

## Article

## Non-pharmacological interventions for anxiety management in patients undergoing anesthesia (a way to preoperative caring): A narrative review

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### Abstract

**Background:** Anxiety disorders are the most common mental health problem and amongst the leading causes of disability worldwide. Patients undergoing surgery often experience varying degrees of anxiety. Management of pre-anesthesia anxiety and related factors is an essential and integral part of preoperative nursing care.

**Objectives:** The purpose of this study was to determine the anxiety management strategies for patients undergoing anesthesia focused on non-pharmacological interventions.

**Methods:** This review conducted based on searching in PubMed, Web of Science, ProQuest, Scopus, Science Direct databases and Google Scholar motor engineer using main key words Anxiety and Anesthesia and Surgery from 2000 to 2022. Comprehensive selection and screening process was used to extract information. Conventional content analysis was used for analyzing and interpreting sources that inform this literature review.

**Results:** 35 relevant articles identified inductively, were categorized into "patient-based", "healthcare providers-based" and "environment-based" interventions these strategies.

**Conclusion:** The findings of studies reviewed in the present study indicate the effectiveness of non-pharmacological modalities for management of patient anxiety, particularly preoperative anxiety. Therefore, it is recommended to consider these interventions as safe, effective and simple alternatives to pharmacological approaches for reducing patient anxiety. Patient-based interventions are the most important approach to reduce patient anxiety and nurses should be receptive for the patients' thoughts and beliefs preoperatively. The majority of studies reviewed in the present study were in this category. The care procedures performed by nurses and other healthcare staff should be based on the needs, values and preferences of patients.



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#### Application of Study Results in Preventive Care in Nursing and Midwifery:

The purpose of preventive care is to reduce and control chronic disease risk behaviors, including client anxiety. Among the interventions with executive quality, this is great importance to seek effective non-pharmacological approaches for management of per anesthesia anxiety correctly. This bring beneficial effects such as quick recovery, pain tolerance increasing, early discharge from the hospital and finally preventive care during the recovery time.

### Introduction

Experiencing anxiety before anesthesia and surgery is a widespread phenomenon [1,2]. This problem can be accompanied with a wide range of psychological and physical symptoms including cardiac dysrhythmia, hypertension, nausea, vomiting and postoperative hyperalgesia [3,4]. Patients with anxiety response poorly to anesthesia, which may increase the need for anesthetics and the risk of intraoperative awareness and other related complications [5]. Therefore, it is important to identify and manage the main causes of the problem. Various factors

including the type of anesthesia [6], fear of unknown [7], and fear of complications or outcomes can exacerbate preoperative anxiety [3]. In addition, the public perception of the risks associated with different types of anesthesia is often incorrect, which may increase anxiety in patients undergoing anesthesia [8]. Management of preanesthesia anxiety and related factors is an essential [9] and integral part of preoperative nursing care [10]. There are pharmacological and non-pharmacological approaches for management of preoperative anxiety. Traditionally, medications such as

benzodiazepines are widely used for reducing anxiety in the patients [11]. On the other hand, medical intravenous such as propofol and inhaled anesthetics as nitrous oxide are used [12]. However, such medications are associated with side effects, such as suppressing the cardiovascular and respiratory systems and lowering the central body temperature [7]. Therefore, recent researches have shifted towards the use of non-pharmacological methods that are cheap and without side effects [13], Such as cardiovascular and respiratory complications. This was reported in some studies interventions as music therapy, aromatherapy, acupressure, relaxation techniques, or educational interventions that alleviate patients' anxiety [10].

But, it is of great importance to seek effective non-pharmacological approaches for management of par anesthesia anxiety correctly, to solve the problem of patients' anxiety effectively [7,11]. This bring beneficial effects such as quick recovery, pain tolerance increasing , early discharge from the hospital and finally preventive care during the recovery time [12]. The purpose of this study was to review the latest non-pharmacological interventions used for management of anxiety in patients undergoing anesthesia.

## Methods

### Search strategy and data extraction

This narrative review was carried out using relevant articles retrieved from various databases including PubMed, Scopus, Web of Science, ProQuest, Science Direct, and Google Scholar. All articles published from 2000 to 2022 were identified using relevant keywords and their appropriate synonyms. The study data were collected and analyzed from September 22, 2020 to June 1, 2022.

This searching used main key words “Anxiety”, “Anesthesia” and “Surgery” from 2000 to 2022. Search syntax in each database was modified based on its specific search strategy. Example of search syntax base on MeSH in PubMed was

mentioned; (Anxiety OR Stress OR Worry OR Concern) AND (“Spinal Anesthesia” OR Anesthesia) AND (Surgery OR “Surgical Procedures” OR Operative OR Operating Room). Search records were imported in the EndNote version 8. First, relevant titles were selected, then abstracts were retrieved, and eligible articles accessible to the full text were selected, and finally, information was extracted from the articles. This is mentioned in protocol research of study [14] After retrieving and selecting the full text of articles, other related articles that were referred to in the references of these articles, were included by snowball sampling method [15] (Figure 1).

### Selection criteria

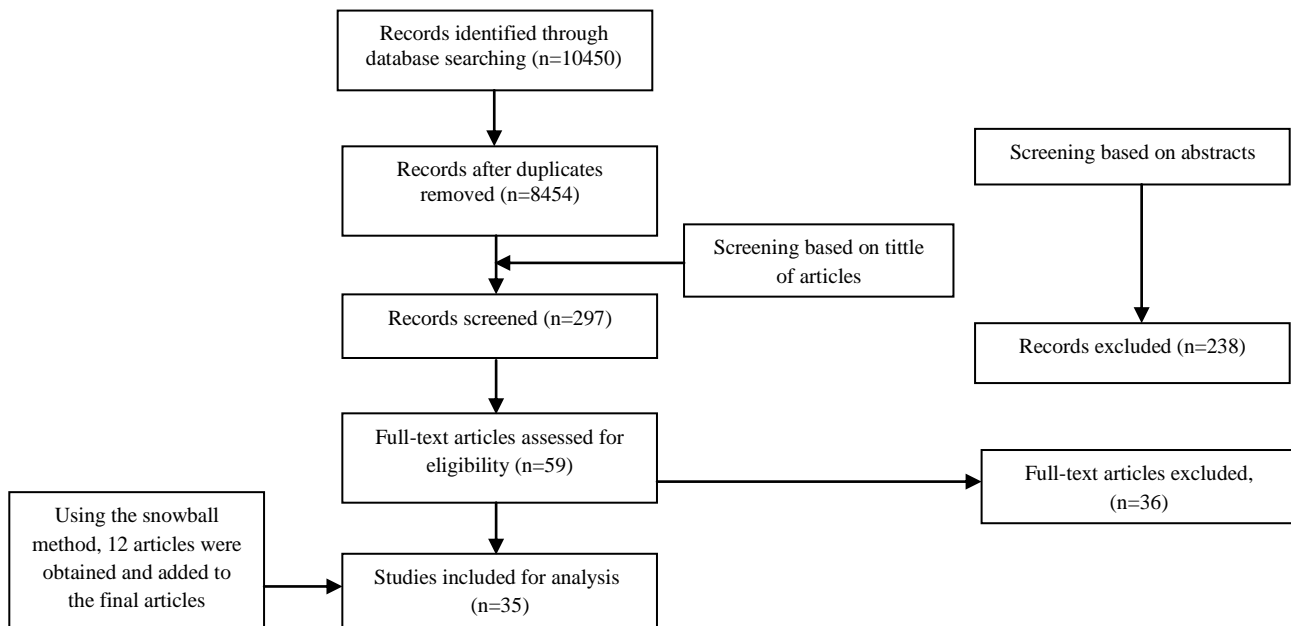
The selected articles were in English and related to non-pharmacological interventions for management of anxiety in patients undergoing surgery with regional, local or general anesthesia. Other selected criteria were including to main participants with over 18 years of age, availability of article abstract.

The excluding criteria were considered as: Non-medical sciences such as geography, computer, law and basic medical sciences such as cytology, physiology.

Overall, 35 eligible articles were included and subjected to qualitative content analysis. For the qualitative content analysis part of study, the selected articles were imported into the MAXQDA (version 10) software [16] for data extraction.

### Data analysis

The analysis was carried out based on the Lundman and Graneheim qualitative content analytical approach in three phases of preparation, organization, and reporting. In this approach, the article text is considered as a unit analysis. Considering the aim of study, meaning units and codes were extracted from the manuscripts. Similar codes were grouped into clusters and formed subcategories. By contrasting the subcategories, related of them were merged to create main categories (17).



**Figure 1: Search results and screening study**

### Quality appraisal

The Jadad scale was used to evaluate the quality of the reviewed articles. This scale is the most commonly used, providing an easy score to quantitatively assess the quality of an experiment. Randomization, blinding, and the account for withdrawals and drop-outs are the scoring items of this scale. For each item, one point is added or subtracted from an initial score (0). The score range is 5 to 5. Low quality tests result in a score of less than three [18]. The quality of the articles was verified by obtaining an average score of 3.5. The Lincoln and Guba criteria were used to ensure methodological rigor of the study [19]. To ensure credibility, prolonged engagement with data was made, such that it took a long time to analyze the data. Member check method was applied where after coding process. For dependability criteria, external audit technique was used where two external experts determined the codes and categories, and compared with each other.

### Results

Out of 35 reviewed studies, there were 23 randomized controlled trials [2,6-7,20-38] 10 quasi-experimental studies [11,12,39-46], one experimental study [47], and two empirically-based interventions [48,49].

### Qualitative data analysis

In the conventional content analysis, 1154 open codes, 12 subcategories, and three main categories were extracted. An overview of the main categories and subcategories were mentioned in our protocol study [research number of 111336] [14].

#### Category 1: Patient-based interventions

##### Subcategory 1-1: Patient education

It is well-established that the lack of knowledge about anesthesia and the role of the anesthesiologist can cause fear and anxiety in patients. For this purpose, studies reported that providing basic information to patients about the anesthesia process before surgery improved patients' knowledge of anesthesia [11] and reduced pre-anesthesia anxiety [40]. In another study, familiarizing patients with the operating room environment using photos had favorable effects on patient's level of anxiety [21]. In studies on patients undergoing spinal anesthesia, playing educational videos about preparation of the patient, positioning of the spinal needle as well as risks, benefits, and possible complications of spinal anesthesia reduced anxiety in the patients [22,24]. In one study patient education improved their satisfaction and knowledge but did not reduce surgical anxiety [11]. Nevertheless, the quality of knowledge transfer depends on the type

of information, patient motivation, and patient's literacy [24].

#### Subcategory 1-2: Music therapy

Music therapy refers to the clinical use of music in order to lower stress level and improve mood. Music is capable of diverting attention from negative stimuli to pleasant emotions and bringing entertainment in people's lives [50]. The use of music therapy dates back to the 6th century BC. A soothing rhythm and melody helps people experience a calm environment and better tolerate stressful situations. A study reported that music therapy using patients' preferred genres through a speaker reduced anxiety and controlled clinical parameters under spinal anesthesia [28]. Other studies also reported that listening to music via headphones in the waiting room had positive effects on pre- and post-operative stress [7,26,28, 31]. However, it is advised to consider patients' preferences, acceptance, as well as religious and cultural beliefs for music therapy. It has been reported that a sound tone of about 30 dB is acceptable, and the duration of listening to music should be adjusted according to the patient's preferences [7].

#### Subcategory 1-3: Psychological support and counseling

Human health can be generally affected by emotional, psychosocial, psychological and behavioral aspects. Motivational interviewing is a type of patient-centered counseling method that aims to discover the causes of anxiety and to control unhealthy behaviors or habits. This approach enhances patient's motivation to change, help them to understand their current and future problems and increase the potential of self-efficacy [25]. Guided imagery is another simple relaxation technique that has been recommended as a standard complementary care. This approach invokes imagery that create a sense of calm, happiness, peace, positive thinking and security in the patients [32]. Based on the results of previous studies, psychological support interventions are effective for reducing anxiety in patients undergoing anesthesia [25,32].

Preoperative counseling is an essential element of anesthesia care that can be integrated in the clinical evaluation process by an anesthesiologist [20]. Based on the findings of studies, preoperative nursing visit is a safe and effective method for counseling patients before anesthesia,

which provides an opportunity to collect data for better management and education of patients undergoing surgery [43].

#### Subcategory 1-4: Touch therapy

Touch is an important non-verbal nursing communication skill that conveys empathy. Holding hands, with its soothing effect, reduces anxiety and creates a sense of security. In fact, holding hands represents physical attendance and nurse's willingness to care for and support the patient. Physical gestures like holding the patient's hand are integral parts of complementary nursing therapies [41]. It has been reported that holding hands of patients during surgery for 15 minutes could reduce anxiety levels [42]. Holding hands accompanied with verbal presentation of information during a surgical intervention can further reduce psychological anxiety. It can also improve the patient-healthcare provider relationship as well as the possibility of successful treatment plan [44]. Although most studies have indicated the positive effects of such interventions on patients anxiety [27,41, 44], one study reported that intraoperative hand holding had no significant impact on anxiety and physiological parameters among patients undergoing cataract surgery [42].

Acupressure is another simple, non-pharmacological method of managing anxiety in patients undergoing surgery. Acupressure practitioners use sharp objects or their fingers to apply pressure to specific areas of body called acupoints. Due to the non-invasive and non-pharmacological nature of this technique, the use of acupressure to reduce complications of diseases are becoming increasingly popular worldwide. Acupressure at Yintang points between the eyebrows, HE-7 points at the ulnar end of the transverse crease of the wrist, and in the small depression between the pisiform and ulnar bones can effectively control perioperative anxiety in patients [27].

#### Subcategory 1-5: Aromatherapy

Aromatherapy refers to the use of essential oils as a complementary therapeutic approach. Essential oils are often inhaled or applied via skin massage. In this regard, a study reported that aromatherapy using Rosa damascene Mill inhalation significantly reduce preoperative anxiety in patients [2]. Similarly, another study indicated that inhalation aromatherapy using lavender

essential oil can reduce preoperative anxiety in patients [12].

**Subcategory 1-6: Diversional therapy intervention**  
A novel approach to control perioperative patients' anxiety is diversional therapy that distracts the focus of attention from a dangerous situation. Screen glasses is an innovative diversional therapy using enabling patients to receive images taken from a computer or mobile phone through lenses close to eyes and headphones. It has been reported that using screen glasses during surgery can reduce anxiety and create a more relaxed mood in patients under local anesthesia [45]. The use of virtual reality application and outdoor screens presentation (as beach or garden) and slow-motion natural scenes of animals, sea or rivers could reduce intraoperative anxiety in patients under spinal anesthesia [29,39].

**Subcategory 1-7: Patient companion's support**  
A study reported that educating patients' companions has a significant positive effect on patients' anxiety level [30]. Generally, the stress level is highest when family members are in the surgical waiting room expecting news of their loved ones' surgery outcome. Informing patients' companions in the waiting room about potential postoperative conditions using audio-visual sources strengthen their cooperation and confidence in the provided care. Therefore, care should be provided not only to the patient but also to those accompanying the patient [30].

**Subcategory 1-8: Orientation tour**  
Presence in an unfamiliar environment and waiting for surgery can cause patient anxiety. In this regard, two studies demonstrated that carrying out patient orientation tours in the operating room decreases preoperative anxiety [6, 35].

### **Category 2: Healthcare providers-based intervention**

**Subcategory 2-1: Changing the behavior of the healthcare providers**

Behavior of the healthcare providers plays a major role in non-pharmacological management of patients' physiological parameters and anxiety.

Findings of studies in this subcategory reported that changing healthcare providers' behavior through educational interventions could positively influence patients' anxiety and pain undergoing surgery [48,49].

**Subcategory 2-2: Music therapy for healthcare providers**

Healthcare providers are almost constantly exposed to multiple stress factors including: long working hours and fear of disease exposure, which can lead to burnout and consequently increase anxiety in patients. Therefore, preventive measures should be taken to help healthcare professionals cope with stress. In this regard, music therapy has been proven to be a simple and effective method of reducing occupational stress and risk of burn-out in operating room staff [46].

**Category 3: Environment-based intervention:**  
Subcategories of "environment art therapy" and "utilization of nature plants" created this category.

**Subcategory 3-1: Environment art therapy**  
Ideally, the environment surrounding patients in healthcare settings should be designed in a way to create a pleasant, quiet and patient-friendly space for patients [51]. Environmental factors may also affect anxiety, stress response, sleep quality and pain tolerance. Frequent interruptions, noise and intense light were considered as environmental factors affecting the psychological components of patients undergoing surgery. To address this issue, a study reported that the use of colors and cheerful design in patient rooms can positively affect patient recovery after total hip or knee arthroplasty [33].

**Subcategory 3-2: Utilization of nature and plants**  
A study indicated that viewing plants during the recovery period was significantly associated with health outcomes of surgical patients. Moreover, using ornamental plants in hospital rooms had positive physiologic and psychological implications, ultimately reducing pain and anxiety while improving patient satisfaction (34). Table 2 summarizes the details of all studies reviewed in the present study.

Table 1: Details of the studies reviewed in the present study

Categories	Subcategories	Author Year-Country	Purpose	Method	Number of participants [Type of anesthesia]	Population	Intervention	Tools	Findings
Patient-based interventions	Patient education	Lemos <sup>[21]</sup> [2019- Brazil]	To investigate the effects of preoperative education on the level of anxiety of cancer patients undergoing surgery	Randomized Clinical trial	N=72 [GA*]	Patients who endometrial cancer and were scheduled to undergo a total abdominal hysterectomy and bilateral adnexectomy	Comprehensive information education	Beck anxiety inventory	Educating patients before surgery reduced preoperative anxiety
		Cakmak <sup>[24]</sup> [2018- Turkey]	To investigate the effect of video-based education on anxiety and satisfaction in patients undergoing spinal anesthesia	Randomized, prospective trial	N=198 [RA**]	Patients undergoing oncological surgery	Video-based education	Self-reported State-Trait Anxiety Inventory	Video-based education reduced patient anxiety
		Uysal <sup>[40]</sup> [2017- Turkey]	To achieve the effect of informative leaflet on preoperative patient anxiety and knowledge of anesthesia and anxiety	Semi-experimental pretest/Posttest design	N=815 [Not reported]	Patients admitted to an anesthesia clinic	Informative leaflet education	Demir knowledge and anxiety tool [2009] .[56]	Preoperative information booklet improved patients' knowledge about anesthesia and reduced anxiety
		Jlala <sup>[22]</sup> [2010- UK]	To determine the effect of preoperative multimedia information on anxiety in patients undergoing regional anesthesia	Randomized Clinical trial	N=110 [RA]	Patients undergoing hand surgery knee or ankle surgery	Video based education	The Spielberger State-Trait Anxiety Inventory and visual analog scale	Multimedia information reduced postoperative anxiety
		Dias <sup>[23]</sup> [2017- India]	To compare the effect of a video on perioperative anxiety in patients undergoing spinal anesthesia	Randomized controlled trial	N=200 [RA]	Reported only elective surgery	Video based education	The Spielberger State-Trait Anxiety Inventory Physiological parameters measurement tool	Multimedia information reduced postoperative anxiety
		Ortiz <sup>[11]</sup> [2015- USA]	Investigating effect of educational content on anesthesia for patients	Pretest/Posttest design	N=387 [Not reported]	Patients who preoperative clinic	Booklet education	Self-report researcher-made questionnaire	Patient training booklets improved patient satisfaction and knowledge of the surgical procedure but did not reduce surgical anxiety.
		Psychological support and counseling	Akhlaghi <sup>[20]</sup> [2020- Iran]	Determining the effect of anesthesia counseling on reducing anxiety in patients undergoing maxillofacial surgery	Randomized clinical trial	N=250 [Not reported]	Candidate patients for laparoscopic cholecystectomy	Nursing visits	Spielberger State-Trait Anxiety Inventory

Music and sound therapy	Sadati <sup>[43]</sup> [2013- Iran]	To investigate the effects of preoperative on anxiety and postoperative complications	Semi-experimental, randomized Clinical trial	N=100 [GA]	Patients with maxillofacial surgery	Anesthesia counseling	The Spielberger State-Trait Anxiety Inventory Physiological parameters tool	Nursing visits had a positive effect on reducing patients' anxiety
	Medina-Garzón <sup>[25]</sup> [2019- Colombia]	To determine the effectiveness of nursing intervention, based on the motivational interview, to reduce preoperative anxiety	Preventive type controlled Randomized clinical trial.	N=56 [RA]	Candidate patients for knee joint replacement surgery	Motivational interview	Amsterdam Preoperative Anxiety and Information Scale	Motivational interviewing reduced postoperative anxiety
	Acar <sup>[32]</sup> [2019- Turkey]	To determine the effects of applied guided imagery on nausea, satisfaction, and anxiety	Randomized Controlled Study	N=60 [GA]	Patients with Hemorrhoids, Laparoscopic cholecystectomy, Femoral hernia, Umbilical hernia, Appendectomy, Inguinal hernia ,Pilonidal sinus Benign breast tumor, Ileus	Guided imagery	Visual Analog Scale Physiological parameters and satisfaction measurement tool	Guided imagery reduced postoperative anxiety and pain, and improved patient satisfaction
	Hepp <sup>[28]</sup> [2018- Germany]	To investigate the influence of music during the caesarean section on anxiety and stress of the mothers	Controlled, randomized study	N=304 [RA]	Caesarean section candidates	Music therapy	State-Trait Anxiety Inventory, anxiety visual analogue scale, Physiological parameters measurement tool	Music intervention reduced patient anxiety
	Wen-Ping Lee <sup>[7]</sup> [2017- Taiwan]	To explore the effects of listening to music on the anxiety levels and physiological responses of surgical patients receiving spinal anesthesia	Experimental design Randomized Controlled Study	N=100 [RA]	Patients with Rectal, Urological, Orthopedic, Trauma, Gynecological surgery	Music therapy	State-Trait Anxiety Inventory	Listening to music in the recovery room reduced anxiety levels in patients undergoing regional anesthesia.
	Kukreja <sup>[26]</sup> [2020- USA]	To investigate effect of music therapy on sedation requirements, anxiety levels, and patient satisfaction in patients undergoing total knee arthroplasty under spinal anesthesia	Prospective Randomized Controlled Study	N=57 [RA]	Patients undergoing total knee arthroplasty	Music therapy	State-Trait Anxiety Inventory	Patients' anxiety levels were significantly lower in the intervention group
	Choubsaz <sup>[32]</sup> [2018- Iran]	To compare the effect of ear plug and music in reducing anxiety in patients undergoing elective cesarean section under spinal anesthesia	Randomized, single-blind, prospective study	N=60 [RA]	Caesarean section candidates	Music therapy	The Spielberger State-Trait Anxiety Inventory	There was a significant difference between the mean anxiety scores in the music intervention and control groups
	Zulkifli <sup>[52]</sup> [2022- Malaysia]	To evaluate the listening to Quran and nature sounds on preoperative anxiety	Experimental study	N=81 [Not reported]	Not reported	Listening to Quran and nature sounds	State-Trait Anxiety Inventory	Listening to Quran or nature sounds were effective in reducing preoperative anxiety, however found no significant difference

Touch therapy	Jung-Soon Moon <sup>[41]</sup> [2001- Korea]	To assess the effectiveness of holding hands on the anxiety of patients undergoing planned cataract surgery under local anesthesia	Untreated control group design	N=62 [LA***]	Patients undergoing cataract surgery	Holding hands	Anxiety Visual Analogue Scale, Interview	Holding hands significantly reduced patients' anxiety
	Anuja B.S <sup>[42]</sup> [2014- India]	To explore the pre-operative anxiety level of patients undergoing cataract surgery and the effectiveness of hand holding on anxiety and physiological parameters	Quasi experimental pre-test post-test control group design	N=54 [LA]	Patients undergoing cataract surgery	Holding hands	Anxiety visual analogue scale, hand holding scale Physiological parameters measurement tool	There was no significant difference in postoperative anxiety between the two groups. However, the intervention reduced blood pressure and heart rate
	Bong-Hee Kim <sup>[44]</sup> [2015- Korea]	To evaluated the effects of holding hands and spoken information provided on the anxiety of patients undergoing percutaneous vertebroplasty under local anesthesia	Quasi-experimental design with a nonequivalent control group	N=94 [LA]	Patients undergoing percutaneous vertebroplasty	Holding hands	Amsterdam preoperative anxiety and information scale, Physiological parameters measurement tool	The intervention significantly reduced anxiety during the surgery.
	Abadi <sup>[27]</sup> [2018- Iran]	To evaluate the effects of acupressure on anxiety in patients preparing to undergo caesarian section	Randomized, single-blind clinical trial	n=60 [GA]	Caesarean section candidates	Acupressure	The Spielberger State-Trait Anxiety Inventory	Acupressure reduced the pain of patients
Aromatherapy	Dagli <sup>[2]</sup> [2019- Turkey]	To investigate the effect of aromatherapy with rose oil on preoperative anxiety	Prospective Randomized clinical trial	n=99 [GA]	Patients admitted in otorhinolaryngology clinic	Aromatherapy with rose oil	The Spielberger State-Trait Anxiety Inventory and visual analog scale	Preoperative anxiety scores reduced in patients receiving complementary rose oil aromatherapy treatment.
	Feyza Çalışır <sup>[36]</sup> [2022- Turkey]	To evaluate of lavender aromatherapy on the level of intraoperative anxiety in caesarean case under spinal anesthesia	Randomized controlled trial	N=96 [Not reported]	Patients undergoing orthopedic operations	lavender aromatherapy	State-Trait Anxiety Inventory and VAS pain	Lavender aromatherapy reduced the need for intraoperative anxiolytics
Diversional therapy Novel technology interventions	Babashahi <sup>[12]</sup> [2011- Iran]	To investigate the effects of inhalation aromatherapy on anxiety level in preoperative patients	Quasi-experimental clinical trial Study	n=72 [GA]	Patients undergoing knee arthroscopy	Muscle relaxation and the application of virtual reality	The Spielberger State-Trait Anxiety Inventory	Inhalation aromatherapy was effective in reducing anxiety levels
	Ozhanlı <sup>[38]</sup> [2022- Turkey]	to determine the effect of progressive relaxation exercises on physiological parameters, pain, anxiety, and serum cortisol levels in patients undergoing colorectal cancer surgery	Randomized controlled trial	N=63 [GA]	Patients undergoing colorectal cancer surgery	Relaxation exercises	cortisol levels biomarker assessment and hemodynamics checklist	Relaxation exercise did not affect cortisol levels and vital signs but decreased pain and anxiety, and relatively increased tissue oxygenation



Healthcare providers-based interventions	patient companion's support	Yamashita <sup>[39]</sup> [2020- Japan]	To investigate whether the use of virtual reality alleviated the anxiety felt by patients who required oral Surgery other than extractions under local anesthesia	Quasi experimental Pretest- posttest-	n=103 [LA]	Patients undergoing oral surgery under	Virtual reality	Visual analog scale	The use of virtual reality reduced intraoperative anxiety during oral surgery under local anesthesia
		Sahin <sup>[29]</sup> [2020- Turkey]	To determine the effects of intraoperative progressive muscle relaxation and the application of virtual reality on anxiety, physiological parameters , and satisfaction levels	Randomized controlled trial	n=93 [RA]	Patients undergoing maxillofacial surgery	Muscle relaxation and the application of virtual reality	The Spielberger State-Trait Anxiety Inventory, and physiological parameters measurement tool	Progressive muscle relaxation techniques and virtual software were not effective in reducing anxiety during surgery. However, it had positive effects on physiological parameters and patient satisfaction.
		Hur <sup>[45]</sup> [2016- Korea]	To verify the effects of diversional therapy targeting the patients who on the patients' anxiety and vital signs	Nonequivalent control group pretest- posttest non-synchronized design	N=60 [LA]	Patients underwent orthopedic operations		State-Trait Anxiety Inventory, Physiological parameters measurement tool	There was a slight difference between pre and postoperative anxiety levels
	Orientation tour	Hamester <sup>[30]</sup> [2016- Brazil]	To verify the effectiveness of nursing guidance provided to the families of patients in post-operative period of cardiac surgery before the first visit in the post-anesthesia care unit in decreasing anxiety levels	Randomized clinical trial	N=210 [GA]	Families of patients in post-operative period of cardiac surgery	Nursing guidance provided to the families of patients	State-Trait Anxiety Inventory, A 4-choice question about the effectiveness of the intervention	Implementing a nursing intervention helped to reduce the level of anxiety of patients companions
		Yuzkat <sup>[6]</sup> [2020- Turkey]	To investigate the effects of showing the operating room on preoperative anxiety and hemodynamics.	Randomized controlled trial	N=90 [Not reported]	Candidate patients for cholecystectomy surgery	Operating room tour	State-trait anxiety Inventory, Physiological parameters measurement tool	Operating room tour reduced patient anxiety, blood pressure scores, and heart rate
	Niknejad <sup>[35]</sup> [2019- Iran]	To explore the effects of an orientation tour on preoperative anxiety in candidates for coronary artery bypass grafting	Randomized controlled trial	N=70 [GA]	Candidates for coronary artery bypass grafting	Orientation tour	State-trait anxiety Inventory	Preoperative orientation tour reduced anxiety.	
	Changing healthcare providers behavior	Martin <sup>[49]</sup> [2011- USA]	To develop and evaluate an intervention designed to change healthcare providers and parental postoperative behaviors related to coping behaviors and stress before surgery	Empirically derived intervention	N=72 [GA]	Healthcare providers and patients family	Empirically-derived intervention, Provider-Tailored Intervention	Child Distress— Yale Preoperative Anxiety Scale, Checklist of nurses' interactions assessment instrument	There was a change in nurses, parents and doctors' behavior

	Jenkins <sup>[48]</sup> [2019- USA]	To develop and evaluate an innovative postoperative intervention on care team	empirically-based intervention	N=135 [Not reported]	Healthcare providers and patients family	Empirically-based intervention	Focus group Faces legs activity cry and consolability scale, researcher-made tool to description of the target behaviors	The intervention was effective in changing the behavior of nurses and parents after surgery.
Music therapy for healthcare provider	Kacem <sup>[46]</sup> [2020- Tunisia]	To evaluate the effects of a music therapy program on the level of stress and burnout risk among the operating room staff of urology and maxillofacial surgery	Pragmatic quasi-experimental study	N=37 [Not reported]	Operating room staff of urology and maxillofacial surgery	Music therapy program	Perceived stress scale in its version PSS-10 and the Maslash burn out Inventory	Music therapy was effective in reducing the stress of operating room staff
Environmental-based interventions	Eminovic <sup>[33]</sup> [2021- Australia]	To describe the effect of colors and art in hospital rooms on patients' recovery after total hip or knee arthroplasty.	Randomized controlled trial	N=80 [Not reported]	Patients undergoing total hip or knee arthroplasty		Hospital anxiety and depression tool, QOL assessment tool [SF 12],	The use of colors in hospital rooms improved well-being and the rehabilitation process.
	Jose L. Gomez-Urquiza <sup>[37]</sup> [2016-Spian]	To determine the effectiveness of photographic display at reducing preoperative anxiety alone and in combination with music	Randomized controlled trial	N=180 [Not reported]	Patients undergoing ENT surgery	Photographic display in combination with music	State-Trait Anxiety Inventory	Photographic display in combination with music is more effective at reducing pre-operative anxiety than the standard intervention and photographic display alone.
	Park <sup>[34]</sup> [2009- Korea]	To evaluate whether plants in hospital rooms have therapeutic effects	Randomized controlled trial	N=90 [Not reported]	Patients undergoing hemorrhoidectomy	Observing plants	State-Trait Anxiety Inventory Form Y-1, Environmental assessment scale, and the patient's room satisfaction Questionnaire.	Observing plants during the recovery period had a positive effect on health outcomes of surgical patients.

\*General anesthesia, \*\* Regional anesthesia, \*\*\* Local anesthesia, \*\*\*\* ear-nose-throat

**Discussion**

In this review, the studies on non-pharmacological methods of preoperative anxiety management were summarized under three categories of patient-based interventions, healthcare providers-based interventions and environment-based interventions. As part of the preoperative nursing care, patient-based interventions are the most important approach to reduce patient anxiety and nurses should be receptive for the patients' thoughts and beliefs preoperatively. As expected, the majority of

studies reviewed in the present study were in this category.

In this study, in the category of patient-based interventions, the most type of interventions was based on patient education. This was reported that, educational interventions about health care processes and sedation skills not only reduce patient concerns, but can also increase patient satisfaction [13]. Providing written information, despite the fact that it is an appropriate approach to inform the patient about the unknown; But not all patients can read or understand what is written,

in this context, multimedia methods are proposed as an alternative method [53]. Uysal (2017) reported that providing patients with an educational pamphlet with simple information about the anesthesiologist and anesthesia method before surgery can improve the knowledge of patients about anesthesia and reduce the fear of anesthesia and death [40]. However, Ortiz (2015) has stated in his study that in patients who are candidates for general anesthesia, teaching the patient before the surgery, despite the fact that it increased the satisfaction of the patients; But it did not affect their stress [11].

Pestana-Santos et al. (2021) assessed the effectiveness of non-pharmacological interventions, including cognitive-behavioral techniques, hypnosis, guided imagery and relaxation, in a review study including 5 articles on 420 adolescents. Santos reported that non-pharmacological interventions implemented in the pre-operative period, although there was no statistically significant difference; But by creating soothing and appropriate conditions for the patient, it helps to reduce pre-operative anxiety and can be used as a supplement to pharmaceutical interventions to create a feeling of well-being in patients [54]. Therefore, preparing the patient psychologically is very important. The healthcare providers of the operating room performs the task of evaluating and optimizing the patient before the operation and provides information related to anesthesia, the correct implementation of which can reduce the stress of patients and improve their clinical condition [55]. For this reason, health care providers should receive the necessary training to manage patients' anxiety.

The care procedures performed by nurses and other healthcare providers should be based on the needs, values and preferences of patients [10]. In this regard, it is imperative to personalize strategies to reduce anxiety for each group of patients as experience of worry and anxiety might vary in different individuals. Playing soothing scenes in the waiting area inside the operating room can caused the mental deviation of patients who were candidates for surgery and reduced their anxiety. Vogel sang et al. (2020) also mentioned this issue; that when a patient is admitted to the operating room, usually the first person to meet him is a nurse, thus it is necessary;

Greet the patient and create a calm and friendly atmosphere [56].

Providing care for patients who experience high levels of anxiety is a challenging but important aspect of nursing care. Normally, the nursing team has the closest relationship with patients compared to other healthcare professionals. Therefore, the behavior of nursing staff, particularly in the preoperative stage, will have a greater impact on the level of anxiety and fear in patients [57].

Environment-based interventions were amongst the main categories of non-pharmacological preoperative stress management interventions. The role of surrounding environment during clinical surgery may be as important as the surgery itself. Entering the operating room environment alone is a highly stressful event for most patients. From the surgical patients' perspective, operating room is a dark, cold terrifying place with overhead lights and narrow tables filled with needles and surgical equipment. Therefore, the operating room should be ideally designed to create a pleasant, calm, patient-friendly, and relaxing ambiance for the patient [51].

In the present study, this was reported that, by creating changes in the internal environment of the operating room, can make sense of relaxation in the patients and mental deviation. Jamshidi et al. (2020) in a review of 15 articles, in determining the evidence of the impact of the environment on the health outcomes of patients in the hospital reported that; The environmental factors that have influenced the patient's results were placed in several categories, the format and layout of the building, building floor materials, room characteristics, the visibility of medical equipment, the nature of lighting and music [58].

In this review study, the non-pharmacological interventions performed to manage patients' anxiety before anesthesia were not based on the actual needs of the patients, and in each study, one to two groups of interventions were implemented. It seems that the implementation of comprehensive interventions based on Identifying patients' problems help in solving the anxiety problem of patients around surgery. Therefore, deeper information and context-based interventions are required to achieve better results [59].

The following limitations of the review are identified.

For the inclusion criteria, articles were limited to English language. The review revealed a number of studies in other languages. In other hand there was no access to the full text of some articles. Therefore, some articles were not included in the study.

### Conclusion

In line with the aim of the study, three main categories including patient-based, health care provider-based and environment-based interventions were identified as non-pharmacological interventions to reduce pre-anesthesia anxiety. Therefore, it is recommended to consider these interventions as safe, effective and simple alternatives to pharmacological approaches for reducing patient anxiety and increasing patient satisfaction.

Patients who are candidates for surgery need support in various dimensions based on their needs, before the operation. One of the goals of care in these people is to prevent and reduce stressful and disturbing conditions in patients. The operating room should be designed to provide a pleasant and friendly environment. In order to create this, the operating room personnel must work as a team and factors that contribute to preoperative anxiety should be avoided, which can play an important role in preventive caring to reduce the short and long-term effects of anxiety in patients

The results of the current study showed that anxiety management interventions reduce the intensity of anxiety and thus prevent from causing physical, mental and psychological problems. The reviewed studies indicated that the intervention of the patient is of special importance. But we must keep in mind that other categories of interventions need more scrutiny and then implementation in the field.

### Ethical Consideration

This study approved in the center of ethics committee of Golestan university of medical Sciences-Iran (code: IR.GOUMS.REC.1399.230).

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ethics committee of Golestan University of Medical Sciences, Iran.

### Conflict of interest

The authors declare that there is no conflict of interest.

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### Authors' contributions:

Mahnaz Modanloo Executor of the project who guided the study and contributed specifically to the analysis plan, Solmaz Halakou (Correspondence author) Collected the literature drafted the paper, categorized the data that was modified and supplemented by all other authors. Homeyra Khoddam: consultants of project help to interpretation of extracted data in all steps of study. Nasrin Nikpeyma: consultants of project help to interpretation of extracted data in all steps of study. SeyedBabak MojaverAghili: Help to edit the primary and final study.

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