



International Journal of Innovative Technologies in Social Science

e-ISSN: 2544-9435

Operating Publisher
SciFormat Publishing Inc.
ISNI: 0000 0005 1449 8214

2734 17 Avenue SW,
Calgary, Alberta, T3E0A7,
Canada
+15878858911
editorial-office@sciformat.ca

ARTICLE TITLE	PREOPERATIVE ANXIETY IN ADULT SURGICAL PATIENTS: PERIOPERATIVE OUTCOMES AND NON-PHARMACOLOGICAL INTERVENTIONS - A NARRATIVE REVIEW
----------------------	--

DOI	https://doi.org/10.31435/ijitss.3(51).2026.6167
------------	---

RECEIVED	29 July 2026
-----------------	--------------

ACCEPTED	17 September 2026
-----------------	-------------------

PUBLISHED	21 September 2026
------------------	-------------------

LICENSE



The article is licensed under a **Creative Commons Attribution 4.0 International License**.

© The author(s) 2026.

This article is published as open access under the Creative Commons Attribution 4.0 International License (CC BY 4.0), allowing the author to retain copyright. The CC BY 4.0 License permits the content to be copied, adapted, displayed, distributed, republished, or reused for any purpose, including adaptation and commercial use, as long as proper attribution is provided.

PREOPERATIVE ANXIETY IN ADULT SURGICAL PATIENTS: PERIOPERATIVE OUTCOMES AND NON- PHARMACOLOGICAL INTERVENTIONS - A NARRATIVE REVIEW

Agata Agnieszka Cieřlik (Corresponding Author, Email: agata.miecznikowska@onet.pl)
Ludwik Rydygier Specialist Hospital in Krakow, a limited liability company, Krakow, Poland
ORCID ID: 0009-0001-2808-9911

Mateusz Gąbka
St. Anne's Hospital in Piaseczno, Piaseczno, Poland
ORCID ID: 0009-0006-5805-4281

Magdalena Cieřlik-Porębska
Stefan Cardinal Wyszyński Provincial Specialist Hospital SPZOK in Lublin, Lublin, Poland
ORCID ID: 0009-0002-2226-4317

Agnieszka Cichocka
Stefan Cardinal Wyszyński Provincial Specialist Hospital SPZOK in Lublin, Lublin, Poland
ORCID ID: 0009-0002-2198-0709

Jadwiga Pelc
Independent Public Healthcare Institution of the Ministry of the Interior and Administration in Lublin, Lublin, Poland
ORCID ID: 0009-0009-1906-3419

Agata Cieřlik
Stefan Cardinal Wyszyński Provincial Specialist Hospital SPZOK in Lublin, Lublin, Poland
ORCID ID: 0009-0003-5496-9378

ABSTRACT

Background: Preoperative anxiety affects patients undergoing all types of surgical procedures. It stems from the concerns about both the course and the results of the surgery, as well as their postoperative performance. The changes that occur in the body under stress have a significant impact on perioperative outcomes and postoperative recovery. Recently, there has been a growing body of research on the effects of postoperative stress and non-pharmacological methods of treating it, which are safer than pharmacological methods.

Aim: The aim of this narrative review is to summarize the recent evidence on the influence of preoperative anxiety on perioperative outcomes and the effectiveness of non-pharmacological treatment methods.

Material and methods: Sources for the narrative review were taken from the studies published in the PubMed database between 2021 and 2026.

Results: The greatest impact was demonstrated regarding the use of analgesics and anesthetics. Anxiety was also associated with a longer recovery process and a greater risk of chronic post-surgical pain (CPSP) and postoperative delirium (POD). Methods of treating preoperative anxiety have been shown to be effective, including: counseling sessions, educational interventions, CBT, hypnosis, physical interventions, musical interventions, aromatherapy and virtual reality interventions.

Conclusions: Preoperative anxiety should be considered an important factor in preparing patients for surgeries. Early detection and implementation of therapeutic interventions are crucial. Studies on a larger population of patients are necessary, divided into precisely defined subgroups and with a clearly defined methodology for measuring anxiety.

KEYWORDS

Preoperative Anxiety, Surgical Patients, Perioperative Outcomes, Non-Pharmacological Interventions, Patient-Centered Care, Virtual Reality

CITATION

Cieřlik, A. A., Gąbka, M., Cieřlik-Porębska, M., Cichocka, A., Pelc, J., & Cieřlik, A. (2026). Preoperative anxiety in adult surgical patients: Perioperative outcomes and non-pharmacological interventions - a narrative review. *International Journal of Innovative Technologies in Social Science*, 3(51). [https://doi.org/10.31435/ijitss.3\(51\).2026.6167](https://doi.org/10.31435/ijitss.3(51).2026.6167)

COPYRIGHT

© The author(s) 2026. This article is published as open access under the Creative Commons Attribution 4.0 International License (CC BY 4.0), allowing the author to retain copyright. The CC BY 4.0 License permits the content to be copied, adapted, displayed, distributed, republished, or reused for any purpose, including adaptation and commercial use, as long as proper attribution is provided.

Introduction

According to the World Health Organization, the number of surgeries performed worldwide is estimated at approximately 312.9 million per year, and this number is constantly increasing. Every surgery, despite obvious health benefits, is associated with difficulties such as preoperative anxiety. (Sui et al., 2026) Preoperative anxiety is a feeling of emotional tension, accompanied by fear, dissatisfaction, and concerns about anesthesia, the course of surgery, postoperative outcomes, decreased performance, severe pain, and even the fear of death. (Alimonaki et al., 2025) The prevalence of preoperative anxiety among surgical patients depends, among other things, on the type of procedure. It is estimated that it affects from approximately 11% of those undergoing ear, nose and throat surgeries to as much as 80% of neurosurgical patients. (Chiu et al., 2023) The risk of preoperative anxiety decreases by approximately 5% with each passing year. Women, those with higher education, and those who are unmarried are at higher risk. The history of anxiety and depression also increases the severity of anxiety. (Wang, Huang, Wang, & Akbari, 2022) A specific group of surgical patients are those undergoing neurosurgical procedures. Among neurosurgical patients, the prevalence of anxiety ranged from 17% to 89% (excluding clinically irrelevant anxiety), with up to 55% of patients reporting high anxiety levels. In most patients, experienced anxiety is related to the fear of anesthesia and surgical outcomes. Awake surgery does not appear to increase anxiety levels in neurosurgical patients significantly. (Oteri, Martinelli, Crivellaro, & Gigli, 2021)

The fear can manifest as an increased heart rate, increased respiratory rate, hyperglycemia, elevated blood pressure, and gastrointestinal disturbances. Released stress hormones, for example glucocorticoids, and proinflammatory cytokines, reduce heart rate variability and increase platelet aggregation. Excessive adrenaline release can reduce the effectiveness of anesthesia. Stress-intensified surgical pain, as well as weakened immunity due to hormonal changes, can inhibit the immune response. All of these changes complicate patients' preparation for the surgery, prolong hospitalization and recovery, and impair postoperative tissue repair. (Alimonaki et al., 2025) Anxiety-related side effects are the source of increased financial burden for hospitals. In pharmacological treatment, frequently used anxiolytics include benzodiazepines, ketamine, and fentanyl. Their usage is associated with the adverse effects such as respiratory depression, interactions with medications used during surgery, and drowsiness after the surgery. (Wang et al., 2022) Recently, a growing body of research has emerged on non-pharmacological treatments for preoperative anxiety. These interventions have significantly reduced the side effects. Moreover, they are much safer for patients and can complement anxiolytic medications. (Sui et al., 2026)

This article focuses on preoperative stress-related perioperative outcomes and non-pharmacological stress management approaches. This topic appears to play a key role in a proper preparation of patients for surgeries, and therefore in the effectiveness of medical interventions. The treatments discussed include educational interventions, pre-operative counseling, cognitive-behavioral therapy (CBT), hypnosis, musical interventions, aromatherapy, physical interventions, and the use of virtual reality (VR).

Methodology

This article presents the results of the narrative review of the PubMed database. The search terms used to identify relevant articles were: ("preoperative anxiety" OR "pre-operative anxiety" OR "preanesthetic anxiety") AND (surg OR perioperative OR "surgical patients"); preoperative anxiety and postoperative recovery; aromatherapy and preoperative anxiety. The search criteria were limited to studies from the last 5 years. Studies written in a language other than English, without free access to the full article, and studies involving children, cataract surgery, and cesarean section were excluded. Meta-analyses and systematic reviews were analyzed. One prospective observational cohort study and one randomized controlled trial were also allowed. The bibliographies of included studies were searched for additional articles. After the abstracts review, 16 articles were eligible.

Results

Perioperative outcomes

The results of the available meta-analysis indicate that perioperative anxiety is associated with an increased need for medication requirements during anesthesia. Patients with anxiety had a significantly higher need for both anesthetic and analgesic drug doses compared with those without anxiety. The effect was moderate to large for anesthetics: Standardized Mean Difference (SMD) = 0.67 and large for analgesics: SMD = 1.02. Higher anxiety levels are also associated with propofol dose escalation. For situational anxiety assessed using the State-Trait Anxiety Inventory state subsystem (STAI-S), the cumulative correlation coefficient (COR) = 0.35, while for trait anxiety assessed using the State-Trait Anxiety Inventory trait subsystem (STAI-T), the COR = 0.43. Preoperative anxiety is also related to a significant increase in the time of reaching a modified Aldrete score (MAS) of 9 which could mean slower recovery process. Patients with anxiety reached this level on average 1.83 minutes later than patients without anxiety. Regarding the extubation time, the direction of the effect was observed, indicating its prolongation in patients with anxiety by 2.50 min. However, the total result indicated statistical uncertainty. (Shebl et al., 2025) (Table 1)

Table 1. The relationship between preoperative anxiety and perioperative outcomes.

Outcome	Effect measure	Result	95% CI	p-value	I ²	Interpretation
Anesthetic drug requirements	SMD	0.67	0.32–1.01	0.0001	63%	Statistically significant, moderate heterogeneity
Analgesic drug requirements	SMD	1.02	0.29–1.76	0.006	89%	Statistically significant, high heterogeneity
Propofol consumption, STAI-S	COR	0.35	0.15–0.55	not reported	88%	Weak to moderate positive correlation, high heterogeneity
Propofol consumption, STAI-T	COR	0.43	0.18–0.68	not reported	89%	Moderate positive correlation, high heterogeneity
Time to MAS 9	MD	1.83 min	1.21–2.46	<0.00001	0%	Statistically significant longer recovery
Extubation time	MD	2.50 min	–0.93–5.93	0.15	95%	Not statistically significant, high heterogeneity

95% CI - 95% Confidence Interval; p-value - probability value; I² - I-squared statistic, MD - Mean Difference

Postoperative outcomes

One prospective observational cohort study shows that there is a positive correlation between the total score of Anxiety Specific to Surgery Questionnaire (ASSQ) measuring preoperative anxiety and the total score of Postoperative Recovery Index (PoRI) measuring postoperative recovery at time points: days 0-3 and 10-15. The correlation measured by Spearman correlation ($r = 0,222$; $p < 0,05$) was weak nonetheless statistically significant. The effect was stronger in the period just after the surgery and it weakened over time. (Turan & Dönmez, 2026) Preoperative anxiety may also be associated with the extension of hospital stay. In one meta-analysis patients' stay was extended by approximately half a day (MD: 0.55 day). (Chung et al., 2025) (Table 2)

Table 2. The relationship between preoperative anxiety and postoperative outcomes.

Outcome	Effect measure	Result	95% CI	p-value	I ²	Interpretation
Length of hospitalization	MD	0,55 day	0.29–0.82	< 0.01	0%	Statistically significant
CPSP	SMD	0.31	0.20–0.41	<0.01	78%	Small to moderate effect, high heterogeneity
Postoperative delirium, dichotomized measurements ^[1]	OR	2.17	1.01–4.68	0.048	54%	Statistically significant, moderate heterogeneity
Postoperative delirium, continuous measurements ^[2]	OR	0.99	0.93–1.05	0.766	0%	No significant association
Hyperactive type of emergence delirium	Pooled OR	2.12	1.47- 3.05	<0.0001	0%	Statistically significant

[1] - anxiety understood as HADS-A score ≥ 8 or APAIS-A score ≥ 11 ; [2] - based on the scale score: APAIS-A, STAI-S, STAI-6; HADS-A - Anxiety subscale of Hospital Anxiety and Depression Scale, APAIS-A - Anxiety subscale of Amsterdam Preoperative Anxiety and Information Scale, STAI-S - State scale of Spielberger State-Trait Anxiety Inventory, STAI-6 short form of state scale of STAI

The relationship between preoperative anxiety and pain is not obvious on the first day after the surgery. However, it may be more evident in longer follow-up. . In one meta-analysis, patients with preoperative anxiety were more likely to report increased pain intensity, particularly in the first five days after the surgery and at 3, 6, and 12 months after the surgery. (Chung et al., 2025) Another meta-analysis indicated a small, however, statistically significant positive association between preoperative anxiety and increased incidence or severity of chronic post-surgical pain (CPSP). The pooled effect size was SMD = 0.31. This effect persisted in the subgroup analyses including 3-month, 6-month, and 1-year or longer follow-up. (Bakker-Bons, Hijmering, Soer, & Wolff, 2025) (Table 2) According to the systematic review examining patients undergoing brain surgeries, there is also a probable positive correlation between preoperative anxiety and the intensity of pain before and after the surgery, its interference with daily activities, as well as the pain experienced by the patient during and at the end of the surgery. There was no association between preoperative anxiety and postoperative survival rate. (Oteri et al., 2021)

On the one hand, the analysis of five studies demonstrated a possible association of dichotomously assessed preoperative anxiety with postoperative delirium (POD) (odds ratio (OR) = 2.17. In the subgroup of studies using the anxiety subscale HADS-A, the association was stronger and more consistent - OR = 3.23; 95% CI: 1.70–6.13. On the other hand studies that treated preoperative anxiety as a continuous variable did not find a significant association with postoperative delirium. The overall result was neutral - OR = 0.99; 95% CI: 0.93–1.05. (Yang et al., 2023) In the analysis of two studies, patients with preoperative anxiety were more than twice as probable to develop hyperactive type of emergence delirium as those without anxiety (pooled OR = 2.12). (He et al., 2024) (Table 2)

Non-pharmacological Interventions

The results of one meta-analysis indicate that non-pharmacological interventions may play a significant role in reducing preoperative anxiety as their combined effect size was large ($SMD = -0.80$; 95% $CI = (-1.10) - (-0.51)$; $I^2 = 84$). (Tse, Sin, Choi, & Cheng, 2026)

Educational interventions and communication-based interventions

According to the reviewed studies, the recommended preoperative counseling session should last 20–45 minutes. It should cover topics such as information about the patient's upcoming surgery, clarifying and alleviating the patient's concerns, and discussing the perioperative process, including postoperative pain management. Preoperative counseling was notably effective ($SMD = -1.36$; 95% $CI = (-1.96) - (-0.76)$; $I^2 = 75\%$). (Tse et al., 2026)

In the Enhanced Recovery after Surgery (ERAS) programme, an important element recommended is patients' education, which is consistent with the disease management programmes (DMPs). Education that embraces adherence to recommendations and health-promoting behaviors improves patients' health-related quality of life and their independence of self-care and coping with problems. It enables them to actively and consciously participate in their treatment. (Brodersen, Wagner, Uzunoglu, & Petersen-Ewert, 2023) Its goal is to improve knowledge as well as clinical outcomes. In the meta-analysis conducted on a group of patients undergoing hip and knee arthroplasty, a small effect of educational intervention on reducing anxiety in patients was observed ($SMD = 0.37$, 95% $CI = (-0.63) - (-0.11)$, $I^2 = 70\%$). In the analyzed studies, the most frequently used scale to measure anxiety was the STAI scale. Due to its broad range, the magnitude of individual benefit for educational intervention appears to be small. Patients with a higher medical burden, higher baseline anxiety levels, and lower levels of social support may benefit more from the educational intervention. (Lloyd, Verma, & Crane, 2026)

In one systematic review, the groups of patients who received an educational intervention had shorter hospital stays, lower postoperative complication rates, fewer in-hospital falls, and a lower incidence of dizziness during patient-controlled analgesia (PCA). Some studies also observed a reduction in anxiety and negative emotions, and even a reduction in the level of pain experienced. Its consequences may vary depending on the type of surgical procedure. (Brodersen et al., 2023)

Psychological preparation and mind–body interventions

Another intervention method is CBT, which aims to strengthen adaptive behaviors and prevent maladaptive behaviors while simultaneously changing the patient's abnormal beliefs and cognitions. The therapy can be delivered through the exposure and cognitive therapy.

A 10-week intervention has been observed to reduce anxiety in patients undergoing bariatric surgeries. (Wang et al., 2022)

One meta-analysis observed a possible reduction in the level of preoperative anxiety and postoperative pain in the patients who received hypnosis before general anesthesia for breast cancer surgeries. The goal of hypnosis is to change the patient's perceptions, emotions, thoughts, sensations, or behavior through direct or indirect cues. It can alter pain perception and thus increase patients' ability to control the pain. In the analyzed studies, hypnosis was used for between 2 and 20 minutes. The results observed for anxiety was $MD = -2.79$ (95% $CI: (-3.93) - (-1.65)$; $p < 0.00001$; $I^2 = 96\%$) while for the pain $MD = -1.25$ (95% $CI: (-1.64) - (-0.86)$; $p < 0.00001$, $I^2 = 93\%$). No effect on the incidence of postoperative nausea and vomiting or on the duration of surgery was demonstrated. (Zeng, Wang, Cai, Wu, & Zhou, 2022)

Physical interventions

A comprehensive review demonstrated the effectiveness of the massage of both hands, feet, and back on reducing preoperative anxiety. The combined useage of massage and music demonstrated greater effects than the intervention alone. The massage requires trained personnel and appropriate equipment. Some patients are excluded from this intervention due to hypersensitivity to massage oils, coagulation disorders, acute coronary syndrome, or pregnancy. (Wang et al., 2022)

One meta-analysis demonstrated the effectiveness of a 10- to 30-minute acupuncture session performed on the day of the surgery in reducing preoperative anxiety. Acupuncture is defined as the therapeutic needling the patient's skin at specific points using needles, beads, or balls. (Wang et al., 2022)

It was not proved that relaxation exercises reduce anxiety. However, it can potentially shorten the time to return of intestinal peristalsis and reduce opioid consumption. The exercises should be performed for approximately 15–20 minutes and repeated once or twice a day before and after the surgery. They involve focusing attention through progressive muscle relaxation or imagery. (Tse et al., 2026)

Sensory and comfort-based interventions

The musical intervention, understood as listening to music administered by the medical staff, distracts patients from the stressful aspects of their upcoming procedure, replacing them with a pleasant musical stimulus. Stress reduction also occurs through inhibition of the sympathetic nervous system, reduction of neuromuscular arousal, and adrenergic activity. This intervention should meet the psychological and physiological needs of different patients. The meta-analysis of studies using the STAI-S scale showed lower levels of preoperative anxiety in patients who received the musical intervention compared to those who did not - MD = -5.20, 95%CI = (-6.32) – (-4.07), $I^2 = 49\%$. The highest effectiveness was observed with the interventions lasting longer than 20 minutes. Patients under the age of 60 appeared to derive greater benefits than older patients. Also in patients who underwent 2 musical interventions, the reduction of preoperative anxiety turned out to be greater. The most common musical intervention was a one-time one, on the day of the surgery, lasting approximately 20 minutes. The most frequently chosen genre was classical music, played to the patients on headphones. (Yang et al., 2025)

Aromatherapy, administered through inhalation, massage, bathing, oral administration, or skin absorption, can also be effective in reducing preoperative anxiety. The most commonly used scented essential oils include lavender, citrus species, and rose. Its undoubted advantage is that it eliminates the need of additional equipment or the need of licensed experts, thanks to its ease of use. (Wang et al., 2022)

Virtual Reality intervention

The use of VR in the prevention of preoperative anxiety would involve mounting a 360° view display on the patient's head, along with a gyroscope for movement tracking. This would create an immersive environment, engaging patients in calming scenes during their hospitalization. The images shown to patients, such as beaches, forests, or waterfalls, accompanied by soothing music, had a relaxing effect by engaging their senses. VR can also be used in the educational interventions, guiding patients through all the stages of treatment, expanding their knowledge and facilitating adaptation. (Alimonaki et al., 2025)

In systematic review the length of a VR session was usually 10 to 15 minutes. Among 2,354 patients, only 11 interventions were discontinued due to headaches, dizziness, nausea, claustrophobia, eye fatigue, eye pain or blurred vision. Most of the analyzed studies (25 out of 29) indicated the effectiveness of VR interventions in statistically significant reduction of preoperative anxiety. In the reviewed study, the most frequently used scales to measure anxiety were the Visual Analog Scale (VAS), STAI, APAIS and HADS. (Alimonaki et al., 2025) In one RCT, with 74 participants undergoing elective surgeries, patients underwent an 8-minute VR intervention in which they explored an operating room, simulating the entire perioperative process. As a result preoperative anxiety levels in surgical patients decreased both after the intervention ($\beta = -5.46$; 95% CI = -7.60 – (-3.32); $p < .001$) and before the surgery ($\beta = -5.57$; 95% CI = (-7.73) – (-3.41); $p < .001$), compared to the control group. No effect of this intervention on postoperative pain or length of hospitalization was observed. (Chiu et al., 2023)

Neurosurgical patients

The non-pharmacological methods for reducing preoperative anxiety, such as acupuncture, virtual reality, or music therapy, could be effective in neurosurgical patients. Skin surface warming has not demonstrated to have any influence. The information provided to the patients during a conversation with a doctor (surgeon or anesthesiologist) before the surgery has reduced anxiety, although the effectiveness of this intervention may be insufficient. (Oteri et al., 2021)

Discussion

Preoperative anxiety can significantly reduce preoperative quality of life and cognitive performance. It has been shown to be correlated with poorer physical and emotional functioning, impaired memory and attention, as well as higher level of fatigue. After the surgery, prior anxiety may continue to impact patients' daily lives, including reduced quality of life, symptoms of depression, or increased physical disability. (Oteri et al., 2021)

The increased usage of propofol and other drugs used by an anesthesiologist results in side effects such as the risk of respiratory depression and hypotension. Preoperative anxiety is associated with prolonged recovery time from anesthesia and the time of the readiness for being discharged from hospital. Combined with a longer hospital stay it involves a greater financial outlay per patient. (Shebl et al., 2025) Anxiety has also been shown to have a small effect on the length of recovery. (Turan & Dönmez, 2026)

The increased risk of pain in the short postoperative period and CPSP may occur with patients' higher need for painkillers, which increase the risk of adverse effects associated with their useage. The differences in follow-up periods between individual studies prevent generalized conclusions. Standardized studies are necessary, including those regarding the type of the surgery, which may influence anxiety and pain. Confounding factors, such as differences in anxiety susceptibility in different risk groups, should also be considered. (Bakker-Bons et al., 2025) (Chung et al., 2025) (Oteri et al., 2021)

Preoperative anxiety is suggested to be a presumable precipitating factor of POD. Anxiety may be associated with the migration of inflammatory cytokines and their induction of neuroinflammation, as well as with higher glucocorticoid concentration or sleep disturbance. These factors may contribute to the development of delirium. The dichotomous analyses showed a significant association between preoperative anxiety and POD, while the studies examining anxiety scale scores as a continuous variable did not confirm such an association. The results suggest that the classification of a patient as anxious by a specific threshold, rather than a continuous increase in anxiety scores alone, may have prognostic significance. (Yang et al., 2023)

Some of these studies has moderate or high heterogeneity which suggest significant methodological and clinical differences between studies. These results should be interpreted with a great caution. Further research on these relationships is necessary due to the limited research, various tools for measuring anxiety, wide patient population and the amount of different surgical procedures. (Shebl et al., 2025) (Bakker-Bons et al., 2025) (Yang et al., 2023)

The quality of doctor-patient communication is particularly important in reducing preoperative anxiety, as clear information sharing and shared decision-making increase the sense of control over treatment and reduce preoperative anxiety. In preoperative practice, it seems reasonable to standardize the basic elements of the patient assessment, with the possibility of adapting them to the type of the surgery. This assessment can also be conducted before hospital admission, for example, by telephone, especially in the day of the surgery. It helps reduce anxiety and reduce the number of procedure cancellations. What is more it improves patients' satisfaction. Health education tailored to the individual patient's needs is also a crucial element of preparation. Not all patients expect the same amount of information, so on-demand education should be preferred. Multimedia tools can increase the accessibility of educational content and more effectively alleviate anxiety. Due to the fact that anxiety typically intensifies immediately before surgery, optimizing preparation during this period is crucial. (Sui et al., 2026)

There was a noticeable difference in the level of detail provided during the educational intervention across studies. The most common topics covered pre- and postoperative physical activity, respiratory therapy, nutritional counseling, motivation, and stress reduction. Education was largely delivered individually, face-to-face, online, or by telephone. Nurses were most often responsible for the preoperative education. The studies also differed in the timing of the educational intervention - it was conducted from several days to several weeks before the surgery. There are no clearly defined criteria of implementing such an intervention that would ensure the durability and comparability of its outcomes. Patient education is a component of multimodal treatment, therefore the results of the effectiveness its usage should be interpreted with caution, taking into account the influence of other factors on reducing preoperative anxiety. (Brodersen et al., 2023)

Promising suggestions for the effectiveness of CBT, hypnosis and physical interventions are also emerging. It is necessary to conduct further research to clarify the effectiveness of the intervention and its implementation, as well as to address the issue of high heterogeneity (Wang et al., 2022) (Zeng et al., 2022) (Tse et al., 2026) Preoperative massage can have many benefits, including reducing anxiety levels. Soft tissue massage promotes relaxation, reduces muscle tension. Moreover, it can block pain transmission from peripheral receptors and increase circulation, facilitating the removal of irritants from soft tissues, supporting

their regeneration. (Wang et al., 2022) The high heterogeneity of the studies suggests the need of cautious interpretation of the results and the need of further, well-designed studies with clearly defined anxiety measurement times, uniform assessment tools, and precise descriptions of the interventions. (Tse et al., 2026)

The effectiveness of influencing the patients' senses in relieving stress should be used in clinical practice due to the simplicity of implementation and almost no additional costs. (Yang et al., 2025) (Wang et al., 2022)

The Virtual Reality intervention is a promising element of the preoperative treatment. The exposure in a controlled setting carries a low risk of adverse events and can reduce patient anxiety by educating them about the entire process, allowing them to explore the operating room. Participants exposed to this intervention were better prepared for the entire perioperative process. Its effectiveness is also related to the distraction from stressful stimulus, reducing their current anxiety levels. Caution should be exercised in patients with a history of epilepsy, mental illness and with implanted cardiac pacemakers. (Chiu et al., 2023)

Much of the research focuses on anxiety immediately before the surgery, nonetheless it is also important to consider anxiety experienced even weeks before the procedure. A prior assessment of anxiety levels allows the intervention at an early stage and increases the chances of success. (Wang et al., 2022) Medical personnel should devote more attention to recognizing preoperative anxiety and implementing interventions to alleviate it. Patients who act out of fear are less cooperative and may even refuse surgical treatment. (Sui et al., 2026) Pharmacological treatment is associated with the side effects such as postoperative nausea and vomiting, risk of delirium, prolonged length of stay or irritation of mucosal membranes while non-pharmacological techniques are almost devoid of side effects. (Chiu et al., 2023) Non-pharmacological treatment techniques should be widely introduced into clinical practice, tailored to individual patients, after the professional assessment made by medical staff. (Sui et al., 2026)

Conclusions

These findings suggest that assessing and reducing preoperative anxiety may have clinical significance for anesthetic planning, analgesic management, postoperative pain control, delirium risk and recovery after the surgery. However, several analyses showed high heterogeneity, indicating that the strength of this association varied across studies.

Due to the small number of studies conducted and the lack of standardization of some results, there is a lack of specific data determining the size of the effect. Further research is needed to establish clear standards for detecting, measuring, and preventing preoperative anxiety, as well as its impact on perioperative outcomes. This research should be conducted on larger numbers of patients, in subgroups appropriately adjusted for risk factors and the type of surgery, and using standardized anxiety measurement methods.

Non-pharmacological methods show promising effectiveness in relieving stress, especially preoperative counseling, musical intervention, hypnosis and VR intervention, and should be widely used in surgical patients. The beneficial financial impact is cumulative – most of non-pharmacological methods do not require large financial outlays, and reducing patients' anxiety will offset its high-cost effects.

Author's contribution:

Conceptualisation and Methodology: Agata Agnieszka Cieřlik, Mateusz Gąbka

Software: Magdalena Cieřlik-Porębska, Jadwiga Pelc

Check: Agata Cieřlik, Agnieszka Cichocka, Magdalena Cieřlik-Porębska

Formal analysis: Agata Agnieszka Cieřlik, Agnieszka Cichocka

Investigation: Jadwiga Pelc, Magdalena Cieřlik-Porębska

Resources: Mateusz Gąbka, Agata Cieřlik, Agnieszka Cichocka

Data curation: Magdalena Cieřlik-Porębska, Mateusz Gąbka, Jadwiga Pelc

Writing-rough preparation, review and editing: Agata Agnieszka Cieřlik, Mateusz Gąbka, Magdalena Cieřlik-Porębska, Agnieszka Cichocka, Jadwiga Pelc, Agata Cieřlik

Visualisation: Agnieszka Cichocka, Agata Cieřlik

Supervision: Agata Agnieszka Cieřlik

Project administration: Agata Agnieszka Cieřlik, Mateusz Gąbka, Jadwiga Pelc

All authors have read and agreed with the published version of the manuscript.

Funding Statement: The study did not receive special founding.

Conflict of Interest Statement: The authors declare no conflicts of interest.

REFERENCES

1. Alimonaki, E. C., Bothou, A., Diamanti, A., Deltsidou, A., Paliatsiou, S., Karampas, G., & Kyrkou, G. (2025). Management of preoperative anxiety via virtual reality technology: A systematic review. *Nursing Reports*, 15(8), 268. <https://doi.org/10.3390/nursrep15080268>
2. Bakker-Bons, M., Hijmering, R. M. J., Soer, R., & Wolff, A. P. (2025). The association between preoperative anxiety and chronic post-surgical pain after general anaesthesia, a systematic review and meta-analysis. *BJA Open*, 16, 100487. <https://doi.org/10.1016/j.bjao.2025.100487>
3. Brodersen, F., Wagner, J., Uzunoglu, F. G., & Petersen-Ewert, C. (2023). Impact of preoperative patient education on postoperative recovery in abdominal surgery: A systematic review. *World Journal of Surgery*, 47(4), 937–947. <https://doi.org/10.1007/s00268-022-06884-4>
4. Chiu, P. L., Li, H., Yap, K. Y. L., Lam, K. M. C., Yip, P. L. R., & Wong, C. L. (2023). Virtual reality-based intervention to reduce preoperative anxiety in adults undergoing elective surgery: A randomized clinical trial. *JAMA Network Open*, 6(10), e2340588. <https://doi.org/10.1001/jamanetworkopen.2023.40588>
5. Chung, J., Andrusiak, J., Ali, S., Yan, E., Saripella, A., & Chung, F. (2025). Anxiety and depression in non-cardiac surgical patients and associations with adverse outcomes: A systematic review and meta-analysis. *Journal of Anesthesia and Translational Medicine*, 4(4), 207–219. <https://doi.org/10.1016/j.jatmed.2025.10.001>
6. He, M., Zhu, Z., Jiang, M., Liu, X., Wu, R., Zhou, J., Chen, X., & Liu, C. (2024). Risk factors for postanesthetic emergence delirium in adults: A systematic review and meta-analysis. *Journal of Neurosurgical Anesthesiology*, 36(3), 190–200. <https://doi.org/10.1097/ANA.0000000000000942>
7. Lloyd, A., Verma, S., & Crane, L. (2026). Preoperative education for reducing patient anxiety in elective hip and knee arthroplasty: A systematic review and meta-analysis. *Perioperative Medicine*, 15, 11. <https://doi.org/10.1186/s13741-025-00638-1>
8. Oteri, V., Martinelli, A., Crivellaro, E., & Gigli, F. (2021). The impact of preoperative anxiety on patients undergoing brain surgery: A systematic review. *Neurosurgical Review*, 44(6), 3047–3057. <https://doi.org/10.1007/s10143-021-01498-1>
9. Shebl, M. A., Toraih, E., Shebl, M., Tolba, A. M., Ahmed, P., Banga, H. S., Orz, M., Tammam, M., Saadalla, K., Elsayed, M., Kamal, M., Abdulla, M., Eldessouky, A. I., Moustafa, Y. T., Mohamed, O. A., & Aiash, H. (2025). Preoperative anxiety and its impact on surgical outcomes: A systematic review and meta-analysis. *Journal of Clinical and Translational Science*, 9(1), e33. <https://doi.org/10.1017/cts.2025.6>
10. Sui, S., Bao, L., Zhu, L., Tang, Y., Gu, S., Mi, Y., Han, X., & Li, L. (2026). Nonpharmacological management of preoperative anxiety in adults: A systematic review. *Journal of PeriAnesthesia Nursing*, 41(2), 446–456. <https://doi.org/10.1016/j.jopan.2025.06.009>
11. Tse, W. W. L., Sin, P. Y., Choi, K. C., & Cheng, H. Y. (2026). The effectiveness of non-pharmacological interventions on preoperative and postoperative anxiety among patients undergoing abdominal surgery: A systematic review and meta-analysis. *Worldviews on Evidence-Based Nursing*, 23(1), e70099. <https://doi.org/10.1111/wvn.70099>
12. Turan, N. E., & Dönmez, Y. C. (2026). Assessing the relationship between preoperative anxiety and postoperative recovery. *BMC Surgery*, 26, 189. <https://doi.org/10.1186/s12893-026-03589-6>
13. Wang, R., Huang, X., Wang, Y., & Akbari, M. (2022). Non-pharmacologic approaches in preoperative anxiety, a comprehensive review. *Frontiers in Public Health*, 10, 854673. <https://doi.org/10.3389/fpubh.2022.854673>
14. Yang, K.-L., Detroyer, E., Van Grootven, B., Tuand, K., Zhao, D.-N., Rex, S., & Milisen, K. (2023). Association between preoperative anxiety and postoperative delirium in older patients: A systematic review and meta-analysis. *BMC Geriatrics*, 23, 198. <https://doi.org/10.1186/s12877-023-03923-0>
15. Yang, K.-L., Detroyer, E., Niu, M.-M., Hoogma, D. F., Tian, J.-H., Rex, S., & Milisen, K. (2025). Music intervention as a strategy to reduce preoperative anxiety: An umbrella review. *BMC Anesthesiology*, 25, 410. <https://doi.org/10.1186/s12871-025-03120-z>
16. Zeng, J., Wang, L., Cai, Q., Wu, J., & Zhou, C. (2022). Effect of hypnosis before general anesthesia on postoperative outcomes in patients undergoing minor surgery for breast cancer: A systematic review and meta-analysis. *Gland Surgery*, 11(3), 588–598. <https://doi.org/10.21037/gs-22-114>