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Authors

Associate Professor Khulood Sh, Batarseh
Faculty of Nursing,
Al-Ahliyya Amman University,
Amman, Jordan

Manar Nabolsi
The University of Jordan, Jordan

Professor Mohammad Y N Saleh
Clinical Nursing Department,
School of Nursing,
The University of Jordan,
Jordan

Assistant Professor Haifa S Y Batarseh
Department of Physical and
Occupational Therapy, Faculty of
Applied Medical Sciences,
The Hashemite University,
Zarqa, Jordan

Corresponding author

Manar Nabolsi
The University of Jordan
manarn@ju.edu.jo

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The effect of pre-operative education intervention on patient uncertainty and length of stay after coronary artery bypass graft surgery

Abstract

Background: Coronary artery disease (CAD) remains a leading cause of global mortality. For patients whose condition is refractory to medical interventions, coronary artery bypass graft (CABG) surgery stands as the gold standard surgical treatment. Patients undergoing CABG frequently experience pre-operative uncertainty, which has been correlated with adverse post-operative outcomes. This uncertainty often stems from concerns regarding disease severity, potential life-threatening complications, the likelihood of treatment success and effective symptom management.

Aims: This study aimed to examine the impact of a structured pre-operative education intervention program on patients undergoing CABG surgery and to evaluate post-operative health outcomes, specifically patients' uncertainty levels and hospital length of stay.

Methods: A post-test-only control group experimental design was employed, using a convenience sample of 130 patients requiring CABG surgery. Participants were randomly assigned to either the control or the experimental group (n = 65 per group). Data were analysed using descriptive and inferential statistics.

Results: Patients who received pre-operative structured education reported significantly lower levels of uncertainty post-operatively compared to patients who received routine pre-operative care. The difference in post-operative length of stay between the groups was not statistically significant.

Conclusions: The findings of this study highlight the importance of structured pre-operative education interventions in influencing post-operative outcomes, particularly reducing uncertainty, for patients undergoing CABG surgery.

Keywords: cardiac surgery, coronary artery bypass graft, educational program, length of stay, uncertainty

Introduction

Cardiovascular disease (CVD) remains a leading cause of death worldwide and is responsible for 17.5 million deaths a year[1]. CVD accounts for 32 per cent of annual deaths globally[1,2], of these, 80 per cent are attributed to heart attacks and strokes[1]. The burden of CVD is disproportionately high in low- and middle-income countries – more than 75 per cent of global CVD deaths occur in poor and developing countries[2].

The two most common CVDs are cerebrovascular disease and coronary artery disease (CAD). In the Arab world, CAD is rated as the number one cause of death, accounting for 37 per cent of all deaths[1].

Coronary artery bypass graft (CABG) surgery is the gold standard for managing main coronary artery disease. It aims to decrease mortality rates, improve patients' quality of life, relieve symptoms and increase survival rates[3]. It is associated with significantly lower mortality rates and a marked reduction in major cardiovascular and cerebrovascular events compared to coronary angioplasty or percutaneous coronary intervention (PCI)[4].

Undergoing CABG surgery is a significant life event, often met with a complex mix of hope and fear. While the procedure offers the promise of improved cardiac health and an enhanced quality of life, the pre- and post-operative periods are frequently characterised by considerable patient uncertainty. This uncertainty can manifest in various ways, impacting emotional wellbeing and the overall patient experience[5,6].

Uncertainty is defined as the inability to determine the meaning of illness-related events and describes a cognitive state in which an individual lacks sufficient cues to form a clear understanding of their illness situation[5]. Various factors contribute to uncertainty, including inconsistencies between expectations and experiences, a lack of information and the unpredictability of treatment outcomes[7].

Uncertainty in illness is a significant source of psychological stress and can profoundly impact a person's emotional wellbeing, quality of life and ability to cope with their condition. Uncertainty has negative physiological and psychological consequences on the health behaviours of patients[8].

A major source of uncertainty for patients undergoing CABG is their incomplete understanding of the procedure and its potential outcomes. Limited or unclear information can heighten anxiety and create feelings of threat and unpreparedness for the experience[9].

Patients respond differently to surgery, with recovery influenced by factors such as age and health status, and the procedure's complexity[5,6]. Common concerns include outcomes, complications, pain, hospital stay and recovery time. When information is lacking or unclear, or patients doubt their understanding, the resulting uncertainty can cause distress and make it hard for them to envision their recovery and future[9].

Support from healthcare providers, through patient education, guidance and clarification of symptom patterns, effectively reduces uncertainty, post-operative complications, adverse events, and the ambiguity and unpredictability of illness outcomes, ultimately contributing to shorter hospital length of stay (LOS)[10]. Patients who receive inadequate information pre-operatively may face problems such as readmissions, prolonged recovery periods, increased LOS and decreased quality of life post-operatively[11].

Addressing uncertainty is crucial for ensuring a positive patient experience, facilitating optimal recovery and decreasing hospital LOS. Nurses play a vital role in providing comprehensive and clear information about the CABG procedure, the expected recovery process and potential lifestyle adjustments. Ebrahimi et al.[9] examined the impact of insufficient information on patients undergoing CABG surgery and their resulting uncertainty, reporting challenges such as confusion and worry.

Pre-operative education programs are invaluable for reducing uncertainty. These programs typically offer detailed explanations of the surgical process, pain management strategies, breathing exercises and the importance of early mobilisation. By providing patients with knowledge and practical skills, these programs can empower them to actively engage in their recovery. Researchers generally agree that comprehensive pre-operative education is associated with several beneficial clinical outcomes, including a reduction in LOS and improved comfort and quality of life[10–14].
In a systematic review of literature, by Guo[15] examined the impact of pre-operative educational interventions on anxiety levels and recovery outcomes in patients undergoing cardiac surgery between 2000 and 2011. The findings were contradictory – some studies reported positive physical and psychological effects associated with educational programs, while others found no significant impact on patient anxiety, pain levels, or length of hospital stay. Sampalis et al.[16] studied the impact of waiting time on uncertainty among patients undergoing CABG surgery. The authors reported a relationship between uncertainty and lack of information about CABG surgery, and concluded that uncertainty is a significant predictor of poor quality of life[16].

In addition to the benefits of pre-operative health education for patients in enhancing their emotional wellbeing, policymakers are concerned with LOS post-operatively as an indication of the outcomes of surgery and quality of care, in addition to the cost burden on the health services[17].

There is a paucity of published studies that examined the effects of pre-operative education intervention on the level of uncertainty for patients undergoing CABG surgery and LOS after CABG surgery. The aim of this study was to examine the effects of a pre-operative education intervention on the post-operative outcomes, including uncertainty levels and post-operative LOS, on patients undergoing CABG surgery.

Methodology

This study used a post-test only control group experimental design. The participants were recruited by convenience sampling from patients who had been admitted and diagnosed with severe coronary artery occlusion, undergoing CABG surgery for the first time in a hospital in Amman.

Inclusion criteria were being 18 years of age or over, conscious, having no history of mental disorders and being able to communicate, read and write Arabic. Adult patients in the selected cardiac surgical wards, who had been admitted for CABG surgery and met the inclusion criteria were invited to participate in this study.

The estimated sample size of the control and intervention groups was 65 participants each, based on an independent t-test with a power of 0.80, a level of significance (α) of 0.05 and a medium effect size of 0.5[18]. The participants ($N = 130$) were then randomly assigned to either the control or intervention group ($n = 65$) using a coin-flip strategy.

Both groups received routine care; however, the intervention group also received a pre-operative educational intervention through face-to-face verbal explanation, demonstration and discussion, using a traditional educational session method, combined with an Arabic version of the booklet as a written hard copy.

All participants were evaluated on the day of admission and post-operatively on day four.

Instruments

A demographic data questionnaire was developed to collect data including demographic, socioeconomic and clinical characteristics of participants.

The Mishel uncertainty in illness scale-adult form (MUIS-A) was used to collect data about participant uncertainty levels. The MUIS-A was developed in 1980 to address hospitalised adult patients' uncertainty and has been widely used for assessing uncertainty levels among patients with cancer and cardiac and chronic illnesses[19]. Patients' responses to the MUIS-A were based on their perception of their present situation and used to measure uncertainty in different clinical settings.

The MUIS-A has 28 items in two factors. Each item is measured on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). 21 items reflect respondents present uncertainty, such as 'I have a lot of questions without answers', and the remaining seven items reflect the absence of uncertainty, such as 'The purpose of each treatment is clear to me'. After reverse coding for the absence of uncertainty (items 6, 7, 10, 24, 26, 27, 28), the total score for uncertainty can range from 28 to 140, with a higher score indicating greater uncertainty.

When the MUIS-A was used with cardiac patients (n = 852) it showed a Cronbach's alpha of 0.89[19]. Researchers used an Arabic translation of the English-language version of the MUIS-A. The internal consistency of the Arabic version of the scale was assessed with patients undergoing CABG surgery (n = 15) and showed a Cronbach's alpha of 0.95 pre-operatively and 0.96 post-operatively.

The LOS was measured by the number of days patients were hospitalised after surgery and was determined through patient medical records.

Data collection

Data was collected in two phases – before CABG surgery and after CABG surgery.

Phase one: Before CABG surgery

Participants who met the inclusion criteria on the admission day were surveyed for demographic and clinical data, using the questionnaire, after the routine preoperative care. The intervention group received a pre-operative educational program.

Phase two: After CABG surgery

After CABG surgery, data were collected for all participants in both groups on the fourth post-operative day and during the hours between 8.00 am and 9.00 pm. The rationale for collecting data on the fourth post-operative day was that the narcotic analgesic effect is more likely to be diminished, chest and pericardial tubes and all lines were removed, and patients were more settled in the ward.

Ethical considerations

This study received institutional ethical approval. All participants were provided with verbal and written information about the purpose of this study, its significance and the risks and benefits involved, before signing a consent form. They were assured that their participation was voluntary, that they could withdraw at any time and that there were no anticipated risks associated with participation. Confidentiality, anonymity and privacy were assured. Data was stored with a secure password and will be properly discarded after the publication of the research.

Data analysis

Data were analysed using the Statistical Package for Social Sciences (SPSS) software, version 21. Descriptive and inferential statistics were used to analyse the data. Demographic and clinical-related variables were described using means, standard deviations and frequencies. Independent samples t-test, one-way analysis of variance (ANOVA), the Mann–Whitney test and the chi-square test were used to examine the uncertainty level and LOS of the intervention group compared to the control group.

Results

Demographic characteristics

There were 130 participants in the study, 25 women and 105 men. The mean age of the intervention group was 56.5 years (±10.7), and of the control group was 58 (±8.8). Nearly all participants (90%) were married, over a third (39.2%) were working, more than half (60%) had a monthly income of less than JOD 500 (AUD 1063) and just over half (53.8%) had primary or secondary school as the highest education level. Details of demographic characteristics of both the interventional and control groups are presented in Table 1.

Clinical characteristics

Of the 130 study participants, 49 (37.7%) were current smokers, smoking 36 (±21) cigarettes a day for a mean of 28.3 (±13) years. Previous experience of surgery was reported by 62 participants (47.7%). A history of diabetes mellitus was reported by 71 participants (54.6%), a history of hypertension by 73 (56.2%) and a family history of CVD by 71 (54.6%),. Descriptive statistics for clinical characteristics by intervention and control groups are presented in Table 2.

Uncertainty levels and LOS

Participant post-operative uncertainty levels were scored using the MUIS-A and found to range between 69 and 112 in the control group and between 33 and 73 in the intervention group. Descriptive statistical analysis revealed a mean score of 94.3 ± 8.7 for the control group and 46.1 ± 9.3 for the intervention group. An independent samples t-test found a statistically significant difference between the post-operative MUIS-A mean scores of the intervention group compared to the control group ($t(128) = -30.7$, $p = < 0.001$). These results indicate that participants in the control group had higher perceived post-operative uncertainty than participants in the intervention group.

The mean LOS in days was 7.5 ± 3.5 (ranging from 5 to 28 days) for the control group and 7.7 ± 3.9 (ranging from 4 to 31 days) for the intervention group. An independent samples t-test found the difference in LOS between the groups was not statistically significant ($t(128) = 0.26$, $p = 0.79$).

Table 1: Demographic characteristics of the study sample (N = 130)

Variables		Total sample (N = 130)	Intervention group (n = 65)	Control group (n = 65)
Gender	female	25 (19.2%)	9 (13.8%)	16 (24.6%)
	male	105 (80.8%)	56 (86.2%)	49 (75.4%)
Age in years, M±SD (range)		57.3 ±9.7 (35–76)	56.5±10.7 (35–76)	58.0 ±8.8 (37–76)
Marital status	single	2 (1.5%)	2 (3.1%)	0 (0.0%)
	married	117 (90.0%)	59 (90.8%)	58 (89.2%)
	divorced	1 (0.8%)	1 (1.5%)	0 (0.0%)
	widowed	10 (7.7%)	3 (4.6%)	7 (10.8%)
Employment status	employed	51 (39.2%)	28 (43.1%)	23 (35.4%)
	unemployed	32 (24.6%)	11 (16.9%)	21 (32.3%)
	retired	47 (36.2%)	26 (40.0%)	21 (32.3%)
Educational level	primary/secondary	70 (53.8%)	32 (49.2%)	38(58.5)
	high school	28 (21.5%)	16 (24.6%)	12 (18.5%)
	diploma	18 (13.8%)	11 (16.9%)	7 (10.8%)
	bachelor degree	11(8.5%)	4 (6.20%)	7 (10.8%)
	master's degree	3 (2.3%)	2 (3.1%)	1 (1.5%)
	PhD	0 (0.0%)	0 (0.0%)	0 (0.0%)
Monthly income	< JOD 500	78 (60%)	33 (50.0%)	45 (69.2%)
	JOD 500–1000	40 (30.8%)	24 (36%)	16 (24.6%)
	JOD 1001–1500	10 (7.7%)	7 (10.8%)	3 (4.6%)
	> JOD 1500	2 (1.5%)	1 (1.5%)	1 (1.5%)

M = mean, SD = standard deviation, JOD = Jordanian dinars

Effects of demographic and clinical variables

Further analysis was done to investigate effects of demographic and clinical variables on post-operative uncertainty levels and LOS. An independent samples t-test and Mann-Whitney U test were used to assess the effects of dichotomous variables, while a one-way ANOVA test and chi-square test were used to examine the effects of continuous and categorical variables.

Effects of demographic and clinical variables on post-operative uncertainty

Of the demographic variables, only age (p = 0.014) had a significant effect on post-operative uncertainty (see Table 3).

Of the clinical variables, history of hypertension (p = 0.019) and using pain killer medication (p = 0.008) both had significant effects on post-operative uncertainty (see Table 4).

Effects of demographic and clinical variables on LOS

Data analysis showed no significant effects of demographic and clinical variables on LOS (see tables 5 and 6).

Discussion

Patients undergoing CABG surgery face multiple ambiguous, complex and unpredictable events leading to high levels of uncertainty and psychological distress that may affect their recovery and hence their hospital LOS[20]. If patients' uncertainty is not managed, it becomes a threat to their wellbeing and may lead to health complications, such as delayed recovery and repeated admissions[11].

Effect of pre-operative education on patient uncertainty

Mishel[7] asserted that patients' uncertainty decreased when they developed cognitive vision and understanding of their illness, treatment and reason for hospitalisation.

Table 2: Clinical characteristics of the study sample (N = 130)

Variables		Total sample (N = 130)	Intervention group (n = 65)	Control group (n = 65)
Smoking status	smoker	49 (37.7%)	23 (35.4%)	20 (30.8%)
	non-smoker	41 (30.5%)	21 (32.3%)	26 (40.0%)
	ex-smoker	40 (30.8%)	21 (32.3%)	19 (29.2%)
Smoking duration, M±SD (range)		28.3 ±13, (2–55)	26.34 ±11.87, (2–55)	30.2 ±13.8, (6–55)
Cigarettes per day, M±SD (range)		36.0 ± 21, (3–100)	36.91 ±22.59, (3–100)	35.2 ±19.6, (9–100)
Previous experience of surgery	yes	62 (47.7%)	31 (47.7%)	31 (47.7%)
	no	68 (52.3%)	34 (52.3%)	34 (52.3%)
Family history of CVD	yes	71 (54.6%)	35 (53.8%)	36 (55.4%)
	no	59 (45.4%)	30 (46.2%)	29 (44.6%)
History of diabetes mellitus	yes	71 (54.6%)	32 (49.2%)	39 (60.0%)
	no	59 (45.4%)	33 (50.8%)	26 (40.0%)
History of hypertension	yes	73 (56.2%)	31 (47.7%)	42 (64.6%)
	no	57 (43.8%)	34 (52.3%)	23 (35.4%)
Relaxation medication use	yes	14 (10.8%)	5 (7.7%)	9 (13.8%)
	no	116 (89.2%)	60 (92.3%)	56 (86.2%)
Painkiller medication use	yes	100 (76.9%)	42 (64.6%)	58 (89.2%)
	no	30 (23.1%)	23 (35.4%)	7 (35.4%)
History of anaesthesia	yes	62 (47.7%)	31 (47.7%)	31(47.7%)
	no	68 (52.3%)	34 (52.3%)	34 (52.3%)
Expectation of pain after CABG surgery	no pain	6 (4.6%)	3 (4.6%)	3 (4.6%)
	mild pain	15 (11.5%)	8 (12.3%)	7 (10.8%)
	moderate pain	15 (11.5%)	11 (16.9%)	4 (6.2%)
	severe pain	12 (9.2%)	8 (12.3%)	4 (6.2%)
	unknown	82 (63.1%)	35 (53.8%)	47 (72.3%)

M = Mean, SD = Standard Deviation, CVD =cardiovascular disease, CABG = coronary artery bypass graft

The findings of the current study showed that participants who received routine pre-operative preparation for surgery and did not receive pre-operative education had a higher uncertainty level than those who received structured pre-operative education. Thus, pre-operative education had a positive effect on the post-operative uncertainty level. This finding aligns with other studies that have examined the effects of pre-operative education on various types of surgeries. Ryu et al.[21] examined the effect of pre-operative information on the uncertainty level of patients undergoing total knee arthroplasty (TKA) and concluded that pre-operative information was effective in decreasing uncertainty of patients undergoing TKA surgery. Shin and Lee[22] studied the effects of a pre-operative information booklet on pre- and post-operative uncertainty of patients undergoing endoscopic submucosal dissection and found that patients in the intervention group had a significantly lower uncertainty levels than those in the control group.

Other studies used different delivery methods to evaluate the effect of pre-operative education interventions on the level of uncertainty. Chuang et al.[23] examined the use of cell phone devices to offer information to patients undergoing cervical disc herniation surgery and found that the intervention group exhibited significantly less anxiety and uncertainty. Jeon and Park[24] studied pre-operative education for patients undergoing hysterectomy and found using multimedia education was more effective in reducing patient uncertainty compared to routine

Table 3: Effect of demographic variables on post-operative uncertainty of patients undergoing CABG surgery (N = 130)

Variable	Test result	P value α = 0.05 (2-tailed)
Age (years)	F =1.74	0.01*
Gender	t =1.58	0.12
Marital status	X2=2.86	0.41
Employment status	F =2.98	0.05
Educational level	F =0.77	0.54
Monthly income	X2 = 2.80	0.43

F = F-ratio (one-way ANOVA), t = t-value (independent samples t-test), X2 = chi-square, α = significance level

Note: The chi-square test was used as a non-parametric analogue of independent samples t-test when assumptions were not met based on the variables level of measurement.

Table 4: Effect of clinical variables on post-operative uncertainty of patients undergoing CABG surgery (N = 130)

Variable	Test result	P value α = 0.05 (2-tailed)
Smoking status	F = 0.22	0.80
Smoking duration (years)	F= 0.58	0.96
Cigarettes per day	F = 1.00	0.51
Previous experience of surgery	t = 0.01	0.99
Family history of CVD	t = 0.66	0.95
History of diabetes mellitus	t = 1.77	0.08
History of hypertension	t = 1.85	0.02*
Relaxation medication use	z = -1.72	0.80
Painkiller medication use	z = -2.67	0.01*
History of anaesthesia	t = 0.09	0.92
Expectation of pain after CABG surgery	F = 1.83	0.13

F = F-ratio (one-way ANOVA), t = t-value (independent samples t-test), z = z-score (Mann-Whitney U test), α = significance level

Note: The Mann-Whitney U test was used as a non-parametric analogue of independent samples t-test when assumptions were not met based on the level of measurement of examined variables.

Table 5: Effect of demographic variables on LOS of patients undergoing CABG surgery (N = 130)

Variable	Test result	P value α = 0.05 (2-tailed)
Age (years)	F = 1.3	0.19
Gender	t = -1.02	0.31
Marital status	X^2 = 3.19	0.36
Employment status	X^2 = 3.58	0.17
Educational level	X^2 = 3.62	0.46
Monthly income	F = 0.77	0.71

F = F-ratio (one-way ANOVA), t = t-value (independent samples t-test), X2 = chi-square, α = significance level

Table 6: Effect of clinical variables on LOS of patients undergoing CABG surgery (N = 130)

Variable	Test result	P value α = 0.05 (2-tailed)
Smoking status	X^2 = 0.96	0.33
Smoking duration (years)	F = 0.68	0.78
Cigarettes per day	F = 0.68	0.78
Previous experience of surgery	t = 1.17	0.26
Family history of CVD	t = 0.86	0.39
History of diabetes mellitus	t = 0.09	0.93
History of hypertension	T = 1.14	0.26
Relaxation medication use	t = -1.90	0.85
Painkiller medication use	t = 1.38	0.17
History of anaesthesia	t = 0.93	0.17
Expectation of pain after CABG surgery	X^2 = 1.7	0.80

[1]: One Way ANOVA, [2]: independent samples t-test, [3]: Chi-Square, α = 0.05(2-tailed)

X^2 = chi-square, F = F-ratio (one-way ANOVA), t = t-value (independent samples t-test), α = significance level

education. Pre-operative education programs can be invaluable in reducing uncertainty. These programs often include detailed explanations of the surgical process, pain management strategies, breathing exercises and an emphasis on the importance of early mobilisation. By equipping patients with knowledge and practical skills, these programs can empower them to actively participate in their recovery.

Uncertainty is a common and understandable experience for patients facing CABG surgery. By acknowledging and actively addressing the various sources of this uncertainty through clear communication, comprehensive education and robust emotional support, nurses can empower patients to navigate this challenging period with greater confidence and hope for a healthier outcome.

Effect of pre-operative education on LOS

LOS is an important component of surgical outcomes, and may be influenced by demographic and clinical characteristics of patients[25]. In this study, there was no statistically significant difference in LOS between the intervention and control groups, which is consistent with the findings of other studies[15,17,26]. Kalogianni et al.[27] found that pre-operative education delivered by nurses reduced the anxiety of patients undergoing cardiac surgery; however, it was not effective in reducing LOS or readmissions.

In contrast, Cavallaro[12] found that patients who received scripted educational phone calls had a notably shorter average LOS compared to those who received the usual care. Similarly, Brodersen et al.[10] found that educational interventions conducted by nurses before surgery led to positive outcomes in terms of LOS. As LOS is influenced by a range of factors[25] further research into the impact of pre-operative education on LOS in needed.

Effect of demographics and clinical variables on LOS

The current study did not find any statistically significant relationship between LOS and demographic or clinical variables (see tables 5 and 6). This is consistent with Sorensen and Wang[28], who reported that there is no relationship between gender and LOS for patients undergoing CABG surgery. In contrast, Aburuz et al.[29] identified advanced age and female sex as factors contributing to prolonged LOS after CABG surgery. Similarly, Biondi et al.[30] and Almashrafi et al.[31] found that age is associated with increased LOS after CABG surgery[30,31].

A range of factors have been found to be associated with LOS. Jafarkhani et al.[32] and Triana et al.[33] reported that the most significant predictors of LOS in the intensive care unit (ICU) among CABG patients were intubation duration, body mass index (BMI), patient age, surgical duration and the quantity of post-operative packed red blood cell transfusions. Ai et al.[34] reported that post-operative LOS among patients having open-heart surgery was affected by multiple variables such as gender, age, medical co-morbidities, ventricular ejection fraction, long perfusion time and coronary bypass graft surgery. Similarly, Cserép et al.[35] found that factors affecting hospital LOS include longer operation duration, longer stay in ICU, complications in ICU and patient psychosocial status.

While pre-operative education may enhance outcomes, such as reduced pain[13] and anxiety[13,15], and reduce the incidence of complications[10,12], its impact on significantly decreasing hospital LOS is inconsistent. The varied content, delivery and timing of pre-operative education are likely to contribute to this inconsistency, suggesting that effectiveness in reducing LOS may depend on the specific elements and quality of the education provided.

Conclusion

Pre-operative education was found to have a positive effect on post-operative uncertainty with participants in the control group having significantly higher perceived post-operative uncertainty than participants in the intervention group.

Nurses' ability to acknowledge and proactively mitigate uncertainty contributes to their crucial role in empowering patients to navigate challenging health journeys. Nurses should consistently integrate strategies for acknowledging and proactively addressing patient uncertainty as a core component of pre- and post-operative care. This includes implementing and regularly updating standardised, evidence-based patient education programs that are tailored to individual learning needs, ultimately leading to improved patient outcomes and a more efficient healthcare system.

While the effect of pre-operative education on LOS was not significant in this study, a significant effect has been reported by other researchers. Future research should employ different methodologies such as a pretest–posttest interventional and control groups design with random sampling methods, randomised controlled trials with standardised intervention protocols or longitudinal studies tracking patient progression. Further research studies are also recommended to assess the effectiveness of different educational approaches (e.g. digital platforms, group sessions, individualised counselling) on patients' post-operative outcomes.

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