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Research

The Effect of Visits by Operating Room Nurses Before Cardiac Surgery on Anxiety and Pain Management

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A B S T R A C T

Purpose: Further studies are needed in line with the Enhanced Recovery for Cardiac Surgery (ERCS) protocols with a view to reducing anxiety and opioid use in cardiac surgery patients. The present study investigates the effects of preoperative visits by operating room nurses to patients scheduled for cardiac surgery on postoperative anxiety, pain severity and frequency, and the type and dose of analgesic medication.
Design: This is a quasi-experimental study with a pretest-posttest control group design involving nonrandomized groups.
Methods: The study was conducted in the Department of Cardiovascular Surgery of a Foundation University Hospital in Turkey between August 20, 2020 and April 15, 2021. Included in the study were patients selected based on a nonprobability sampling approach who met the study inclusion criteria (aged 18-75 years, no psychiatric diagnosis or drug use, first cardiovascular surgery experience, scheduled for elective surgery, up to five coronary anastomoses, literate and able to speak and understand Turkish, undergoing cardiovascular surgery with Cardiopulmonary Bypass (CPB)) determined by the researcher. The treatment group was visited preoperatively by operating room nurses, and followed-up for the first 72 hours after surgery.
Findings: The intervention was effective in reducing postoperative state anxiety levels ($P < .05$). In the control group, each one-point increase in the preoperative state-anxiety level caused a 9% increase in the length of stay in the intensive care unit ($P < .05$). Pain severity increased as the preoperative state-anxiety and trait-anxiety levels, and the postoperative state-anxiety levels, increased ($P < .05$). While there was no significant difference in pain severity, the intervention proved to be effective in reducing pain frequency ($P < .05$). It was further noted that the intervention reduced the use of opioid and nonopioid analgesics for the first 12 hours ($P < .05$). The probability of using opioid analgesics increased 1.56 times ($P < .05$) with each one-point increase in pain severity reported by the patients.
Conclusions: The participation of operating room nurses in preoperative patient care can contribute to the management of anxiety and pain and the reduction of opioids. It is recommended that such an approach be implemented as an independent nursing intervention given the potential contribution to ERCS protocols.

Previous studies have shown that preoperative anxiety levels influence postoperative pain levels and analgesic requirements in open heart surgery patients.[1-3] Anxiety related to the operating room staff (10.35%) and the operating room environment (7.62%) in open heart surgery patients[4-6] are high on the list of concerns among those who experience a high level of preoperative anxiety.[7]

It is recommended that preoperative visits be made to ascertain the physiological, social and psychological status of patients, and that care be maintained in the operating room.[8] While preoperative patient visits by operating room nurses will place increasing demands on the nursing staff, the potential benefits will contribute to the improvement of postoperative patient outcomes and support the development of the Enhanced Recovery for Cardiac Surgery (ERCS) protocol in cardiac surgery.[9-11] It has been emphasized that to facilitate enhanced recovery after cardiac surgery, further studies are needed to develop a comprehensive ERCS protocol based on the Enhanced Recovery after Surgery (ERAS) protocol, and that there is a

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need to reduce patient anxiety, especially through preoperative patient information, to provide effective postoperative pain management and to reduce the use of opioid analgesics.[9,12-15]

The present study investigates the effects of preoperative visits by operating room nurses to patients scheduled for cardiac surgery on postoperative anxiety, pain severity and frequency, and the type and dose of analgesic medication through a study of patients scheduled for cardiopulmonary bypass surgery.

Study Hypotheses

Hypothesis 1 (H1): The level of postoperative anxiety will be lower in patients undergoing surgery with CPB who are visited and given details of the procedure by an operating room nurse the day before surgery, and who are greeted in the operating room by the same nurse, than in those who are not visited.

Hypothesis 2 (H2): The severity and frequency of postoperative pain will be lower in patients undergoing surgery with CPB who are visited and given details of the procedure by an operating room nurse the day before the surgery, and who are greeted in the operating room by the same nurse, than in those who are not visited.

Hypothesis 3 (H3): The dose and frequency of postoperative opioid analgesics and nonopioid analgesics will be lower in patients undergoing surgery with CPB who are visited and given details of the procedure by an operating room nurse the day before the surgery, and who are greeted in the operating room by the same nurse, than in those who are not visited.

Methods

This quasi-experimental study involving nonrandomized groups with a pretest-posttest control group design was conducted in the Department of Cardiovascular Surgery of a Foundation University Hospital in Turkey, with 350 beds and 12 operating rooms. The study was conducted between August 20, 2020 and April 15, 2021.

Included in the study were patients identified through a nonprobability sampling approach who were evaluated using the "Sampling Criteria Form" developed by the researcher following a review of related literature.[16-19] Included in the study were adults aged 18 to 75 years with no psychiatric diagnosis or drug use, undergoing their first cardiovascular surgery experience, scheduled for elective surgery, with up to five coronary anastomoses, literate and able to speak and understand Turkish, and undergoing cardiovascular surgery with Cardiopulmonary Bypass (CPB) (Figure 1). A total of 98 patients from the study period were evaluated, and those who met the above criteria and who were eligible for the study were assigned nonrandomly first to the treatment group, and then to the control group. In line with previous studies,[3,4] a power analysis was performed using the clinical calculator program, revealing $d = 2.836$ (effect size), $\alpha = 0.05$, $\beta = 0.20$ and power = 0.80, and a sample size of 64 patients was determined, with 32 patients each in the treatment and control groups.

Data Collection Tools

The sampling was carried out using the “Sampling Criteria Form” developed by the researcher based on a review of literature.[16-19] Anxiety levels were measured using the “State-Trait Anxiety Inventory (STAI TX I-II),” which is a generally accepted tool for the assessment of anxiety[17,18]; pain was assessed using the “Visual Analog Scale (VAS)”; pain and analgesic use were recorded on the “Pain and Analgesic Monitoring Form” developed by the researcher based on a review of literature,[20] and patients’ demographic and clinical data were recorded using the 32-item “Descriptive Data Form” developed by the researcher.

State-Trait Anxiety Inventory

The State-Trait Anxiety Inventory (STAI TX I-II) was developed by Spielberger in 1970. It was adapted for the Turkish context in 1974 to 1977 by Öner and Le Compte, who also carried out its validity and reliability studies.[6,17] The reliability coefficients of the English version STAI TX-I-II range from 0.83 to 0.92 for STAI TX-I, and from 0.86 to 0.92 for STAI TX-II.[3,19,21]

The internal consistency and reliability of the Turkish version were found to be between 0.94 and 0.96 for STAI TX-I and between 0.83 and 0.87 for STAI TX-II according to a Kuder-Richardson α reliability measure. The item reliability correlations of the Turkish version were in the 0.42 to 0.85 for STAI TX-I and the 0.34 to 0.72 range for STAI TX-II. The Turkish version’s Test-Retest reliability coefficients were determined to be in the 0.26 to 0.68 range for STAI TX-I and the 0.71 to 0.86 range for STAI TX-II.[3,19,21] In the present study the Cronbach’s α coefficient was found to be reliable at 0.74 for the preoperative state anxiety STAI TX-I and 0.71 for the postoperative state anxiety STAI TX-I. The Cronbach’s α coefficient for preoperative trait anxiety STAI TX-II was also found to be reliable at 0.78.

The scale includes 40 items measuring 20 state and 20 trait anxieties. Each item is measured on a four-point Likert-type scale.[17,24] For STAI TX-I, the items are rated as (1) none, (2) a little, (3) a lot, (4) completely, according to the current feelings of the respondent.[3,17,21] For STAI TX-II, the items are rated with of four options: (1) almost never, (2) sometimes, (3) often, (4) almost always, expressing how the individual usually feels.[3,17,21] The total scores obtainable from each can very theoretically between 20 and 80 points. In this assessment of state and/or trait anxiety, a high score indicates a high level of anxiety and a low score indicates a low level of anxiety.[17,21] The preoperative state anxiety STAI TX-I threshold is considered to be 44 to 45 points for preoperative patients, with a score of 40 to 59 suggesting moderate anxiety and 60 to 80 suggesting severe anxiety.[3,6,19,21-24]

Visual Analog Scale

The validity study of the VAS,[3,20,25] which is used to quantify unmeasurable values, was conducted by Bryant in 1993. The Cronbach’s α coefficient of the scale is 0.82. VAS scores are interpreted as follows: “0 points, no pain,” “1 to 2 points, very mild pain,” “3 to 4 points, mild pain,” “5 to 6 points, moderate pain,” “7 to 8 points, severe pain,” and “9 to 10 points, unbearable pain.”[4,20,25,26]

Pain and Analgesic Monitoring Form

This form was developed by the researcher based on a review of literature,[20] and was used to collect data on the pain experienced by patients diagnosed, monitored, and treated postoperatively using the VAS in the intensive care unit (ICU) and surgical clinic, until discharge.

Descriptive Data Form

The 32-item Descriptive Data Form, developed based on a review of literature,[3,27] garnered sociodemographic data, medical history, diagnosis and intervention data, surgical intervention and postoperative data, operating room nurse’s visits, status of and reasons for withdrawal from intervention or follow-up, and preoperative STAI TX I-II and postoperative STAI TX-I scores of the respondents.

Intervention Steps

Before Intervention

The operating room nurses were provided information on the content of the patient information booklet developed by the researcher based on a review of literature,[24,28-30] and the patient visit protocol to be applied by the operating room nurse, in a face-to-face interview. The patient information booklet provides details of the activities to be carried out for morning preparation before surgery, on exiting the unit,

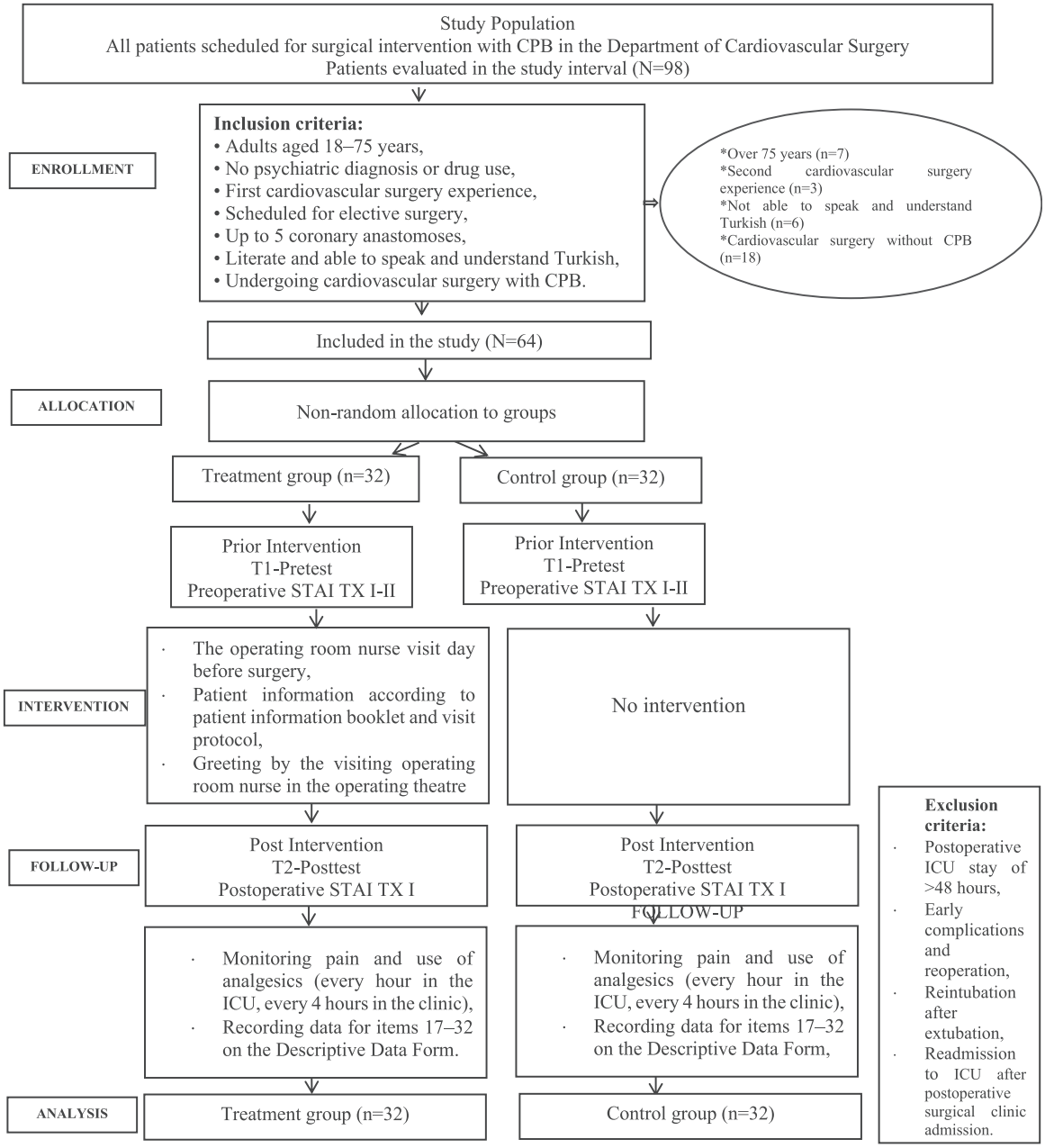

Figure 1. Study design flowchart.

and on entry to the operating room. The information covering the operating theatre provides details of the operating room environment, the attending teams, the characteristics of the environment, and the anesthesia protocol. For the postoperative period, information is given regarding the waking up of the patient in the postoperative intensive care unit, weaning from mechanical ventilation, monitoring the patient's pain expression, reporting and evaluating pain, and the applications to be made. The protocol contents; addressing the patient's concerns, verbal transfer of the content of the training booklet, informing that the visiting nurse will be greeting her/him in the operating room and participating in the surgery, and directing her/him to the physician for medical questions. The information booklet and protocol were approved after being reviewed by five team members (the supervising surgeon and four surgical nurses). As part of the study, information training was provided to the operating room nurses about the scope of the study. To standardize the patient visits, the nurses were provided with a patient information booklet and a patient visit protocol. All of the participating nurses confirmed their receipt of information training with a signature. The nurses in the surgical clinic in which the study was conducted were informed about the visit to be made by the chief operating room nurse, although the purpose of the visit was not explained. Neither the ICU nurses nor physicians were provided with study information.

The eligibility of the patients admitted preoperatively to the surgical clinic for sampling was assessed by the researcher using the Sampling Criteria Form and the study inclusion criteria (Figure 1). Eligible patients were visited in the patient's room by the researcher and informed about the study, and submitted their verbal and written consent for inclusion in the study via the Informed Consent Form. The sociodemographic information, medical history, and diagnosis of the patients were retrieved from the patients' files and recorded on

the Descriptive Data Form. The state and trait anxiety levels of the patients who were revisited in the patient's room by the researcher a minimum 12 hours before the surgical intervention were measured using the STAI TX-I and STAI TX-II Forms within 10 to 20 minutes of the face-to-face interviews. Consistent with the literature,[31] STAI TX II was measured only at this stage to determine the relationship between the preoperative trait and state anxiety levels. Since trait anxiety levels can be affected in the long term by other factors, no trait anxiety level measurement was made for the early postoperative period in this study. All procedures up to this stage were identical for the control and treatment groups.

Patients were allocated nonrandomly first to the treatment group until the required number had been attained, and then similarly to the control group. The researcher delivered the patient information and the visit request to the operating room nurse for the patients allocated to the treatment group.

Intervention

The preoperative patient visit was made by the operating room nurse, who visited the patient in their room at 18:30 the day before surgery, as described in the patient information booklet and the patient visit protocol. As part of the patient information content, the patient was informed about their need-based admission to the operating room and the administration of anesthesia, postoperative awakening in the ICU, and pain assessment. The patient information booklet, prepared with appropriate content according to the scope of verbal information and printed in color, was handed to the patient at the end of the visit with the recommendation that they read it. The visiting nurse gave the patient about 10 to 15 minutes to review the patient information booklet and ask questions. An explanation was given to the patients who had questions. The visiting operating room nurse greeted the patient at the entrance to the operating theater on the day of surgery, introducing himself/herself and communicating with her/him. The visiting operating room nurse then accompanied the patient to the bed and stayed with them until they were taken to the operating room. The visiting operating room nurse participated in the surgery. All interventions at this stage were applied only to the treatment group.

The control group patients were provided with nursing care, as well as information on patient admission and preoperative preparations, by the surgical clinic nurses, without the influence of the researcher, as is routine practice in the institution. The patients were not visited nor given information by the operating room nurses, and no patient information booklet was provided. On the day of surgery, the patients were not met or accompanied to the operating room by the operating room nurses.

Post Intervention

All patients were operated on by the same surgical and anesthesiologist teams. All patients were sedated and curarized without any remifentanil infusion after surgery, and were taken to the intensive care unit. The patients were treated in the intensive care unit by the same intensive care teams. After admission to the intensive care unit, sedation was terminated or discontinuued by the physician as soon as possible, depending on the patient's needs for early weaning from the ventilator. Pain reporting and analgesic administration were monitored from the moment of the first verbal or nonverbal expression of pain at the surgical incision site by the patient. The medical data of the patients admitted to the surgical clinic reporting the surgical intervention and the ICU process were retrieved from the patient file and recorded on the descriptive data form by the researcher. The patient was revisited by the researcher within the first 12 hours of admission to the surgical clinic, and postoperative anxiety levels were measured using the STAI TX-I form in a face-to-face interview lasting 5 to 10 minutes. The severity and time of pain assessed by the researcher using the VAS in the ICU and surgical clinic, the analgesics administered and the time of administration, the type and dose of analgesics, and the postanalgesic pain were monitored via the patient file until discharge and recorded on the Pain and Analgesic Monitoring Form. Findings after the first 72 hours were not evaluated due to the similarity caused by the standard physician's request. The procedures at this stage were identical for the control and treatment groups.

Pain monitoring and practices in the ICU, usually for the first 24 hours after surgery, were followed up from the patient files and recorded every hour, along with pain monitoring and practices every 4 hours after admission to the surgical clinic (at 10:00, 14:00, 18:00, 22:00, 02:00, and 06:00). The severity and frequency of pain were monitored at predetermined time intervals:

Z0: 0 to 12 hours, pain assessment every hour
Z1: 13 to 24 hours, pain assessment every hour.
Z2: 25 to 36 hours, pain assessment every 4 hours.
Z3: 37 to 48 hours, pain assessment every 4 hours,
Z4: 49 to 60 hours, pain assessment every 4 hours.
Z5: 61 to 72 hours, pain assessment every 4 hours.

The type, dose and frequency of opioid analgesics, and nonopioid analgesics were applied at predetermined time intervals:

A0: Analgesic administrations at hours 0 to 12,
A1: Analgesic administrations at hours 13 to 24,
A2: Analgesic administrations at hours 25 to 36,
A3: Analgesic administrations at hours 37 to 48,
A4: Analgesic administrations at hours 49 to 60,
A5: Analgesic administrations at hours 61 to 72.

Ethical Approval

Ethics Committee Approval for the study was granted on November 5, 2019 by Doğuş University, while Institutional Approval was granted by the Chief Physician of the hospital on March 6, 2020. Permission for the use of the STAI TX I-II scales was obtained from the researcher who carried out the validity and reliability study of the Turkish version of the tool.

Patients who gave verbal and written informed consent for their inclusion in the study after face-to-face interviews and briefings by the researcher were included in the study. The planning and execution of all stages of the study were carried out in accordance with the Declaration of Helsinki and professional ethics.

Data Analysis

Study data were analyzed using IBM SPSS Statistics (Version 25.0.; IBM Corp., Armonk, NY). Qualitative variables were presented as frequencies and ratios, and quantitative variables were presented as mean, standard deviation, and median. The normality of quantitative variables was analyzed with a Shapiro-Wilk analysis. Qualitative variables and non-normally distributed quantitative variables were analyzed using nonparametric methods (χ^2 analysis, Fisher's exact test, Kolmogorov-Smirnov test, Mann-Whitney *U* test, Spearman's rho correlation, and logistic regression), and normally distributed quantitative variables were analyzed using parametric methods (independent samples *t* test and paired samples *t* test). A *P* value of less than .05 was considered statistically significant in all data analyses. The SPSS Levene statistical test was used to verify the homogeneity of the treatment and control groups. A post hoc power analysis was performed using the G*Power (v3.1.9.4) program for the comparison of the difference between two independent means using data obtained from the study.

Table 1
Comparison of Pre- and Postoperative Mean STAI TX-I Scores and Preoperative Mean STAI TX-II Scores of the Patients (n = 64)

STAI TX I-II Scores	Treatment Group (n = 32) Mean ± SD	Control Group (n = 32) Mean ± SD	Total (n = 64) Mean ± SD	Levene's Test for Equality of Variances		t Test for Equality of Means	
				F	P	t	P
STAI TX-I							
Preoperative	47.59 ± 10.01	49.34 ± 8.60	48.46 ± 9.30	0.292	.591	0.750	.456
Minimum	28.00	32.00	28.00				
Maximum	70.00	60.00	70.00				
Postoperative	41.81 ± 6.94	48.93 ± 7.51	45.37 ± 8.02	1.364	.247	3.937	**.0001**
Minimum	28.00	30.00	28.00				
Maximum	65.00	61.00	65.00				
STAI TX-II							
Preoperative	44.90 ± 8.22	46.15 ± 6.54	45.53 ± 7.39	0.803	.374	0.673	.503
Minimum	28.00	30.00	28.00				
Maximum	65.00	57.00	65.00				

F, Levene test; Mean, mean. P, level of significance; SD, standard deviation; STAI TX-I, state anxiety; STAI TX-II, trait anxiety; t, paired samples test.

Table 2
Comparison of Pre- and Postoperative Mean STAI TX-I Scores of the Patients (n = 64)

STAI TX-I	Treatment Group (n = 32)	Control Group (n = 32)	Total (n = 64)
Preoperative (mean ± SD)	47.59 ± 10.01	49.34 ± 8.60	48.46 ± 9.30
Postoperative (mean ± SD)	41.81 ± 6.94	48.93 ± 7.51	45.37 ± 8.02
t	4.103	0.934	3.838
P	**.0001**	.358	**.0001**

Mean, mean; P, level of significance; SD, standard deviation; STAI TX-I, state anxiety; t, paired samples test.

Results

The patients in the treatment and control groups were aged 66.72 ± 6.98 and 61.78 ± 8.36 years (mean ± SD), respectively, and the majority were male (53.1%, 65.6%), married (90.6%, 84.5%), secondary school graduates (90.6%, 93.7%), working (53.1%, 62.5%) and living with their families (87.5%, 90.6%). The descriptive characteristics of the patients were similar in the treatment and control groups ($P > .05$).

The majority of both the treatment and control group patients had a diagnosis of ischemic heart disease (65.6%, 59.4%) and comorbidities (87.5%, 78.1%), including diabetes mellitus (DM) and/or hypertension (HT) (62.5%, 75.0%), had an ASA score of greater than II (78.1%, 56.3%) and had undergone a CABG (65.6%, 59.4%), respectively. The medical characteristics of the patients in the treatment and control groups were similar ($P > .05$).

The majority of the treatment and control group patients had previous hospitalization experience (81.3%, 65.6%), as well as previous surgical intervention experience (68.8%, 53.1%), with the number of previous surgical experiences being once (25%, 37.5%), twice (21.9%, 15.6%), and three times or more (21.9%, 0.0%), respectively. The medical histories of the patients were similar in the treatment and control groups ($P > .05$).

The duration of the surgical procedure was 190.27 ± 52.56 minutes and 209.79 ± 61.04 minutes, the duration of intubation was 8.60 ± 4.75 hours and 7.04 ± 3.60 hours, the recovery time from general anesthesia was 3.70 ± 2.03 hours and 3.03 ± 1.54 hours, the duration of ICU stay was 24.73 ± 8.00 hours and 23.69 ± 6.70 hours, the duration of mediastinal drainage was 42.97 ± 21.43 hours and 54.54 ± 28.64 hours, the duration of thoracic drainage was 45.70 ± 25.00 hours and 57.55 ± 36.47 hours, and the time until discharge was 8.25 ± 2.24 days and 8.69 ± 2.97 days, respectively, for the patient and control groups in all cases. The characteristics of the patients during and after surgical intervention were similar in the treatment and control groups ($P > .05$).

The preoperative and postoperative state anxiety scores, the preoperative trait anxiety scores, and the homogeneity of the treatment and control groups were evaluated with a Levene test ($P > .05$), the results of which are presented in Table 1. A comparison of the preoperative and postoperative state anxiety scores of the two groups is presented in Table 2. The correlations between the preoperative STAI TX I-II and pain severity in the patients, and the preoperative STAI TX I-II and postoperative STAI TX-I values are presented in Table 3. It was determined that each point increase in the preoperative state anxiety level caused a 9% increase in the duration of intensive care stay in the control group with a linear effect ($r^2 = 0.09$) ($P < .05$).

There was a significant difference in the pain reporting and frequency between the two groups for all time intervals ($P < .05$), with an extremely statistically significant difference in the first 12 hours when the patients were first mobilized ($P < .001$) and in the 25 to 36-hour period ($P < .001$). The pain prevalence ranged from 6.2% to 65.6% in all patients Table 4. A comparison of the pain severity score monitoring of the patients is presented in Table 5. Although no

Table 3
Correlations Between Preoperative STAI TX I-II and Pain Severity, and Preoperative STAI TX I-II and Postoperative STAI TX-I of the Patients (n = 64)

Correlation Test Results		Treatment Group			Control Group			Total		
		Postop STAI TX-I	Preop STAI TX-II	Preop STAI TX-I	Postop STAI TX-I	Preop STAI TX-II	Preop STAI TX-I	Postop STAI TX-I	Preop STAI TX-II	Preop STAI TX-I
Preop STAI TX-II	r	0.478**			0.765**			0.594**		
	P	**.006**			**.0001**			**.0001**		
Preop STAI TX-I	r	0.474**	0.837**		0.955**	0.725**		0.714**	0.785**	
	P	**.006**	**.0001**		**.0001**	**.0001**		**.0001**	**.0001**	
Pain severity	r	−0.023	0.492	0.311	0.413*	0.423*	0.425*	0.299	0.412**	0.337*
	P	.946	.124	.352	**.026**	**.022**	**.022**	.061	**.008**	**.034**

P, level of significance; postop, postoperative; Preop, preoperative; r, Spearman's rho (Spearman's rank correlation coefficient); STAI TX-I, state anxiety; STAI TX-II, trait anxiety.
* $P < .05$
** $P < .01$.

Table 4
Comparison of Patients in Terms of Pain Reporting and Frequency (n = 64)

Pain Reporting		Treatment Group (n = 32)		Control Group (n = 32)		Total (n = 64)		P**
Time of Monitoring	Frequency	n	%	n	%	n	%	
Z0	1	0	0.0	12	37.5	12	18.7	**.0001**
	≥2	2	6.2	4	12.5	6	9.3	
	Total	2	6.2	16	50.0	18	28.1	
Z1	1	6	18.8	12	37.5	18	28.1	**.001**
	≥2	2	6.2	9	28.1	11	17.2	
	Total	8	25.0	21	65.6	29	45.3	
Z2	1	2	6.2	6	18.8	8	12.5	**.0001**
	≥2	4	12.5	14	43.7	18	28.1	
	Total	6	18.8	20	62.5	26	40.6	
Z3	1	3	9.4	9	28.1	12	18.7	**.002**
	≥2	3	9.4	9	28.1	12	18.7	
	Total	6	18.8	18	56.2	24	37.5	
Z4	1	1	3.1	3	9.4	4	6.3	**.037**
	≥2	3	9.4	8	25.0	11	17.2	
	Total	4	12.5	11	34.5	15	23.5	
Z5	1	2	6.2	4	12.5	6	9.4	**.008**
	≥2	1	3.1	8	25.0	9	14.0	
	Total	3	9.4	12	37.5	15	23.4	

** Fisher's exact test. P, level of significance; Z0, at 0 to 12 hours, pain assessment every hour; Z1, At 13 to 24 hours, pain assessment every hour; Z2, at 25 to 36 hours, pain assessment every 4 hours; Z3, At 37 to 48 hours, pain assessment every 4 hours; Z4, at 49 to 60 hours, pain assessment every 4 hours; Z5, at 61 to 72 hours, pain assessment every 4 hours.

Table 5
Comparison of Pain Severity Score Monitoring of the Patients (n = 64)

Pain Severity Time of Monitoring	Measurement Values	Treatment Group (n = 32) VAS Score	Control Group (n = 32) VAS Score	Total (n = 64) VAS Score	z****	P****
	Mean ± SD	3.50 ± 2.12	5.91 ± 2.06	5.64 ± 2.15		
	Minimum	2	2	2		
Z0	Maximum	5	9	9	*****	*****
	Median	3.50	6.00	5.50		
	n	2/32	16/32	18/64		
	Mean ± SD	2.88 ± 2.16	2.98 ± 2.31	2.95 ± 2.23		
	Minimum	1	1	1		
Z1	Maximum	6	7	7	0.257	.797
	Median	2.00	2.00	2.00		
	n	8/32	21/32	29/64		
	Mean ± SD	3.17 ± 2.49	2.43 ± 2.13	2.60 ± 2.19		
	Minimum	1	1	1		
Z2	Maximum	8	8	8	1.223	.221
	Median	2.67	1.29	1.83		
	n	6/32	20/32	26/64		
	Mean ± SD	2.14 ± 1.92	2.13 ± 1.38	2.13 ± 1.49		
	Minimum	1	1	1		
Z3	Maximum	6	5	6	0.103	.918
	Median	1.42	1.50	1.50		
	n	6/32	18/32	24/64		
	Mean ± SD	1.33 ± 0.47	2.21 ± 1.59	1.98 ± 1.42		
	Minimum	1	1	1		
Z4	Maximum	2	5	5	*****	*****
	Median	1.17	1.33	1.33		
	n	4/32	11/32	15/64		
	Mean ± SD	1.33 ± 0.57	2.00 ± 1.65	1.87 ± 1.50		
	Minimum	1	1	1		
Z5	Maximum	2	5	5	*****	*****
	Median	1.00	1.00	1.00		
	n	3/32	12/32	15/64		
	Mean ± SD	2.58 ± 1.92	3.03 ± 1.94	2.90 ± 1.92		
Grand	Minimum	1	1	1		
total	Maximum	7	6.60	7	0.731	.465
	Median	1.67	2.55	2.41		
	n	11/32	29/32	40/64		

Mean, mean; SD, standard deviation.
**** Mann-Whitney U test; P, level of significance; VAS, visual analog scale.
***** Not eligible for analysis because the number of patients reporting pain was less than five in the treatment group. Z0, at 0 to 12 hours, pain assessment every hour. Z1, at 13 to 24 hours, pain assessment every hour; Z2, at 25 to 36 hours, pain assessment every 4 hours; Z3, at 37 to 48 hours, pain assessment every 4 hours; Z4, at 49 to 60 hours, pain assessment every 4 hours; Z5, at 61 to 72 hours, pain assessment every 4 hours.

analysis could be made of the statistical differences between the treatment and control groups in terms of pain severity within the first 12 hours, the severity of pain was observed to follow a different course between the groups Table 5. A subsequent regression analysis revealed that each one-point increase in the pain severity increased the likelihood of opioid analgesic use (OR = 1.563) by 1.56 times ($P < .05$).

The monitoring of the analgesics received by the treatment and control groups at all time intervals revealed an extremely statistically significant difference in the use of opioid and nonopioid analgesics within the first 12 hours between the groups ($P = .001$) Table 6.

A post hoc power analysis was performed using the G*Power (v3.1.9.4) program and data obtained from the study. Considering the STAI-I values in the treatment and control groups, each of which contained 32 people, at the level of $\alpha = 0.05$, the effect size of the preop STAI-I measurement was 0.187, with a power of 0.114; the effect size for the postoperative STAI-I measurement was 0.98, with a power of 0.972; and the effect size of the difference between the groups in the postoperative STAI-I change according to the preop was 0.91, with a power of 0.947. The effect size of the changes observed in the postoperative STAI-I measurements when compared to the preop in the study group was 0.65, with a power of 0.999, while for the control group the effect size was 0.05 and the power was 0.068. Based on the total pain frequency seen at all time intervals, the study power was determined as 0.998, while the power of the study was determined to be 0.999 according to the use of analgesics for the A0 time interval (0-12 hours).

Discussion

Initially limited to only early discharge, studies of ERAS practices in cardiac surgery have been increasing in number recently with the adoption of ERAS protocols.[9,15,32,33] The medical characteristics of the patient population, the application of extracorporeal circulation, the high prevalence of arrhythmia, and the use of blood and blood products has made the development of practices in cardiac surgery challenging, unlike other fields of surgery. Accordingly, there is a need to develop common approaches that are supported by scientific evidence for the optimization of care.[15,32]

The present study reveals that the preoperative and postoperative state/trait anxiety scale scores of the patients were consistent with those reported in studies of cardiac surgery patients in literature.[4,6] The preoperative state anxiety level of the patients was found to increase with increasing levels of preoperative trait anxiety, while postoperative state anxiety levels increased as preoperative state anxiety levels increased., which is a finding that is consistent with literature.[3] While there have been conflicting results reported in literature,[4] the results of the present study are in line with those of studies[2,31,34-36] reporting that postoperative anxiety levels can be reduced through effective interventions for the treatment of preoperative anxiety in cardiovascular surgery (CVS). Although the preoperative state and trait anxiety levels were similar in the two groups, the postoperative state anxiety levels varied considerably within the treatment group, and between the groups. These findings affirm hypothesis H1.

When the preoperative state and trait anxiety levels and postoperative state anxiety levels of the patients in the treatment and control groups were compared based on preoperative and postoperative characteristics, each one-point increase in the preoperative state anxiety level was found to increase the length of ICU stay by 9% in the control group, with a linear effect. This finding is consistent with those of previous studies in literature,[37-40] and suggests that ICU stays may be reduced by relieving the patient's preoperative surgical anxiety. That said, there have been studies reporting that preoperative anxiety levels have no effect on the duration of ICU stays,[41] and

Table 6
Comparison of the Data on the Type, Active Ingredient, Dose, Route of Administration, and Use Frequency of Analgesics Administered to the Patients ($n = 64$)

Use of Analgesics				Treatment Group ($n = 32$)		Control Group ($n = 32$)		Total ($n = 64$)		P**
Time Interval	Type of Analgesics	Active Ingredient	Unit Dose and Route of Administration	Use Frequency	%	Use Frequency	%	Use Frequency	%	
	OA	Tramadol	100 mg IV	1	25.0	16	61.5	17	56.7	
A0	NO	NSAID	75 mg IM	3	75.0	8	30.8	11	36.6	**.001**
		Paracetamol	1,000 mg IV	0	0.0	2	7.7	2	6.7	
		Total		4	100.0	26	100.0	30	100.0	
	OA	Tramadol	100 mg IV	0	0.0	2	5.6	2	3.1	
	NO	NSAID	75 mg IM	3	10.3	2	5.6	5	7.7	
A1		Paracetamol	1,000 mg IV	0	0.0	1	2.7	1	1.5	.197
		Paracetamol	500 mg PO	26	89.7	31	86.1	57	87.7	
		Total		29	100.0	36	100.0	65	100.0	
	OA	Tramadol	100 mg IV	1	3.3	3	8.5	4	6.2	
	NO	NSAID	75 mg IM	0	0.0	1	2.9	1	1.5	
A2		Paracetamol	1,000 mg IV	0	0.0	1	2.9	1	1.5	.381
		Paracetamol	500 mg PO	29	96.7	30	85.7	59	90.8	
		Total		30	100.0	35	100.0	65	100.0	
	OA	Tramadol	100 mg IV	0	0.0	0	0.0	0	0.0	
A3	NO	Paracetamol	500 mg PO	29	100.0	32	100.0	61	100.0	******
		Total		29	100.0	32	100.0	61	100.0	
	OA	Tramadol	100 mg IV	0	0.0	0	0.0	0	0.0	
A4	NO	Paracetamol	500 mg PO	31	100.0	32	100.0	63	100.0	******
		Total		31	100.0	32	100.0	63	100.0	
	OA	Tramadol	100 mg IV	0	0.0	0	0.0	0	0.0	
A5	NO	Paracetamol	500 mg PO	31	100.0	33	100.0	64	100.0	******
		Total		31	100.0	33	100.0	64	100.0	

** Fisher's exact test.

****** An analysis could not be conducted due to the use of nonopioid analgesics in all patients. A0, analgesic administrations at hours 0 to 12; A1, analgesic administrations at hours 13 to 24; A2, analgesic administrations at hours 25 to 36; A3, analgesic administrations at hours 37 to 48; A4, analgesic administrations at hours 49 to 60; A5, analgesic administrations at hours 61 to 72; IM, intramuscular; IV, intravenous; NO, nonopioid analgesics; OA, opioid analgesics; PO, peroral.

so further research is warranted. The pain severity score increased as the preoperative and postoperative state anxiety scores and preoperative trait anxiety scores increased in the control group, which is consistent with literature.[42]

The pain experienced after cardiac surgery is related to the associated sternotomy, chest tubes, chest wall injury (due to the excision of the internal mammary artery [IMA]), and the incisions to the legs and arms for the excision of the saphenous vein and the radial artery, respectively.[43-46] In the present study, the incision lengths applied for the maximum five coronary anastomoses and also the length of the surgical procedure were similar in the treatment and control groups, which was attributed to the similarity of the procedure and the sternotomy retraction times, and the fact that this factor affecting the pain severity would not create a difference. Chest tubes were identified as the source of pain by 42% of the patients in literature.[43-46] The durations of mediastinal and thoracic drainage were similar between the treatment and control group patients, which was interpreted that the effect of the duration of having chest drains after the surgical intervention on the severity and frequency of pain of the treatment and control group patients would not create a difference.

The results of the study on pain prevalence are consistent with the pain prevalence reported in CVS patients in literature.[46-48] In the first 12 hours, when pain severity is reported in literature to be the highest,[44,49,50] the highest value of pain severity was 5.91 ± 2.06 in the control group and 3.50 ± 2.12 in the treatment group. The lower pain severity identified in the present study than reported in literature[43,51,52] can be attributed to the effectiveness of the multimodal analgesia technique used in the study center. The lack of any significant difference in pain severity at first 12 hours was attributed to the low number of patients reporting pain in the treatment group ($n < 5$), and its unsuitability for statistical analysis. This finding, however, is in line with studies[4,49-51] that were unable to establish any effect of preoperative patient information on postoperative pain severity, since pain severity was similar in the groups in the time intervals following the first 12 hours. While there was no difference in pain severity, there was a difference in the frequency of pain at all time intervals. This reduced frequency of pain but no difference in severity raises the expectation that the need for analgesics will reduce as patients report less pain. In conclusion, and concurring with literature,[50] there is a need for randomized controlled trials involving larger patient groups to determine the effects of preoperative nonpharmacological interventions on postoperative patient outcomes. These findings did not affirm hypothesis H2 in regards to the reduction in pain severity, but affirm the hypothesis in regards to the reduction in pain frequency.

It has been stated that the use of tramadol and NSAIDs, which are often used for the treatment of acute surgical pain, in combination is more effective.[53,54] There are also reports supporting a multimodal analgesia technique involving paracetamol, NSAID, and opioid analgesics for postoperative pain management in CVS.[52] The use of NSAIDs in cardiac surgery may increase the risk of bleeding and cardiac tamponade due to the increasing effect on bleeding time associated with the reduction in platelet aggregation.[15]

The ERAS-derived ERCS program adopted in cardiac surgery is an example of an evidence-based protocol targeting a reduction of the duration of hospital stays, the time until extubation, postoperative complications, hospital costs and the use of opioid analgesics.[15,55] The evidence-based ERCS protocol recommends anxiety reduction through the provision of information and education to the patient, based class B IIa evidence level (moderate quality-moderate evidence; benefit much greater than risk), and multimodal analgesia in accordance with a pain management strategy with a view to reducing the use of opioid analgesics, based on class B I evidence level (moderate quality-strong evidence; benefit many times greater than risk).[15,56]

The high postoperative use of opioid analgesics in the first 12 hours in the groups is in parallel with the first 12-hour period when the most severe pain is experienced, and concurs with literature.[51] It was determined that the patients were initiated on PO paracetamol in line with the standard procedure within the first 24 hours, and that the IM or IV administration of NSAIDs and/or paracetamol as required was preferred in patients reporting pain. As recommended in literature,[15] NSAIDs were discontinued after 24 hours due to the risk of bleeding, with standard PO paracetamol administered to all patients with no contraindications after 36 hours. Opioid analgesics may be required within the first 36 hours if severe pain is reported with a score of greater than equal to 7. The opioid analgesics used after 36 hours and the use of nonopioid analgesics in accordance with the standard regulations were similar in the groups.

Regarding the increased risk of bleeding associated with NSAIDs in cardiac surgery, the use of NSAIDs was 66% higher in the control group than in the treatment group, while there was no difference in the durations of mediastinal and thoracic drainage between the two groups. This lack of difference in the duration of drainage reveals that there was a reduced need for NSAIDs due to the lower level of pain severity and the different frequency of pain in the treatment group, as well as the controlled use of NSAIDs in cardiac surgery.

While the dose and frequency of opioid and nonopioid analgesic administration within the first 12 hours differed between the treatment and control groups, there was no difference in the dose or frequency after the first 12 hours. Paracetamol 500 mg PO (2*1) was administered after postoperative 36 hours on the request of a physician and showed similar characteristics, and therefore no statistical analysis was conducted. These findings affirm hypothesis H3 regarding the reduction in the dose and frequency of opioid analgesics and nonopioid analgesics administered within the first postoperative 12 hours.

Strengths

The study was registered as a Clinical Trial on September 17, 2020, with ClinicalTrials.gov ID: NCT04525963. The patients were treated by the same surgical and anesthesia care teams during their operations, and by the same surgical clinic and intensive care unit teams before and after surgery.

Limitations

The inability to generalize the results of the study to all cardiac surgery patients due to the quasi-experimental design, and the nonrandom allocation of patients to the groups, thus being limited to the group characteristics, can be considered limitations of the present study.

Conclusion

The present study reveals that preoperative patient visits by the operating room nurse can reduce postoperative state anxiety levels, the occurrence and frequency of postoperative pain, and the dose and frequency of opioid and nonopioid analgesics within the first postoperative 12 hours in open heart surgery patients. Based on these findings, it can be concluded that the participation of operating room nurses in preoperative patient care can contribute to anxiety and pain management and a reduction in opioid use. Given the identified benefits of preoperative visits by operating room nurses to open heart surgery patients, similar randomized controlled studies may be conducted to determine possible improvements to the ERCS protocols and their contribution to pain management in the postoperative period. Open heart surgery patients are recommended for preoperative visits by operating room nurses.

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