. Preoperative physical therapy is effective in regaining functional capacity, helping patients better cope with the stress of surgery, and can reduce complications after surgery. Based on abdominal surgery studies, 3 to 4 weeks of preoperative physical therapy is considered feasible and has been recommended in the ERAS guidelines [10-16].

The primary objective of this pilot study is to examine whether moderate-to-vigorous exercise, applied shortly before surgery as well as early mobilization after surgery, will reduce overall morbidity and mortality in patients who undergoing abdominal surgery or complex thoracic and abdominal surgery.

Method

The 51 patients were randomly allocated to an intervention group and a control group, after their signed consent. The control group, 36 patients followed a 15-minute inpatient postoperative physical therapy program while the intervention group, 15 patients proceeded to the ERAS protocol and followed a specific 45-minute preoperative and postoperative physical therapy program.

The selection criteria were patients of both sexes who are going to undergo surgery (ERAS), their age should be >18-75 years, while patients were excluded whose score on the functional independence scale was less than 25 in the fields concerning mobility / transportation, commuting, suffered from a serious lung or heart condition that does not allow them to perform physical exercise, presented some language or psychological disorder that prevented them from understanding and following the program and did not give their signed consent.

Recorded variables were either categorical or numerical. The residence time variable converted to a numerical variable. Categorical variables summarized as absolute and relative frequencies. For the numerical variables, normal distribution checked with the Shapiro – Wilks test with a significance level of 5% and based on the result for each one, they summarized with median value and interquartile range (IQR). Comparisons between groups made by Wilcoxon test Mann Whitney for numerical variables and by x 2 test or Fisher 's exact test based on expected frequencies test. Hospitalization costs calculated based on the published closed consolidated hospitalizations and the additional stay on the Surgical Clinic hospitalization cost per day. Multivariate logistic or linear regression models used for multivariate testing based on the nature of the dependent variables (logistic regression for categorical dependent variables and linear for numerical dependent variables). The maximum number of factors evaluated simultaneously was two. The results of the models interpreted with the beta coefficient for the linear models and with the likelihood ratio for the logistic models together with the corresponding 95% confidence intervals (95% CI) calculated by the Wald method. The likelihood ratio used for both x 2 and Fisher 's tests.

The level of statistical significance was set at 5% and the power of the study at 80%. The present study is a pilot sample in the context of a wider protocol and as in the existing literature when the protocol was drawn up there were only data on the time of hospitalization, it was calculated that in order to detect a clinically significant difference (with Student 's t - test) for a difference in hospitalization time of two days requires 16 patients per group.

Core used to analyze the data Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria at version 4.2.3 via her RStudio platform and specifically the libraries stats, tidyverse, rstatix, gtsummary.

Results

In a total of 51 patients, 15 proceeded to the ERAS protocol and 36 to the non- ERAS Protocol. The two groups did not differ statistically significantly in the frequency of age groups, gender, BMI weight classification, height, temperature, level of consciousness, circulatory diseases, and cardiac diseases. A statistically significant difference was observed in sexes with an odds ratio of 0.12 (95% CI 0.01, 0.89) for smoking for the ERAS group and a 14-fold increased likelihood of not reporting any smoking or alcohol use habits (OR: 13.8, 95% CI 2.12, 160.9). A statistically significant difference also observed in the category of the individual recall of respiratory diseases where the relative frequency of individual diseases was higher in the ERAS group. The parameters chest x-ray, electrocardiogram, heart, and respiratory rate had no difference. (Table 1)

Table 1: *Basic Sample Characteristics*

	Total	Teams		
Variable	**N = 51** [1]	**ERAS,** N = 15 [1]	**non -ERAS,** N = 36 [1]	**p-value** [2]
Age				0.2
18-30	0 (0%)	0 (0%)	0 (0%)	
30-45	4 (7.8%)	0 (0%)	4 (11%)	
45-60	17 (33%)	7 (47%)	10 (28%)	
60-75	30 (59%)	8 (53%)	22 (61%)	
Sex				0.3
Male	25 (49%)	9 (60%)	16 (44%)	
Female	26 (51%)	6 (40%)	20 (56%)	
Weight (BMI)				0.2
Fat enough	3 (5.9%)	2 (13%)	1 (2.8%)	
Normal	48 (94%)	13 (87%)	35 (97%)	
Height	170 (162, 176)	170 (168, 175)	166 (162, 176)	0.6
Temperature				
Normal	51 (100%)	15 (100%)	36 (100%)	
Pregnancy				
No	51 (100%)	15 (100%)	36 (100%)	
Six				0.001
Suffocation	7 (14%)	5 (33%)	2 (5.6%)	
Wine spirit	2 (3.9%)	2 (13%)	0 (0%)	
What a drink	42 (82%)	8 (53%)	34 (94%)	
Level of consciousness				>0.9
Good morning	49 (96%)	15 (100%)	34 (94%)	
Blurring	2 (3.9%)	0 (0%)	2 (5.6%)	
Respiratory diseases				0.003
Asthma	3 (5.9%)	3 (20%)	0 (0%)	
Miscellaneous a	1 (2.0%)	1 (6.7%)	0 (0%)	
Shortness of breath	1 (2.0%)	1 (6.7%)	0 (0%)	
COPD	1 (2.0%)	0 (0%)	1 (2.8%)	
Without problem	45 (88%)	10 (67%)	35 (97%)	

Circulatory diseases				0.5
Miscellaneous a	1 (2.0%)	0 (0%)	1 (2.8%)	
Support	17 (33%)	4 (27%)	13 (36%)	
Submission	1 (2.0%)	1 (6.7%)	0 (0%)	
Without problems	32 (63%)	10 (67%)	22 (61%)	
Heart diseases				0.7
Arrhythmia a	5 (9.8%)	1 (6.7%)	4 (11%)	
Miscellaneous a	1 (2.0%)	0 (0%)	1 (2.8%)	
Acquired heart passion	0 (0%)	0 (0%)	0 (0%)	
Previous embolism	2 (3.9%)	0 (0%)	2 (5.6%)	
Relative heart passion	1 (2.0%)	1 (6.7%)	0 (0%)	
No problems	42 (82%)	13 (87%)	29 (81%)	
Chest X-ray				
Normal	51 (100%)	15 (100%)	36 (100%)	
Heart beat				
Normal	51 (100%)	15 (100%)	36 (100%)	
Respiratory rate				
Normal	51 (100%)	15 (100%)	36 (100%)	
EKG				0.3
Pathological	4 (7.8%)	0 (0%)	4 (11%)	
Normal	47 (92%)	15 (100%)	32 (89%)	
[1] n (%)? Median (IQR)				
[2] Fisher's exact test? Pearson's Chi-squared test; Wilcoxon rank sum test				

The median length of hospitalization did not differ statistically significantly between the two groups, nor did the median cost of hospitalization. The relative frequencies of preoperative diagnoses and operations are in table 2. History of previous operations did not differ statistically significantly between the two groups. Access (laparoscopic, open, hybrid) differed statistically significantly between the two groups, specifically the comparisons Open - Hybrid (p - value 0.0154) and Hybrid - Laparoscopic (p - value 0.0154). The remaining variables did not differ statistically significantly between the groups. Postoperative complications included respiratory and trauma complications and were not statistically significantly different between the two groups.

Table 2: *Nursing Parameters*

Variable	Total **N = 51** [1]	Teams **ERAS,** N = 15 [1]	**non -ERAS,** N = 36 [1]	**p-value** [2]
Duration of hospitalization	4 (2, 7)	4 (1, 5)	5 (2, 8)	0.3
Missing values	7	2	5	
Anatomical site of operation				0.10
Groin area	10 (20%)	2 (13%)	8 (22%)	
Thoraco-abdominal area	2 (3.9%)	2 (13%)	0 (0%)	
Abdominal	39 (76%)	11 (73%)	28 (78%)	
Previous operations				0.7
Yes	36 (71%)	10 (67%)	26 (72%)	
No	15 (29%)	5 (33%)	10 (28%)	
Access				0.012
Open	22 (44%)	5 (33%)	17 (49%)	
Laparoscopic	24 (48%)	6 (40%)	18 (51%)	
Hybrid	4 (8.0%)	4 (27%)	0 (0%)	
Missing values	1	0	1	
Severity of operation				0.7
Great gravity	41 (80%)	13 (87%)	28 (78%)	
Medium gravity	10 (20%)	2 (13%)	8 (22%)	
Nursing clinic				
Surgery	51 (100%)	15 (100%)	36 (100%)	
Preoperative physiotherapy				
Yes	15 (100%)	15 (100%)	0 (NA%)	
Missing values	36	0	36	
Postponement of surgery during the pre-operative check-up				>0.9
Yes	0 (0%)	0 (0%)	0 (0%)	
No	50 (100%)	15 (100%)	35 (100%)	
Missing values	1	0	1	
Postoperative complications				>0.9
Respiratory System	7 (100%)	2 (100%)	5 (100%)	
Trauma	0 (0%)	0 (0%)	0 (0%)	
Missing values	44	13	31	

Cost of hospitalization	1.685 (1.085, 3.228)	1,849 (1,285, 3,319)	1.685 (1.085, 3.102)	0.4
Missing values	7	2	5	
[1] Median (IQR); n (%)				
[2] Wilcoxon rank sum test? Fisher's exact test				

The FIM scale differed statistically significantly between the two groups at the first and second postoperative assessments with the median value for the ERAS group being 35 at both time points while the non- ERAS group was 17 and 25 respectively (table 3). Algometer measurement had a statistically significant difference at all measurement times. For this reason, linear regression models adjusted for each time point with the intervention group and the preoperative algometer measurement as independent variables. For the first postoperative assessment, the algometry value reduced by 4.4 units (95% CI -8.5, - 0.26) adjusted for each unit increase in the preoperative algometry by 0.62 (95% CI 0.25, 0.99). At the second postoperative assessment the algometry value reduced by 4.4 units (95% CI -7.3, -1.5) adjusted for each unit increase in the preoperative algometry by 0.75 (95% CI 0.50, 1.00). At the third postoperative assessment the algometry value reduced by 1.7 units (95% CI -3.3, - 0.18) adjusted for each unit increase in the preoperative algometry by 0.89 (95% CI 0.75, 1.00). The VAS scale did not show a statistically significant difference between the two groups at the preoperative assessment but had statistically significant differences in all three postoperative measurements with the ERAS group always having lower median values than the non- ERAS group. Finally, the Oxford scale did not fluctuate at any time of assessment. All patients found to have a synchronized breathing pattern at all time points. The probability of productive cough was higher in the non- ERAS group at the first and second postoperative assessments (first estimate OR: 5.15, 95% CI 0.87, 53). (Table 3)

Table 3: *Comparison of preoperative and postoperative measurements*

	Preoperative assessment			First postoperative assessment			Second postoperative assessment			Third postoperative assessment		
Variable	**ERAS,** N = 15 [1]	**non -ERAS,** N = 36 [1]	**p-value** [2]	**ERAS,** N = 15 [1]	**non -ERAS,** N = 36 [1]	**p-value** [2]	**ERAS,** N = 15 [1]	**non -ERAS,** N = 36 [1]	**p-value** [2]	**ERAS,** N = 15 [1]	**non -ERAS,** N = 36 [1]	**p-value** [2]
FIM scale	35.00 (35.00, 35.00)	35.00 (35.00, 35.00)		35.00 (25.00, 35.00)	17.00 (5.00, 26.00)	<0.001	35.00 (35.00, 35.00)	25.00 (21.00, 35.00)	0.001	35.00 (35.00, 35.00)	35.00 (35.00, 35.00)	0.1
Missing values				2	5		2	5		2	5	
Algometer												
Yes	15 (100%)	36 (100%)		13 (100%)	31 (100%)		13 (100%)	31 (100%)		13 (100%)	31 (100%)	
Missing values				2	5		2	5		2	5	
Algometry position			0.4			0.12			0.4			0.4
Bu bonica	2 (13%)	7 (19%)		2 (15%)	8 (26%)		2 (15%)	8 (26%)		2 (15%)	8 (26%)	
Abdominal thor	1 (6.7%)	0 (0%)		2 (15%)	0 (0%)		1 (7.7%)	0 (0%)		1 (7.7%)	0 (0%)	
Stomach a	12 (80%)	29 (81%)		9 (69%)	23 (74%)		10 (77%)	23 (74%)		10 (77%)	23 (74%)	
Missing values				2	5		2	5		2	5	
Algometer price	28.0 (25.5, 28.2)	22.4 (19.3, 26.6)	0.007	22.0 (20.0, 27.0)	16.0 (10.0, 19.0)	0.003	27.0 (24.0, 29.0)	18.0 (15.0, 22.0)	<0.001	28.0 (26.0, 30.0)	21.5 (19.2, 24.3)	<0.001
Missing values				2	5		2	5		2	5	
VAS scale						>0.9			>0.9			>0.9
Yes	15 (100%)	36 (100%)		13 (100%)	31 (97%)		13 (100%)	31 (97%)		13 (100%)	31 (97%)	
No				0 (0%)	1 (3.1%)		0 (0%)	1 (3.1%)		0 (0%)	1 (3.1%)	
Missing values				2	4		2	4		2	4	
VAS position			>0.9			0.7			0.7			0.7
Missing values				2	5		2	5		2	5	

Bu bonica	2 (13%)	5 (14%)		2 (15%)	8 (26%)		2 (15%)	8 (26%)		2 (15%)	8 (26%)	
Abdominal thor	0 (0%)	0 (0%)		0 (0%)	0 (0%)		0 (0%)	0 (0%)		0 (0%)	0 (0%)	
Stomach a	13 (87%)	31 (86%)		11 (85%)	23 (74%)		11 (85%)	23 (74%)		11 (85%)	23 (74%)	
Missing values				2	5		2	5		2	5	
VAS scale value	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.5	0.00 (0.00, 2.00)	4.00 (0.00, 7.00)	0.042	0.00 (0.00, 0.00)	2.00 (0.00, 3.50)	0.002	0.00 (0.00, 0.00)	0.00 (0.00, 1.00)	0.023
Missing values				2	5		2	5		2	5	
Oxford scale						>0.9			>0.9			>0.9
Yes	15 (100%)	36 (100%)		13 (100%)	31 (100%)		13 (100%)	31 (100%)		13 (100%)	31 (100%)	
No				0 (0%)	0 (0%)		0 (0%)	0 (0%)		0 (0%)	0 (0%)	
NA				2	5		2	5		2	5	
Trunk												
3+–5	15 (100%)	36 (100%)		13 (100%)	31 (100%)		13 (100%)	31 (100%)		13 (100%)	31 (100%)	
Don't say prices				2	5		2	5		2	5	
Upper extremity DE												
3+–5	15 (100%)	36 (100%)		13 (100%)	31 (100%)		13 (100%)	31 (100%)		13 (100%)	31 (100%)	
Don't say prices				2	5		2	5		2	5	
Upper end NO												
3+–5	15 (100%)	36 (100%)		13 (100%)	31 (100%)		13 (100%)	31 (100%)		13 (100%)	31 (100%)	
Missing values				2	5		2	5		2	5	

Type of breathing			>0.9			>0.9			>0.9			>0.9			>0.9			>0.9	
Thoracic _			0 (0%)	0 (0%)		0 (0%)	0 (0%)		13 (100%)	0 (0%)		13 (100%)	0 (0%)		13 (100%)	0 (0%)		13 (100%)	0 (0%)
Synchronized	15 (100%)	36 (100%)		13 (100%)	31 (100%)		13 (100%)	31 (100%)		13 (100%)	31 (100%)		13 (100%)	31 (100%)		13 (100%)	31 (100%)		
Missing values				2	5		2	5		2	5		2	5		2	5		
Cough			0.7			0.04			0.019			>0.9			>0.9			>0.9	
Non - productive	14 (93%)	31 (86%)		11 (85%)	16 (52%)		13 (100%)	20 (65%)		13 (100%)	31 (100%)		13 (100%)	31 (100%)		13 (100%)	31 (100%)		
Productive _	1 (6.7%)	5 (14%)		2 (15%)	15 (48%)		0 (0%)	11 (35%)		0 (0%)	0 (0%)		0 (0%)	0 (0%)		0 (0%)	0 (0%)		

[1]n (%)? Median (IQR)
[2]Fisher's exact test? Wilcoxon rank sum test? Pearson's Chi-squared test

The following table (table 4) shows the parameters of the postoperative program to which the patients subjected during their hospitalization. In the first and third post-operative assessments there are no differences between the two groups. In the second postoperative assessment, no differences observed in the common parameters of the two groups.

[1]n (%)
[2]Fisher's exact test? Pearson's Chi-squared test

Table 5: *Postoperative physical therapy program of ERAS patients*

Parameter	Preoperative assessment			First postoperative assessment			Second postoperative assessment			Third postoperative assessment		
	ERAS, N = 15[1]	**non -ERAS,** N = 36[1]	**p-value** [2]	**ERAS,** N = 15[1]	**non -ERAS,** N = 36 [1]	**p-value** [2]	**ERAS,** N = 15[1]	**non -ERAS,** N = 36 [1]	**p-value** [2]	**ERAS,** N = 15[1]	**non -ERAS,** N = 36[1]	**p-value** [2]
Diaphragmatic, thoracic and synchronized breathing									0.005			
Yes	15 (100%)	0 (NA%)		13 (100%)	0 (0%)		4 (31%)	0 (0%)		0	0	
No	0	0		0 (0%)	31 (100%)		9 (69%)	31 (100%)		13 (100%)	31 (100%)	
Missing values	0	36		2	5		2	5		2	5	
Chest expansion combined with upper extremity exercises									0.005			
Yes	15 (100%)	0 (NA%)		13 (100%)	0 (0%)		4 (31%)	0 (0%)		0	0	
No	0	0		0 (0%)	31 (100%)		9 (69%)	31 (100%)		13 (100%)	31 (100%)	
Missing values	0	36		2	5		2	5		2	5	
Bronchial drainage									0.064			
Yes	-	-		13 (100%)	31 (100%)		4 (31%)	19 (61%)		0	0	
No	-	-		0 (0%)	0 (0%)		9 (69%)	12 (39%)		13 (100%)	31 (100%)	
No	0	0		0 (0%)	31 (100%)		9 (69%)	31 (100%)		13 (100%)	31 (100%)	
Missing values	0	36		2	5		2	5		2	5	

Missing values				2	5		2	5		2	5	
Causing a cough									0.064			
Yes	-	-		13 (100%)	31 (100%)		4 (31%)	19 (61%)		0	0	
No	-	-		0 (0%)	0 (0%)		9 (69%)	12 (39%)		13 (100%)	31 (100%)	
Missing values				2	5		2	5		2	5	
Use triflo									0.064			
Yes	-	-		13 (100%)	31 (100%)		4 (31%)	19 (61%)		0	0	
No	-	-		0 (0%)	0 (0%)		9 (69%)	12 (39%)		13 (100%)	31 (100%)	
Missing values				2	5		2	5		2	5	
Joint range maintenance exercises									0.064			
Yes	15 (100%)	0 (NA%)		13 (100%)	31 (100%)		4 (31%)	19 (61%)		0	0	
No				0 (0%)	0 (0%)		9 (69%)	12 (39%)		13 (100%)	31 (100%)	
Missing values	0	36		2	5		2	5		2	5	
Upper, lower limb and trunk strengthening exercises									0.064			
Yes	15 (100%)	0 (NA%)		13 (100%)	31 (100%)		4 (31%)	19 (61%)		0	0	
No	0	0		0 (0%)	0 (0%)		9 (69%)	12 (39%)		13 (100%)	31 (100%)	
Missing values	0	36		2	5		2	5		2	5	

Bending from supine to sitting and transition to standing									0.064			
Yes	-	-		13 (100%)	31 (100%)		4 (31%)	19 (61%)		0	0	
No	-	-		0 (0%)	0 (0%)		9 (69%)	12 (39%)		13 (100%)	31 (100%)	
Missing values				2	5		2	5		2	5	
Operational activities training									0.064			
Yes	15 (100%)	0 (NA%)		13 (100%)	31 (100%)		4 (31%)	19 (61%)		0	0	
No	0	0		0 (0%)	0 (0%)		9 (69%)	12 (39%)		13 (100%)	31 (100%)	
Missing values	0	36		2	5		2	5		2	5	
Training in the use of tools									0.005			
Yes	15 (100%)	0 (NA%)		13 (100%)	0 (0%)		4 (31%)	0 (0%)		0	0	
No	0	0		0 (0%)	31 (100%)		9 (69%)	31 (100%)		13 (100%)	31 (100%)	
Missing values	0	36		2	5		2	5		2	5	
Attendant training and briefing and post-operative program im-plementation									0.005			
Yes	15 (100%)	0 (NA%)		13 (100%)	0 (0%)		4 (31%)	0 (0%)		0	0	

Discussion

ERAS guidelines Society developed by Gustafsson *et al*. [17], Nelson *et al*. [18] and Nygren *et al*. [19] provide evidence-based recommendations for perioperative care in surgical procedures demonstrating that successful implementation of ERAS protocols in the United Kingdom has resulted in reduced length of hospital stay and lower complication rates while emphasizing the importance of early mobilization to achieve these better results [20-23]. In order to for the results of the studies to have high reliability and be comparable, the basic elements of the subjects must be relatively similar. In the present study this was made possible since the distributions of age, sex, weight, height, clinical parameters at the initial visit which included temperature, heart and respiratory rate, emotions, level of consciousness, individual memory data about respiratory, circulatory and heart diseases, chest x-ray and electrocardiogram (ECG) findings had no statistically significant difference between the two groups. p - value 2 > 0.05). Also, the distribution of the type of surgery did not differ statistically significantly between the two groups. p - value 2 > 0.05). (Table 2). Therefore, the results of this study are considered to have a high degree of reliability.

The use of the ERAS rehabilitation program can help patients return more quickly to their preoperative functional level, and examining how this is achieved should be a focus of Physiotherapy research in the future, providing evidence for its inclusion in the ERAS programs of tomorrow. different rehabilitation protocols had different effects on the postoperative recovery of patients in the ERAS and non -ERAS groups in terms of their functional recovery [24,25].

In the present pilot study, the FIM, the Functional Independence Scale, differed statistically significantly between the two groups at the first and second postoperative assessments with the median value for the ERAS group being 35 at both time points, while the non- ERAS group was 17 and 25 respectively. The above results are probably due to the pre-operative preparation of the patient with the pre-operative physical therapy program, which includes training the patient on how to mobilize after the operation, as a result of which the patient, knowing what is going to happen after the operation, has reduced stress and anxiety and the possibility of mobilization after a few hours from the surgery (day 0) always with the order of the attending physician.

Algometer measurement had a statistically significant difference at all measurement times. Reduced pain is also a determining factor for early mobilization of the patient. Patients are too often afraid to mobilize in order not to hurt or, in case of pain, not to make it worse. Patients who received the ERAS rehabilitation program experienced less postoperative pain, which is in agreement with previous studies. Furthermore, [26,27] this fact may be due to the preoperative preparation of the patient according to the ERAS guidelines and the preoperative physical therapy program according to which the patient received training in mobilization methods protecting his incision and minimizing the tension of the abdominal muscles so that there is reduced or even no pain.

Conclusion

ERAS protocols promote rapid recovery to reduce postoperative stress and its effects. Therefore, they follow a planned, documented perioperative care [28]. In the present pilot study, it found that a perioperative

physical therapy program, included in ERAS protocols, can improve other postoperative indicators for patients, such as faster mobilization and consequently functional recovery of the patient and reduction of postoperative pain.

Further study is necessary to obtain reliable results in a sufficient sample. Also, an area of future research could be the establishment of a standardized physical therapy rehabilitation program, which would be informed by the principles of ERAS, and delivered by specialist physical therapists, who could monitor the patients or in the TEIs of the surgical specialties. especially in high-risk patients, or pre-operatively in surgical clinics.

Ethical Approval: Aristotle University of Thessaloniki

Financing: This research received no specific grant from funding bodies in the public, commercial or non-profit sector.

Conflict of Interest: The authors declare no conflict of interest in this work. The above pilot study conducted as part of Ms. Kabaroudis Georglia's PhD.

Bibliography

1. Köckerling, F., Sheen, A. J., Berrevoet, F., Campanelli, G., Cuccurullo, D., Fortelny, R., *et al.* (2019). The reality of general surgery training and increased complexity of abdominal wall hernia surgery. *Hernia., 23*(6), 1081-1091.

2. Abdullah Iqbal (2023). Surgery - General Surgeon.

3. American Medical Association (2020). Surgery - General Specialty Description.

4. Lunca, S., Bouras, G. & Stanescu, A. C. (2005). Gastrointestinal robot-assisted surgery. A current perspective. *Romanian Journal of Gastroenterology, 14*(4), 385-391.

5. Fitzgerald, J. E. F. & Caesar, B. (2012). The European working time directive: A practical review for surgical trainees". ("The European Working Time Directive: a practical review for surgical trainees") *International Journal of Surgery, 10*(8), 399-403.

6. Charoenkwan Kittipat, Iheozor -Ejiofor, Zipporah, Rerkasem, Kittipan, Matovinovic, Elizabeth (Cochrane Wounds Group (ed.) (2017). Scalpel versus electrosurgery for major abdominal incisions. *Cochrane Database of Systematic Reviews, 6*.

7. Michael Henry, M. & Jeremy Thompson, N. (2007). Clinical Surgery. Parisianou Scientific Publications S. A. Athens 2007.

8. Broek, R., Issa, Y., Van Santbrink, E. & Bouvy, N. (2013). Burden of adhesions in abdominal and pelvic surgery: systematic review and metaanalysis. *BMJ., 347,* f5588.

9. Global Surg Collaborative (2016). Mortality of emergency abdominal surgery in high-, middle- and low-income countries. *British Journal of Surgery, 103*(8), 971–988.

10. Global Surg Collaborative (2016). Determinants of morbidity and mortality following emergency abdominal surgery in children in low-income and middle-income countries. *BMJ Global Health., 1*(4).

11. Gershkovich Pavel, Itin Constantin, Yacovan Avihai, Amselem Shimon & Hoffman Amnon (2009). Effect of abdominal surgery on the intestinal absorption of lipophilic drugs: Possible role of the lymphatic transport. *Translational Research, 153*(6), 296-300.

12. David Georgy (2021). The Importance of Pre- and Post-operative Physiotherapy Australian Sports Physiotherapy.

13. Sjaak Pouwels, Rutger Stockmans, A., Edith Willigendael, M., Simon Nienhuijs, W., Camiel Rosman, Bertvan Ramshorst & Joep Teijink, A. W. (2013). Preoperative exercise therapy for elective major abdominal surgery A systematic review. *International Journal of Surgery., 12*(2), 134-140.

14. Jayaditya Devpal Patil, Jessica Atef Nassef Sefen & Salim Fredericks (2022). Exploring Non-pharmacological Methods for Pre-operative Pain Management. *Front Surg., 9,* 801742.

15. Pushpal K Mitra Textbook of Physiotherapy in Surgical Conditions. Jaypee Brothers Medical Publishers (P) LTD 2012.

16. Surendra Patil (2022). The Importance of Physiotherapy Before and After Surgery.

17. Gustafsson, U. O., Scott, M. J. & Schwenk, W. (2012). Guidelines for perioperative care in elective colonic surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations. *Clin Nutr., 31*(2), 783-800.

18. Nelson, G., Bakkum-Gamez, J. & Kalogera, E. (2019). Guidelines for perioperative care in gynecologic/oncology: Enhanced Recovery After Surgery (ERAS) Society recommendations-2019 update. ("Guidelines for pre- and intra-operative care in gynecologic/oncology...") *Int J Gynecol Cancer., 29*(4), 651-668.

19. Nygren, J., Thacker, J. & Carli, F. (2012). Guidelines for perioperative care in elective rectal/pelvic surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations. *Clin Nutr., 31*(6), 801-816.

20. Thomas Hoogeboom, J., Jaap Dronkers, J., Erik Hulzebos, H. J. & Nico van Meeteren, L. U. (2014). Merits of exercise therapy before and after major surgery. *Curr Opin Anaesthesiol., 27*(2), 161-166.

21. Darlene Reid, W. (2009). Frank Chung Clinic Approach in Cardiorespiratory Physiotherapy Broken Hill Publishers LTD 2009.

22. Daniels, S. L., Lee, M. J., George, J., Kerr, K., Moug, S., Wilson, T. R., *et al*. (2020). Prehabilitation in elective abdominal cancer surgery in older patients: systematic review and meta-analysis. *BJS Open., 4*(6), 1022–1041.

23. Jayaditya Devpal Patil, Jessica Atef Nassef Sefen & Salim Fredericks (2022). Exploring Non-pharmacological Methods for Pre-operative Pain Management. *Front Surg., 9,* 801742.

24. Kamparoudi Georgia Maria, Ballas Konstantinos & Kamparoudis Apostolos (2021). Physiotherapy and ERAS Protocol. *CPQ Orthopaedics., 5*(2), 1-9.

25. Hughes, M. J., Hackney, R. J., Lamb, P. J., Wigmore, S. J., Christopher Deans, D. A. & Skipworth, R. J. E. (2019). Prehabilitation before major abdominal surgery: a systematic review and meta-analysis. *World J Surg., 43*(7), 1661-1668.

26. Lawrence, V. A., Hazuda, H. P., Cornell, J. E., Pederson, T., Bradshaw, P. T. & Mulrow, C. D. (2004). Functional independence after major abdominal surgery in the elderly. ("Prehabilitation, making patients fit for surgery – a new frontier in...") *J Am Coll Surg., 199,* 762-772.

27. Sorensen, L. T., Karlsark, T. & Gottrup, F. (2003). Abstinence from smoking reduces incisional wound infection: a randomized controlled trial. *Annals of Surgery, 238*(1), 1-5.