

Effectiveness of preoperative education on anxiety reduction among surgical patients in Indonesian hospitals: A randomized controlled trial

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ABSTRACT

Introduction: Preoperative anxiety is a common and clinically significant issue among surgical patients, contributing to adverse perioperative outcomes. Despite growing attention to patient-centered care, structured educational interventions remain inconsistently implemented in Indonesian hospitals. This study aimed to evaluate the effectiveness of structured preoperative education in reducing anxiety among surgical patients.

Research Methodology: A parallel-group randomized controlled trial was conducted in two tertiary hospitals in Indonesia from January to April 2026. A total of 140 adult patients scheduled for elective surgery were randomly assigned to an intervention group ($n = 70$) that received structured preoperative education or a control group ($n = 70$) that received standard care. Anxiety was measured using the State-Trait Anxiety Inventory (STAI). Data were analyzed using independent t-tests and multiple linear regression, with $\alpha = 0.05$.

Results: Baseline characteristics were comparable between groups ($p > 0.05$). The intervention group demonstrated significantly lower post-intervention anxiety scores compared to the control group (34.5 ± 6.8 vs. 42.3 ± 7.2 ; mean difference = -7.8 ; $p < 0.001$). Multivariate analysis confirmed that structured preoperative education was independently associated with reduced anxiety ($\beta = -7.12$; 95% CI: -9.85 to -4.39 ; $p < 0.001$).

Conclusion: Structured preoperative education is an effective and clinically meaningful intervention for reducing anxiety among surgical patients. Integrating standardized educational protocols into perioperative care may enhance patient-centered outcomes and improve surgical service quality in resource-constrained settings.

Keywords: anxiety; patient education; perioperative care; surgical procedures.



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INTRODUCTION



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Preoperative anxiety remains a pervasive and clinically consequential problem among surgical patients, particularly in low- and middle-income countries such as Indonesia (Ahmed et al., 2025). Empirical evidence consistently demonstrates that heightened anxiety before surgery is associated with adverse physiological and psychological outcomes, including increased perioperative pain, elevated anesthetic requirements, prolonged recovery time, and reduced patient satisfaction (Amaya et al., 2025). In Indonesian hospital settings, these challenges are amplified by structural constraints such as high patient volume, limited time for patient-provider interaction, and variability in the quality of patient education (Bromfalk et al., 2025). Despite national efforts to strengthen patient-centered care, preoperative preparation often remains procedural rather than educational, leaving patients insufficiently informed about surgical processes and outcomes (Esper et al., 2024). Consequently, unmanaged anxiety represents not only an individual-level burden but also a systemic inefficiency that can compromise surgical quality and safety (Gamst-Jensen et al., 2025).

Recent literature has increasingly positioned preoperative education as a modifiable intervention with the potential to mitigate anxiety and improve perioperative outcomes (Görgeş et al., 2024). Randomized and quasi-experimental studies conducted over the past five years indicate that structured educational interventions delivered through multimedia tools, counseling sessions, or digital platforms can significantly reduce anxiety scores compared to standard care (He et al., 2024). For instance, interactive video-based education has been shown to enhance patient understanding and decrease uncertainty, thereby lowering anxiety levels (Hsieh et al., 2026). Similarly, nurse-led educational programs that incorporate individualized counseling and cognitive reassurance have demonstrated measurable reductions in both state anxiety and postoperative complications (Liss et al., 2026). However, the effectiveness of these interventions appears to be context-dependent, influenced by factors such as cultural relevance, health literacy, delivery modality, and timing of education (Lu et al., 2026).

Critically, while global evidence supports the role of preoperative education, its applicability within Indonesian healthcare contexts remains underexplored (Luo et al., 2024). Many existing studies are conducted in high-income countries with well-resourced systems, standardized protocols, and higher baseline levels of patient literacy (Machado et al., 2024). In contrast, Indonesian hospitals exhibit heterogeneity in infrastructure, staffing, and patient demographics, which may affect both the feasibility and effectiveness of educational interventions (Maheta et al., 2024). Furthermore, prior studies in Indonesia tend to employ observational or quasi-experimental designs, limiting causal inference. There is also a lack of standardization in intervention content, duration, and delivery methods, making it difficult to identify best practices. Importantly, few studies explicitly measure anxiety using validated psychometric instruments within randomized controlled frameworks.

This gap underscores a critical need for rigorously designed randomized controlled trials evaluating the effectiveness of contextually adapted preoperative education interventions in Indonesian settings. Specifically, there is insufficient evidence regarding whether structured, culturally tailored education can produce clinically meaningful reductions in anxiety when compared to routine care. Additionally, the interaction between educational interventions and patient-level variables such as age, prior surgical experience, and baseline anxiety remains poorly understood. Addressing these gaps is essential for developing scalable, evidence-based strategies that can be integrated into routine surgical workflows.

The present study introduces a novel approach by implementing a standardized, culturally adapted preoperative education program delivered through a combination of visual and verbal

modalities. Unlike previous studies, this trial employs a randomized controlled design with validated anxiety measurement tools and clearly defined intervention protocols. The novelty of this study lies not only in its methodological rigor but also in its contextual sensitivity, ensuring that the educational content aligns with local language, cultural norms, and healthcare delivery realities. By doing so, it seeks to bridge the gap between global evidence and local applicability.

The primary objective of this study is to evaluate the effectiveness of structured preoperative education in reducing anxiety among surgical patients in Indonesian hospitals. Secondary objectives include assessing the influence of patient characteristics on intervention outcomes and determining the feasibility of integrating such educational programs into routine clinical practice. Through a robust experimental design, this study aims to generate high-quality evidence that can inform policy, enhance patient-centered care, and ultimately improve surgical outcomes in Indonesia.

RESEARCH METHODOLOGY

Study Design

A parallel, two-arm randomized controlled trial (RCT) with a superiority framework was conducted to determine whether structured preoperative education reduces anxiety compared with standard care. The RCT design was chosen to maximize internal validity, enable causal inference, and minimize confounding through random allocation and protocolized intervention delivery.

Setting & Participants

The study was implemented in the surgical wards of two tertiary hospitals in Jakarta, Indonesia, from January to April 2026. Eligible participants were adult patients scheduled for elective surgery. Inclusion criteria comprised: (1) age ≥ 18 years; (2) scheduled for elective procedures under general or regional anesthesia; (3) ability to communicate in Bahasa Indonesia; and (4) provision of written informed consent. Exclusion criteria included: (1) emergency surgery; (2) documented psychiatric disorders or cognitive impairment; (3) current use of anxiolytic medication that could bias assessment; and (4) prior exposure to structured preoperative education within the last six months.

Participants were recruited using consecutive sampling until the required sample size was achieved. Sample size estimation was based on detecting a mean difference in anxiety scores between groups using a two-sided test, assuming a standardized effect size (Cohen's d) of 0.5, statistical power of 80%, and $\alpha = 0.05$. The minimum calculated sample was 64 participants per arm. Allowing for 10% attrition, the final target sample size was 140 participants (70 per group).

Variables & Measurement

The primary outcome was preoperative anxiety, operationalized as the score on the State subscale of the State–Trait Anxiety Inventory (STAI-S) measured before surgery. The main independent variable was structured preoperative education, defined as a standardized, protocol-driven educational package delivered via audiovisual media and guided explanation.

Covariates included age (years), sex (male/female), educational attainment (low/high), prior surgical experience (yes/no), and type of surgery (minor/major). All variables were obtained as primary data through interviewer-administered questionnaires and medical record verification. The STAI instrument has established construct validity and internal consistency (Cronbach's α typically >0.85). In this study, reliability testing in a pilot sample yielded Cronbach's $\alpha = 0.87$. A panel of perioperative nursing and anesthesiology experts reviewed the content validity of the intervention materials.

Data Collection

Data collection followed a standardized sequence: (1) baseline assessment (T0), including demographic data and baseline STAI-S; (2) random allocation to intervention or control using computer-generated random numbers with sealed opaque envelopes to ensure allocation concealment; (3) intervention delivery to the experimental group approximately 24 hours before surgery, while the control group received routine information; and (4) outcome assessment (T1) one hour prior to surgery using the same STAI-S instrument. Quality control procedures included training research assistants, using standardized operating procedures (SOPs), pilot testing instruments, double data entry, and periodic data audits. Missing or inconsistent responses were verified immediately with participants to minimize information bias.

Data Analysis

Descriptive statistics (mean, standard deviation, frequency, and percentage) were used to summarize participant characteristics and study variables. Bivariate analyses were conducted using independent samples t-tests (or Mann–Whitney U tests for non-normal data) and chi-square tests for categorical variables. Multivariate analysis was performed using multiple linear regression to estimate the adjusted effect of the intervention on post-intervention anxiety scores while controlling for covariates. Model assumptions (normality, homoscedasticity, multicollinearity) were assessed before inference. Effect estimates are reported as β coefficients with 95% confidence intervals. All analyses were performed using IBM SPSS Statistics version 26. Statistical significance was set at $\alpha = 0.05$.

Ethical Approval

Ethical clearance was obtained from the Health Research Ethics Committee of Sekolah Tinggi Ilmu Kesehatan Fatmawati, Jakarta, Indonesia (Approval No.: 002/LPPM-STIKF/ETIK/I/2026). All participants received detailed information regarding study objectives, procedures, risks, and benefits, and provided written informed consent before enrollment. Confidentiality was maintained through anonymized data coding and participant.

RESULT

A total of 140 participants were enrolled and randomized into the intervention group ($n = 70$) and control group ($n = 70$). All participants completed the study and were included in the final analysis. Baseline characteristics between groups were comparable, indicating successful randomization. The primary outcome analysis demonstrated a statistically significant reduction in preoperative anxiety scores in the intervention group compared to the control group. Further analyses examined the association between participant characteristics and anxiety outcomes, as well as the intervention's adjusted effect after controlling for potential confounders. Table 1. Baseline characteristics of participants in the intervention and control groups, showing comparability before intervention.

Table 1. Baseline Characteristics of Participants (N = 140)

Variable	Intervention (n=70)	Control (n=70)	p-value
Age (mean $\pm$ SD)	41.2 $\pm$ 12.5	42.1 $\pm$ 11.8	0.68
Female (%)	54.3	52.9	0.87
Higher education (%)	60.0	57.1	0.72
Previous surgery (%)	48.6	50.0	0.86
Major surgery (%)	55.7	57.1	0.88

Baseline characteristics were comparable between groups ($p > 0.05$), indicating adequate randomization and group equivalence before the intervention. Table 2. Comparison of post-

intervention preoperative anxiety scores between intervention and control groups using bivariate analysis.

Table 2. Bivariate Analysis of Preoperative Anxiety Scores

Variable	Intervention (mean ± SD)	Control (mean ± SD)	Mean Difference	p-value
Anxiety score (post-test)	34.5 ± 6.8	42.3 ± 7.2	-7.8	<0.001

Patients receiving structured preoperative education exhibited significantly lower anxiety scores compared to controls. The mean reduction of 7.8 points indicates a clinically meaningful improvement. Table 3. Multivariate linear regression analysis of factors associated with preoperative anxiety, including adjusted effect estimates (β), 95% confidence intervals, and p-values.

Table 3. Multivariate Linear Regression Analysis of Factors Associated with Anxiety

Variable	β	95% CI	p-value
Intervention (education)	-7.12	-9.85 to -4.39	<0.001
Age	-0.08	-0.15 to -0.01	0.03
Female sex	1.45	-0.88 to 3.78	0.22
Previous surgery	-1.92	-4.10 to 0.26	0.08
Higher education	-2.10	-4.35 to 0.15	0.06

After adjustment, structured preoperative education remained a significant predictor of reduced anxiety ($\beta = -7.12$, $p < 0.001$). Age also showed a small but significant inverse association with anxiety. Other variables were not statistically significant.

The findings demonstrate that structured preoperative education significantly reduces anxiety among surgical patients. Baseline comparability between intervention and control groups confirms that the observed effects are unlikely to be influenced by pre-existing differences. Bivariate analysis revealed a substantial reduction in anxiety scores in the intervention group, suggesting that the educational intervention effectively addresses uncertainty and psychological distress before surgery. Multivariate analysis further strengthens this conclusion by showing that the intervention remains a robust predictor of reduced anxiety after controlling for demographic and clinical factors. The magnitude of the effect ($\beta = -7.12$) indicates a clinically meaningful reduction, reinforcing the intervention's practical relevance. Age emerged as a modest protective factor, with older patients exhibiting slightly lower anxiety levels, potentially reflecting greater coping experience. Although variables such as sex, education level, and prior surgical experience showed directional associations, none reached statistical significance, suggesting that the intervention effect is relatively consistent across subgroups. Overall, the results provide strong evidence that structured preoperative education is an effective and scalable strategy to reduce anxiety in surgical settings, supporting its integration into routine perioperative care.

DISCUSSION

The present study provides robust empirical evidence that structured preoperative education significantly reduces anxiety among surgical patients within Indonesian hospital settings. The magnitude of the effect observed in this randomized controlled trial indicates not only statistical significance but also clinical relevance, suggesting that anxiety is a modifiable determinant of perioperative outcomes. The persistence of the intervention effect after adjustment for demographic and clinical covariates reinforces the internal validity of the findings. It underscores the central role of information-based interventions in shaping patient experiences (Orgil et al., 2024). From a conceptual standpoint, these results support the theoretical premise

that uncertainty reduction and cognitive preparedness are key mechanisms through which educational interventions influence emotional regulation (Rajala et al., 2026).

Importantly, the findings extend beyond individual-level outcomes to suggest broader implications for healthcare delivery systems (Rasi Rahagia & Dewi Nurhanifah, 2026). In many Indonesian hospitals, preoperative preparation is often constrained by time pressures and high patient turnover, leading to fragmented communication and limited patient engagement (Reddinger et al., 2025). The demonstrated effectiveness of a structured educational approach indicates that even within resource-constrained environments, targeted interventions can yield measurable improvements in patient-centered outcomes (Steyl et al., 2026). This aligns with a growing body of evidence emphasizing the integration of educational and psychosocial components into perioperative care pathways (Sui et al., 2026).

When situated within the broader literature, the results of this study are consistent with previous findings demonstrating the efficacy of preoperative education in reducing anxiety (Talen et al., 2025). Studies conducted in diverse clinical settings have reported similar reductions in anxiety scores following interventions such as multimedia education, structured counseling, and digital health tools (Wijayanti et al., 2025). However, the present study contributes a critical contextual dimension by demonstrating that these effects are reproducible within a middle-income healthcare system characterized by variability in infrastructure and patient literacy (Wu et al., 2024). This contextual sensitivity is particularly important, as interventions that are effective in high-income countries may not translate directly into other contexts without modification (Xie et al., 2026).

Moreover, the observed association between age and anxiety provides additional insight into patient heterogeneity (Xu et al., 2025). The inverse relationship suggests that younger patients may experience higher levels of anticipatory stress, potentially due to limited prior exposure to healthcare procedures or differing coping mechanisms (Yu et al., 2026). Although other covariates, such as sex, education level, and prior surgical experience, did not reach statistical significance, their directional trends suggest that individual characteristics may still influence how patients process and respond to information (Zhang et al., 2025).

Despite these strengths, several limitations must be acknowledged. First, the study was conducted in a limited number of hospitals, which may affect the generalizability of the findings (Zhou & Hu, 2025). Second, although randomization minimizes selection bias, the absence of blinding may introduce performance or response bias. Third, the use of self-reported instruments, while validated, may be influenced by social desirability or situational factors. Additionally, the study focused on short-term outcomes and did not assess longer-term effects such as postoperative recovery or complications. Future research should build on these findings by exploring several key directions. Multicenter trials are needed to enhance external validity, while longitudinal designs could examine sustained effects on postoperative outcomes. Comparative studies evaluating digital and telehealth-based education are also warranted, given the rapid expansion of health technology. From a systems perspective, implementation research should assess scalability, cost-effectiveness, and integration into routine clinical workflows.

Recommendations for Future Research

Future studies should prioritize multicenter randomized controlled trials to enhance generalizability across diverse healthcare settings. Longitudinal designs are needed to examine the sustained impact of preoperative education on postoperative outcomes, including recovery, pain, and patient satisfaction. Comparative effectiveness research evaluating different delivery modalities such as digital platforms, mobile applications, and telehealth should also be conducted.

Additionally, implementation studies are required to assess feasibility, scalability, and cost-effectiveness within routine clinical workflows. Finally, future research should explore tailored educational approaches based on patient characteristics to optimize intervention effectiveness.

CONCLUSION

This randomized controlled trial demonstrates that structured preoperative education is effective in significantly reducing anxiety among surgical patients in Indonesian hospital settings. The findings provide clear evidence that patients who receive standardized, culturally adapted educational interventions experience lower levels of preoperative anxiety compared to those receiving routine care. This effect remains consistent after controlling for demographic and clinical factors, indicating that preoperative education is an independent and clinically meaningful intervention. From a practical perspective, these results highlight the importance of integrating structured educational programs into routine perioperative care. Hospitals should adopt standardized preoperative education protocols that combine audiovisual and verbal approaches to ensure consistent and comprehensive patient understanding. At the policy level, incorporating preoperative education into national clinical guidelines and hospital accreditation standards may enhance patient-centered care and improve surgical outcomes. Overall, structured preoperative education represents a feasible, scalable, and evidence-based strategy to reduce anxiety and strengthen the quality of surgical services. Its implementation has the potential to improve both patient experience and healthcare system performance in resource-constrained settings.

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Conflict of Interest

The author declares no conflicts of interest related to this study.

Authors' Contributions

Siti Utami Dewi: Conceptualization; Methodology; Investigation; Data curation; Formal analysis; Writing – original draft; Writing – review & editing; Supervision.

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Declaration of Generative AI Use

Generative artificial intelligence tools were used to support language refinement and improve clarity of expression during manuscript preparation. All conceptual development, data analysis, interpretation of findings, and final content decisions were performed by the author. The author takes full responsibility for the accuracy and integrity of the work.

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