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Can nurse-led preoperative education reduce anxiety and postoperative complications of patients undergoing cardiac surgery?

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Abstract

Background: The effect of preoperative education on anxiety and postoperative outcomes of cardiac surgery patients remains unclear.

Aim: The aim of the study was to estimate the effectiveness of a nurse-led preoperative education on anxiety and postoperative outcomes.

Methods: A randomised controlled study was designed. All the patients who were admitted for elective cardiac surgery in a general hospital in Athens with knowledge of the Greek language were eligible to take part in the study. Patients in the intervention group received preoperative education by specially trained nurses. The control group received the standard information by the ward personnel. Measurements of anxiety were conducted on admission-A, before surgery-B and before discharge-C by the state–trait anxiety inventory.

Results: The sample consisted of 395 patients (intervention group: 205, control group: 190). The state anxiety on the day before surgery decreased only in the intervention group (34.0 (8.4) versus 36.9 (10.7); P=0.001). The mean decrease in state score during the follow-up period was greater in the intervention group (P=0.001). No significant difference was found in the length of stay or readmission. Lower proportions of chest infection were found in the intervention group (10 (5.3) versus 1 (0.5); P=0.004). Multivariate linear regression revealed that education and score in trait anxiety scale on admission are independent predictors of a reduction in state anxiety.

Conclusion: Preoperative education delivered by nurses reduced anxiety and postoperative complications of patients undergoing cardiac surgery, but it was not effective in reducing readmissions or length of stay.

Keywords

Preoperative patients' education, cardiac surgery, anxiety, postoperative complications, length of stay

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Introduction

Despite the progress of science and technology, cardiac surgeries continue to be accompanied by complications that increase morbidity and mortality.[1–5] Because of forthcoming cardiac surgery, patients experience anxiety[6] that can burden perioperative psychosomatic health. Numerous studies have shown that preoperative anxiety increases significantly in elective and major operations,[7–12] resulting in postoperative complications for a number of patients[13,14] irrespective of the type of surgery.

Preoperative anxiety has been found to be a risk factor for postoperative mortality in patients undergoing coronary

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artery bypass grafting (CABG).[15,16] Previous studies have supported the theory that the control of preoperative anxiety can reduce the morbidity and mortality of patients undergoing cardiac surgery.[16] One study reported that preoperative anxiety had predictive value for postoperative mortality and suggested the addition of preoperative anxiety to the risk model in order to refine the risk factors associated with increased mortality.[14] According to several studies, a reduction of perioperative anxiety of patients undergoing cardiac surgery can be achieved by preoperative education.[10,17,18]

There is also evidence that preoperative education leads to better recovery and a reduction in the length of hospital stay.[19,20] Preoperative education is defined as 'providing the patient with health-related information, psychosocial support and the opportunity to learn selected skills in preparation for surgery'.[21] The patients' preoperative education is designed to prevent risk factors that may lead to complications by adopting behaviours that will enhance patients' ability to cope with cardiac surgery. Emphasising the risk factors and the ways of avoiding them may motivate patients to modify their behaviour in order to reduce these factors.

The objective of providing preoperative education to patients undergoing cardiac surgery is to prevent or reduce anxiety and postoperative complications that are associated with morbidity, mortality and prolonged hospital stay as well as hastening postoperative recovery.[22] The complications that may be associated with lack of patients' preoperative education are pulmonary infection,[23] atelectasis,[24] deep vein thrombosis,[24,25] wound infections[26,27] and split of the sternum.[28] Sternal dehiscence, wound infections[29] and arrhythmia were the most common causes for unplanned 30-day hospital readmissions after cardiac surgery.[30] For example, early mobilisation and muscle training can improve functional outcomes as well as cognitive and respiratory conditions, and reduce the risk of venous stasis and deep vein thrombosis.[24] Interventions such as breathing and coughing exercises before CABG surgery were shown to be effective and were able to lower the risk of pneumonia and atelectasis.[24,31,32]

Extension of the length of stay (LOS) in the intensive care unit (ICU) has been associated with negative short and long-term postoperative outcomes.[33] Prolonged intubation after cardiac surgery results in significant acute and midterm morbidity as well as longer ICU and hospital stays.[34,35] Atrial fibrillation (AF) is the most common arrhythmia during the first to fifth postoperative days after cardiac surgery,[36] and is associated with increased mortality and a higher incidence of stroke.[37] There is an association between postoperative AF and anxiety in patients who undergo CABG.[38] A recent study suggested that AF was a major risk factor for general hospital-based mortality in patients with anxiety disorders.[39]

Some studies concluded that preoperative education can reduce postoperative complications such as pulmonary and cardiovascular complications and the level of postoperative anxiety of cardiac surgery patients.[40–42] However, similar studies found that preoperative education had no effect on postoperative complications and the anxiety of cardiac surgery patients.[43,44] Quite a few studies have reported a reduction in postoperative anxiety as a result of preoperative education but it was not significant.[43–48] Only one study found that preoperative education increased the levels of postoperative anxiety of cardiac surgery patients.[44]

From the literature it is apparent that it has not yet been established whether preoperative education reduces anxiety, postoperative complications and length of hospital stay.

The primary purpose of this study was to evaluate the effectiveness of a nurse-led preoperative education on anxiety and on complications of patients undergoing elective cardiac surgery. A secondary objective was to investigate the effect of education on the length of hospital stay and frequency of readmissions.

Methods

The study was a randomised controlled trial.

Participants

All patients (n=1859) admitted for elective cardiac surgery from May 2011 until January 2014 were eligible to take part in the study (Figure 1). Surgical procedures included CABG, valve replacement, ascending aortic aneurysm repair or a combination of these. The study was performed in the cardiac surgery department of a general hospital in Athens, in which 650 cardiac surgical procedures are performed each year.

The main selection criterion for patients was the ability to speak and read Greek. Exclusion criteria were a history of previous cardiac surgery, taking drugs for anxiety control, mental disorders, serious chronic diseases and terminal illness, because they probably needed specific training.

Mental disorders we took into account were alcohol abuse, diagnosed cognitive disorders (delirium, dementia, amnesia), diagnosed mood disorders (depression) and psychosis. Chronic diseases we took into account were serious long-lasting diseases that cannot be cured (chronic hepatitis B or C with or without cirrhosis, AIDS, Parkinson's disease, severe autoimmune disease, blindness and hearing loss).

Three hundred and ninety-five adult patients met the inclusion criteria and constituted the sample of the study. At the time of the patients' admission, one of the researchers randomly assigned them into the study groups. Two hundred and five patients were enrolled into the intervention group and 190 were enrolled into the control group (Figure 1). Patients with odd admission numbers were assigned to the intervention group and patients with even admission numbers were assigned to the control group.

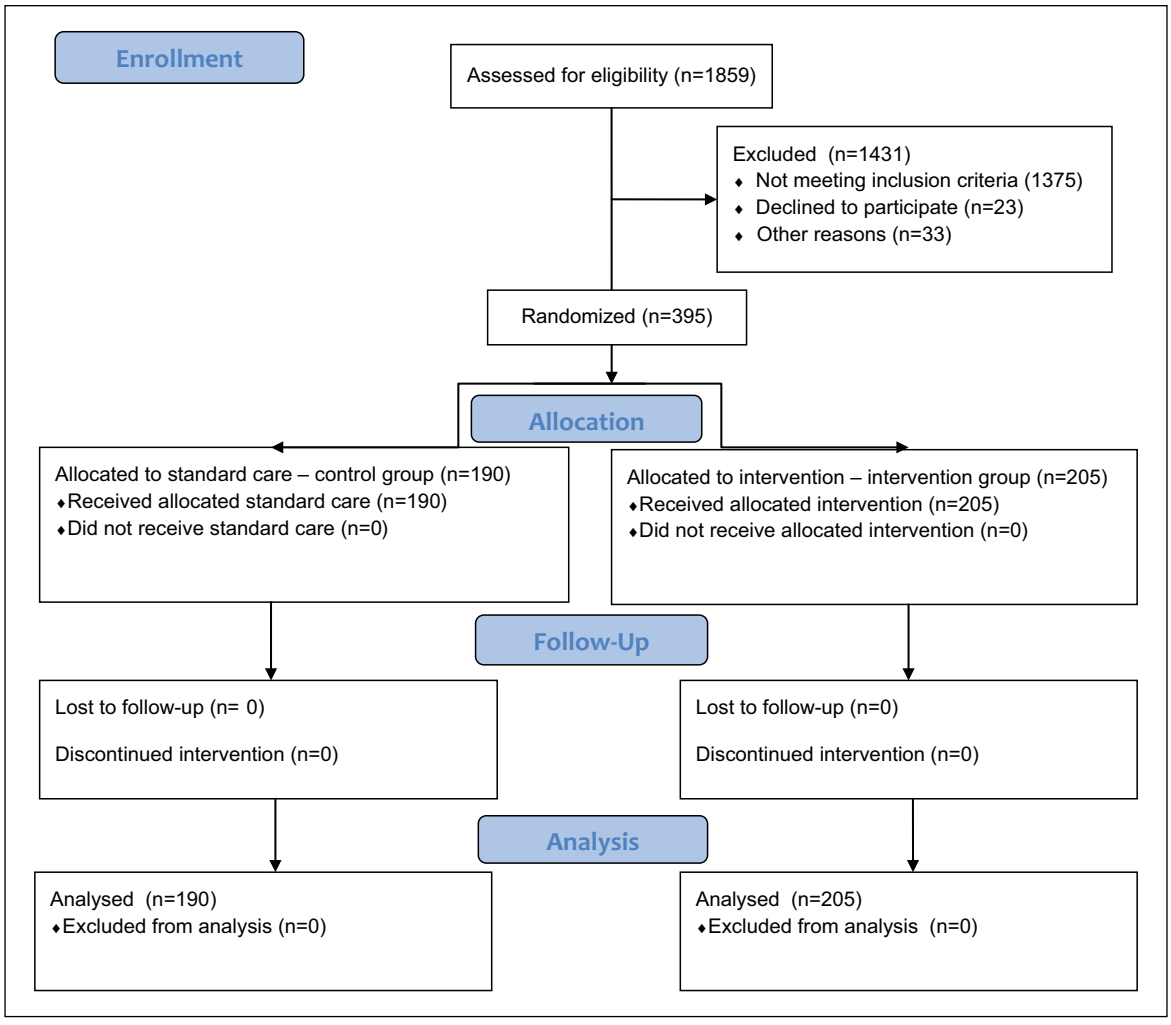

Figure 1. Flow of participants through the trial.

Educational intervention

The educational intervention was carried out by three nurses who were specially trained for this purpose. None of the nurses belonged to the ward personnel. Patients were admitted to the cardiac surgery department 3-4 days before surgery for preoperative assessment and preparation. On admission day, all patients in the intervention group received a booklet with information about the cardiac surgery and perioperative process. The educational intervention included a mixture of content: procedural, psychoeducational and skills (Table 1). The nurses emphasised breathing exercises, the time and method of rising from bed, leg exercises, pain management, coughing, control of anxiety and movement of arms. The specially trained nurses also responded to patients' questions. The most frequent questions were about the duration of pain and of their stay in the ICU. Patients were anxious when they realised that they would have a chest and endotracheal tube in the ICU. They also wanted to know when they would be able to resume their daily activities. The duration of teaching, on the day of admission, ranged from 20 to 40 minutes and depended on the active participation of patients. The teaching took place in a separate room in the cardiac surgery department, not in the ward. The relatives of patients could attend the teaching procedure if the patients consented. The day before surgery the nurses repeated the educational intervention. They also encouraged patients to discuss any issue that concerned them. Patients were mainly concerned about the outcome of the surgery and its duration or if they could avoid the surgery and undergo a non-surgical procedure. Nurses focused on meeting the expressed needs of patients and medical queries.

After surgery and ICU hospitalisation, patients returned to the ward and the educational process was repeated by the nurses. Patients were also taught about caring for their surgical wound (chest and leg in the case of venous graft in CABG).

Patients in the control group received the ordinary information and care provided by the hospital. The standard information was unstructured, verbal and limited to

Table 1. List with educational interventions.

Preoperative educational interventions	Postoperative educational interventions
Suitable physical preparation for operation (body wash with antiseptic agent, oral hygiene)	Repeat the importance of not feeling pain
Inspiratory muscle training	Repeat of respiratory exercises, coughing and using spirometry
Use of incentive spirometry	Leg exercises and early mobilisation
Breathing techniques (including forced expiration techniques)	Prevention of sternum split and infection
Coughing exercises with incision support	Restriction on arm movements
Leg exercises	Avoidance of weightlifting
Techniques for anxiety control	Prevention of leg infection (whenever indicated)
Deep breathing	Stocking and elevation of leg
Music therapy	Repeat of techniques for anxiety control
Meditation	
Sleep and rest	
Highlight the importance of not feeling pain postoperatively	

the bureaucratic procedures. The surgeon and the anaesthetist delivered some information about the preoperative preparation and the surgical procedures the day before the operation. Additional information may be given by the nurses of the cardiac surgery department upon request by patients.

Educational booklet

The educational booklet entitled 'All I should know before cardiac surgery' was conceived taking into account the professional experience of researchers, documented studies[45,49] and the needs of patients.[50,51] It included information about anatomy, function and surgical diseases of the heart, the open heart surgery, the hospital, the perioperative period and process and emphasised the self-care of patients. The booklet was written in plain and intelligible language and contained several coloured photographs and drawings that assist in the better understanding of the information provided.

Outcomes and data collection

Baseline data were collected by a short form questionnaire for demographic, clinical, preoperative and intraoperative characteristics. A baseline measure of trait and state anxiety was performed on the day of admission and before randomisation.

Descriptive variables

The descriptive variables were demographics, clinical history and perioperative characteristics. Demographic data included age, sex, family status, level of education and place of residence. Clinical data included body mass index (BMI), body surface area, risk factors such as smoking, hypertension, diabetes mellitus, hyperlipidaemia, vascular disease and previous surgical history.

The perioperative risk was calculated using Euroscore I (European system of cardiac operative risk evaluation).[52] Euroscore I is a 17-item system used for calculating predicted operative mortality for patients undergoing cardiac surgery.

There is probably a gap between the objective perioperative risk and the patients' perception about their perioperative risk[53] due to a misunderstanding of the information provided by the surgeon. This fact may have an impact on anxiety levels. Patients were asked to estimate, according to their perception, the risk of the surgery as 'low', 'moderate' or 'high'.

Intraoperative data included the type of surgery, the duration of surgery, the duration of cardiopulmonary bypass and ischaemia time.

Outcome variables

The outcome variables were the level of state anxiety, the complications in the ICU and in the ward of the cardiac surgery department, the duration of tracheal intubation in hours, the length of ICU stay, the length of hospital stay, as well as the frequency of hospital readmission within 30 days after the operation. The researchers chose these complications, which could potentially be affected by patients' preoperative education such as atelectasis, respiratory infection, thrombosis, leg wound infection, split sternum infection and arrhythmia. The latter probably has a relationship with the anxiety caused by lack of knowledge. The LOS was counted in days and it was defined as the period from operation until discharge.

The state–trait anxiety inventory (STAI) was used for estimating the patients' anxiety. This is a self-reported questionnaire based on a four-point Likert scale with two subscales within the measure. First the state-anxiety scale (form Y-1) consists of 20 statements that evaluate how the respondent feels 'right now, at this moment' using items that measure subjective feelings of apprehension, tension,

nervousness, worry and activations/arousal of the autonomic nervous system. The trait-anxiety scale (form Y-2) consists of 20 statements that evaluate relatively stable aspects of 'anxiety proneness', including general states of calmness, confidence and security. Scores range from 20 to 80, with higher scores correlating with greater anxiety. The Greek version of the scale has good internal consistency reliability and validity.[54]

There was a total of three measures of anxiety in both groups. The first measurement was performed on the day of hospital admission and before randomisation. The second measurement was made on the eve of surgery, and the third measurement on the day of discharge.

Ethics

Data were collected after written authorisation by the scientific council of the Evangelismos general hospital. All participants in the study were informed about the purpose of the study, data confidentiality and the voluntary nature of participation. The conduct of this study met all the basic principles of ethics according to the Declaration of Helsinki.

Statistical analysis

Continuous variables are presented with mean and standard deviations. Quantitative variables are presented with absolute and relative frequencies. For the comparison of proportions chi-squared and Fisher's exact tests were used. For the comparison of continuous study variables between the intervention and control groups the Student's *t*-test was computed for normal variables. Differences in changes of state score during the follow-up period between the intervention and control groups were evaluated using repeated measurements analysis of variance.

Multiple linear regression analysis dependent on the variable that presented changes in state score was conducted in a stepwise method (*P* for removal was set at 0.1 and *P* for entry was set at 0.05) in order to find independent factors associated with changes in state scale.

Regression coefficients and standard errors were computed from the results of the linear regression analyses. Possible interactions of variables in the regression model were not significant. All *P* values reported are two-tailed. Statistical significance was set at 0.05 and analyses were conducted using SPSS statistical software (version 19.0).

Results

The sample consisted of 395 patients (205 in the intervention group and 190 in the control group). The demographics of the two study groups are presented in Table 2. The two groups of patients were also similar in terms of sex, family status, having children, nationality, educational level, residence, BMI and smoking. The baseline clinical and perioperative characteristics of the two study groups were similar (Table 3).

Mean values of state score for the two study groups on hospital admission-A, the day before surgery-B and before discharge-C are shown in Table 4. Also, the mean trait score was measured once on hospital admission and did not differ between the two study groups. Specifically, it was 51.0 (SD 7.7) for the control group and 50.7 (SD 7.6) for the intervention group (P=0.697). The day before surgery state score decreased only in the intervention group and thus the aforementioned group reached lower state levels the day before discharge. Before discharge both study groups had lower state levels as compared with the corresponding levels on hospital admission and the day before surgery. The mean state scores were lower for the intervention group before discharge. Overall, as defined from the significant interaction effect of time with groups (P=0.001), the mean decrease in state score during the follow-up period was greater in the intervention group as compared with the control group.

The complications in the ICU and ward were similar for the two groups but lower proportions of chest infections were found in intervention group (Table 5).

There was no significant difference in hospital readmission between the two groups (Table 5) or the duration of tracheal intubation and length of ICU and hospital stay (Table 6). When multiple linear regression analysis was conducted in a stepwise method with dependent variables, the change in state score showed that being in the intervention group was independently associated with a greater decrease in state score (Table 7). Also, it was found that patients who estimated they were having a low-risk surgery had a lower decrease in state score as compared with patients who estimated they were having a high-risk surgery. Furthermore, increased trait scores on hospital admission were associated with a greater decrease in state score during the follow-up.

Discussion

According to the results of the study, preoperative education reduced the state anxiety of patients undergoing heart surgery, and had an effect on postoperative complications but did not affect hospital readmissions or LOS. The baseline characteristics of the intervention and control groups were similar.

Effect of education on anxiety

This study revealed that education provided by nurses 3–4 days before the heart operation reduced the anxiety of patients undergoing heart surgery. This finding is consistent with that reached by Chinese researchers, who found a significant reduction in postoperative anxiety after the preoperative education of patients who underwent coronary artery surgery.[40,41] Other researchers have reported that

Table 2. Demographics for the two study groups.

	Group		*P* value
	Control	Intervention	
	N (%)	*N* (%)	
Gender			
Men	140 (73.7)	145 (70.7)	0.513[a]
Women	50 (26.3)	60 (29.3)	
Age, mean (SD)	65.1 (11.0)	65.9 (10.7)	0.500[b]
Family status			
Married	155 (84.2)	154 (75.1)	0.397[a]
Widow/widower	12 (6.3)	20 (9.8)	
Divorced	10 (5.3)	16 (7.8)	
Single	13 (4.2)	15 (7.3)	
Children			
No	16 (8.4)	26 (12.7)	0.170[a]
Yes	174 (91.6)	179 (87.3)	
Nationality			
Greek	180 (94.7)	196 (95.6)	0.685[a]
Other	10 (5.3)	9 (4.4)	
Educational level			
Primary school	110 (57.9)	123 (60.0)	0.184[a]
High school	53 (27.9)	43 (21.0)	
University or higher	27 (14.2)	39 (19.0)	
Residence			
Athens	86 (45.3)	102 (49.8)	0.456[a]
Rural	99 (52.1)	95 (46.3)	
Other city	5 (2.6)	8 (3.9)	
Body mass index, mean (SD)	27.6 (3.8)	28.2 (4.9)	0.177[b]
Smoking			
No	95 (50.0)	97 (47.3)	0.098[a]
Yes	62 (32.6)	76 (37.1)	
Former	33 (17.4)	59 (15.6)	
Years of smoking, mean (SD)	35.0 (10.6)	35.0 (13.3)	0.930[b]

[a]Pearson's chi-square test.
[b]Student's *t*-test.

although there was a reduction of anxiety in educated patients, this was not statistically significant.[33,46–48] The findings of the present study are not consistent with those of previous studies.[45–47,55,56] This is probably due to the difference in the timing and the manner of education delivery. Previous studies took advantage of the long waiting time for surgery to deliver longer-term preoperative education, the effectiveness of which remained controversial regarding anxiety.[43,57] Only one study showed that preoperative education increased the postoperative anxiety of patients.[44]

Education focused on the individual needs of each patient, in conjunction with the opportunity given to the patients to express concerns, questions and fears, can probably mobilise mechanisms of anxiety reduction, associated with a sense of control that patients acquire through the educational process and the interpersonal relationship with nurses. It should be noted that Greek patients, due to a shortage of nursing staff and inadequate preoperative education, are not usually prepared to protect themselves mentally and emotionally towards an oncoming threat such as cardiac surgery.[58,59]

This study used the STAI scale for measuring anxiety. State anxiety decreased significantly, gradually from admission to discharge in both groups, with the intervention group recording the highest reduction. Gradual reduction of anxiety has been reported by studies regardless of whether they used the STAI scale[45,46] or different scales of anxiety assessment.[10–12,51] However, studies report that levels of anxiety peaked the day before surgery and were reduced progressively after surgery to levels before admission.[9,41,60]

Effect of education on patients' complications, LOS and readmission

In the present study only the rate of sternal infection was significantly higher in the control group compared to the

Table 3. Clinical history and perioperative characteristics of the two study groups.

	Group		*P* value
	Control	Intervention	
	N (%)	*N* (%)	
Diabetes			
No	138 (72.6)	137 (66.8)	0.210[a]
Yes	52 (27.4)	68 (33.2)	
Hypertension			
No	40 (21.1)	32 (15.6)	0.162[a]
Yes	150 (78.9)	173 (84.4)	
COPD			
No	174 (91.6)	177 (86.3)	0.098[a]
Yes	16 (8.4)	28 (13.7)	
Chronic renal failure			
No	184 (96.8)	196 (95.6)	0.522[a]
Yes	6 (3.2)	9 (4.4)	
Hyperlipidaemia			
No	92 (48.4)	102 (49.8)	0.791[a]
Yes	98 (51.6)	103 (50.2)	
Ejection fraction (%), mean (SD)	53.0 (10.1)	51.9 (10.6)	0.304[b]
Angiopathy			
No	182 (95.8)	200 (97.6)	0.324[a]
Yes	8 (4.2)	5 (2.4)	
Euroscore, mean (SD)	6.2 (6.1)	6.3 (5.9)	0.822[b]
Diagnosis			
Coronary heart disease	97 (51.1)	113 (55.4)	0.364[c]
Valvular disease	54 (28.4)	62 (30.4)	
Coronary heart disease and valvular disease	16 (8.4)	13 (6.4)	
Aneurysm	11 (5.8)	4 (2)	
Aneurysm and valvular disease	9 (4.7)	11 (5.4)	
Aneurysm, coronary heart disease and valvular disease	2 (1.1)	1 (0.5)	
Other	1 (0.5)	0 (0)	
Type of surgery			
CABG	104 (55.6)	114 (56.2)	0.493[c]
VR	55 (29.4)	70 (34.5)	
CABG and VR	18 (9.6)	13 (6.4)	
Ascending aortic aneurysm repair	8 (4.3)	5 (2.5)	
Other	2 (1.1)	1 (0.5)	
Self-estimated surgery risk			
High	26 (13.8)	34 (16.7)	0.717[a]
Low	102 (54.0)	105 (51.5)	
Moderate	61 (32.3)	65 (31.9)	
Previous surgery			
Scheduled	80 (85.1)	107 (79.3)	0.261[a]
Urgent	14 (14.9)	28 (20.7)	
Duration of surgery (min), mean (SD)	258.8 (78.2)	256.1 (66.3)	0.710[a]

COPD: chronic obstructive pulmonary disease; CABG: coronary artery bypass grafting; VR: valve replacement.
[a]Pearson's chi-square test.
[b]Student's *t*-test.
[c]Fisher's exact test.

intervention group, indicating that preoperative education may have an impact on the reduction of postoperative complications. No other study has reported similar findings. Risk factors for chest infection are associated with the patients'[2,3,61,62] preoperative, intraoperative[3] and postoperative processes. As there was no statistically

Table 4. Changes in state scale for the two study groups during the follow-up period.

	State scale			*P* value[b]	*P* value[b]	*P* value[b]	*P* value[c]
	On hospital admission A	Day before surgery B	Before discharge C	A vs. B	B vs. C	A vs. C	
Group	Mean (SD)	Mean (SD)	Mean (SD)				
Control	37.7 (10.6)	36.9 (10.7)	34.6 (10.2)	0.669	0.032	0.001	0.001
Intervention	36.1 (9.6)	34.0 (8.4)	29.1 (6.5)	<0.001	<0.001	<0.001	
P value[a]	0.116	0.002	<0.001				

[a]*P* value for group effect.
[b]*P* value for time effect.
[c]Repeated measurements analysis of variance. Effects reported include differences between the groups in the degree of change over the follow-up period.

Table 5. Percentage of patients with complications and hospital readmission.

	Group		*P* value
	Control	Intervention	
	N (%)	*N* (%)	
Complications in intensive care unit	54 (28.4)	63 (30.7)	0.615[a]
Respiratory infection	2 (1.1)	0 (0.0)	0.231[b]
Atelectacis	9 (4.7)	8 (3.9)	0.683[a]
Psychosis	3 (1.6)	3 (1.5)	>0.999[b]
Neurological disorders	5 (2.6)	4 (2.0)	0.743[b]
Arrhythmia	33 (17.4)	38 (18.5)	0.763[a]
Other complication	22 (11.6)	14 (6.8)	0.101[a]
Complications in ward	29 (15.3)	23 (11.2)	0.235[a]
Respiratory infection	3 (1.6)	4 (2.0)	>0.999[b]
Atelectasis	1 (0.5)	0 (0.0)	0.481[b]
Deep vein thrombosis	0 (0.0)	0 (0.0)	–[c]
Chest infection	10 (5.3)	1 (0.5)	0.004[a]
Leg infection	2 (1.1)	2 (1.0)	>0.999[b]
Arrhythmia	4 (2.1)	7 (3.4)	0.429[a]
Other complication	18 (9.5)	12 (5.9)	0.183[a]
Readmission	12 (6.3)	9 (4.4)	0.394[a]

[a]Pearson's chi-square test.
[b]Fisher's exact test.
[c]Not computed due to no distribution.

Table 6. The duration of tracheal intubation and the length of stay in the intensive care unit and hospital.

	Group		*P* value Student's *t*-test
	Control	Intervention	
	Mean (SD)	Mean (SD)	
Extubation time (h)	11.8±7.8	13.2±7	0.056
ICU LOS	2.3±1	2.2±0.7	0.370
Hospital LOS	9.9±5.4	10±4	0.842

LOS: length of stay; ICU: intensive care unit.

Table 7. Multiple linear regression analysis results using the stepwise method with dependent variable the change in state score during the follow-up period.

	β[a]	SE[b]	*P* value
Group			
Control	0.00[c]		
Intervention	5.97	1.02	<0.001
Self-estimated surgery risk			
High	0.00		
Low	−4.13	1.55	0.008
Moderate	0.31	1.12	0.783
Trait (after hospital admission)	0.58	0.07	<0.001

[a]Regression coefficient.
[b]Standard error.
[c]Indicates reference category.

significant difference in preoperative and intraoperative data between the groups and both groups received appropriate preoperative preparation, this finding may indicate that preoperative education played a role in preventing sternal infection. It is possible that the emphasis placed on reducing the risk factors of surgical site infections,[27,63] such as control of blood glucose, as well as body and oral cavity hygiene, have played a role in the reduction of sternum infections in the intervention group. However, further investigation is necessary.

In the present study, preoperative education did not appear to affect the incidence of the total measured complications of patients. This finding is consistent with Deyirmenjian et al., who found no significant reduction in complications.[44] However, recent studies report a significant reduction in postoperative complications.[40,41] This result may be explained on the one hand by the fact that postoperative complications also depend on non-educational interventions, and on the other hand by the fact that the duration of preoperative education may have not been sufficient for it to modify the risk factors associated with the occurrence of postoperative complications.

In the context of this study, preoperative education did not reduce the duration of patients' intubation in the ICU, but a previous study found that the intervention group had a significant reduction in intubation time.[44] Our findings suggest that preoperative educational intervention may not be enough to modify the factors that impact on the duration of intubation time.

In the present study, preoperative patient education did not affect the LOS in either the ICU or hospital. This result is consistent with the findings of numerous studies.[33,41,43,44,46,55,64] However, previous studies have reported a reduction in the LOS after educational intervention.[36,40,65] Preoperative educational intervention for patients undergoing cardiac surgery was not enough to reduce the LOS. This finding may be explained by the fact that there was no difference in the incidence of total postoperative complications in either group. Postoperative complications are a common cause of prolonged LOS.[33]

There was no significant change in the 30-day readmission rate for either group. There has been no evidence to demonstrate that preoperative education can reduce the readmission rate in cardiac surgery patients. Nevertheless, postoperative complications such as surgical site infections, sternum split and arrhythmias are common causes for hospital readmissions.[30]

Finally, multivariate linear regression showed that this type of education, the self-estimated risk of surgery and the score in trait anxiety scale on hospital admission are independent predictors of a reduction in state anxiety. Less change in state anxiety was experienced by patients who thought that they would undergo a low-risk surgery compared with patients who thought that they would undergo a high-risk surgery. There are no relevant findings in similar studies. This finding may be related to the temperament and character of patients. Patients who, regardless of whether they received medical information or not, judged the surgery to be low risk, probably do not react to a stressor with a great increase in anxiety and thereby the change in anxiety was not intense. On the contrary, patients who judged the surgery to be high risk may initially react to a stressor such as cardiac surgery with a great increase in anxiety and after the influence of factors such as contact with operated patients may experience a reduction in anxiety levels.

A greater reduction in state anxiety was observed in patients with a high level of trait anxiety on the day of admission in hospital. Patients with high trait anxiety tend to show increased state anxiety because they tend to react more strongly to a stressor.[66] Cardiac surgeries are potent stressors and cause a large increase in the levels of state anxiety.

The impact of alleviative factors on these patients is likely to be equally strong and reduce state anxiety more.

Factors that may have a relieving effect on patients are the preoperative information, familiarisation with the hospital environment and communication with nurses or other patients.

Strengths and limitations of the study

This study was the first one to be conducted in Greece that investigated the effect of nurse-led preoperative education of patients undergoing cardiac surgery on anxiety and postoperative outcomes, and highlighted the positive contribution of preoperative patients' education in controlling anxiety.

However, there were some limitations such as the small sample size and the fact that data were collected by one cardiac surgery centre only. The surgical operations that the study population underwent cover the whole spectrum of cardiac surgery and not just CABG as in most studies. The inter-rater reliability between the three nurses delivering the education as well as the treatment fidelity were not measured. Anxiety was assessed with a single tool in the preoperative stage and before discharge. An additional measurement after discharge might reveal interesting items related to the mental and emotional health of patients. The researchers measured those complications that could be influenced by preoperative education and anxiety. Anxiety-related complications such as restlessness, insomnia/nightmares, need for bolus sedation, pain scores or similar were not measured.

The recording of every postoperative complication and the correlation with anxiety levels might show a significant relationship between anxiety and the short-term morbidity of patients.

Conclusions

The preoperative education delivered by nurses reduced the preoperative and postoperative anxiety of patients undergoing cardiac surgery. It also had an effect on the reduction of postoperative complications. The preoperative education had no effect on LOS or hospital readmissions. The preoperative education, the self-estimated risk of surgery and the score in trait anxiety scale before admission are independent predictors of a reduction in state anxiety. The knowledge of these parameters allows the planning and implementation of preoperative educational, psychological and behavioural interventions in order to control the anxiety of cardiac surgery patients. Further research is needed and investigation into new areas, such as factors that influence anxiety and test interventions that can control anxiety levels for the benefit of cardiac surgery patients.

Implications for practice

- Anxiety of patients undergoing cardiac surgery needs to be assessed
- Patients with increased preoperative anxiety need psychoeducational care
- Skilled nurses must provide specialist patients' education

Conflict of interest

The authors declare that there is no conflict of interest.

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