Patient Safety in Surgery

RESEARCH Open Access

Does a 30-minute introductory visit to the operating room reduce patients' anxiety before elective surgery? A prospective controlled observational study

Zeinab Asilian Bidgoli[1], Zohreh Sadat[1], Mohammadreza Zarei[2], Neda Mirbagher Ajorpaz[2*] and Masoumeh Hosseinian[1]

Abstract

Background Patients scheduled for elective surgery typically suffer from preoperative anxiety related to the unknown environment and unclear expectations. We hypothesized that a virtual or in-person introductory visit to the operating room one day before surgery may decrease the extent of preoperative anxiety by familiarizing patients and their families with the operating room environment. So, this study aimed to evaluate the impact of operating room visits, conducted both in-person and virtual reality, on patients' preoperative anxiety.

Methods This prospective controlled observational study examined patients who were candidates for general surgery in a teaching hospital in Iran. All patients aged between 18–60 years, who were undergoing general surgery between April and September 2022 and had preoperative anxiety based on the Spielberger questionnaire, were selected. Patients who had emergency surgery or were taking anti-anxiety drugs were excluded from the study. Patients were then randomly assigned to the in-person visit, virtual reality visit, and control groups. In the in-person group, individuals visited the operating room for 30 minutes on the day before surgery. In contrast, in the virtual reality group, visits were conducted via a 'live' virtual video tour of the operating room for the same duration on the day before surgery. The control group received routine care such as pre-surgery hospitalization and medication. All participants completed the Spielberger questionnaire before the intervention (the day before surgery) and again two hours before surgery. Data were analyzed using variance analysis, t-tests, and Chi-square tests in SPSS 22 software.

Results We identified 105 patients undergoing general surgery who were divided into three groups of 35 people each. The results showed that, before the intervention, there were no statistically significant differences among the three groups in terms of demographic data and preoperative anxiety ($p > 0.05$). After the intervention, the mean scores of preoperative anxiety in the in-person visit, virtual reality visit, and control groups were 52.82 ± 4.51, 54.48 ± 5.04, and 53.42 ± 4.62, respectively, with no significant statistical difference ($p = 0.33$). Furthermore, there

*Correspondence:
Neda Mirbagher Ajorpaz
salam_20012003@yahoo.co.uk

Full list of author information is available at the end of the article

was no significant difference in preoperative anxiety scores before and after the intervention in the in-person visit ($p=0.13$), virtual reality visit ($p=0.10$), and control ($p=0.33$) groups.

Conclusion A 30-minute visit to familiarize patients with the operating room environment, equipment, and staff, whether conducted in-person or virtually, does not significantly affect patients' preoperative anxiety or reduce their anxiety levels.

Keywords Operating room, Preoperative anxiety, Patient perception, Operating room visit, Patient experience

Introduction

Anxiety is a distressing mental state or sensation of helplessness associated with a threatening situation or the anticipation of an unidentified threat to oneself or others. It is the most prevalent emotion experienced by all humans. Anxiety causes stress and delays the patient's recovery [1]. Surgery is an important event for the patient and their family, and anxiety is a natural response because any type of surgery is perceived as a threat to the integrity of the body and life [2]. Prevalence of anxiety before surgery is very high [1, 2]. Ahmetovic-Djug et al. (2017) reported a prevalence of more than 60%. [3].

Anxiety begins when the patient realizes the necessity of surgical intervention and reaches its peak when he/she is admitted to the hospital. The patient may consider the surgery day as the most dangerous and scary day of his/her life. Sometimes, according to the surgeon, the surgery is postponed due to the excessive anxiety of the patient [4]. Studies indicate that if untreated anxiety persists, it has detrimental outcomes for the patient, prolonging recovery and hospital stays [3, 4]. Preoperative anxiety leads to an increase in heart rate, blood pressure, cardiac excitability, and arrhythmia. The intensity and duration of anxiety can lead to delayed wound healing, increased risk of infection, increased postoperative pain, and increased demand for painkillers [5].

Preoperative anxiety is associated with issues such as the need for higher doses of medication to induce anesthesia and postoperative analgesia, challenging intravenous access, and autonomic fluctuations. Furthermore, increased post-operative pain, nausea and vomiting, prolonged recovery, and increased risk of infection are associated with anxiety [6]. Various methods are used in different countries to reduce preoperative anxiety in patients. These methods include drug treatments, psychological counseling sessions, educational videos, visiting patients who have already undergone surgery, and playing music before surgery.

Also, familiarization of patients with the environment, staff, and equipment of the operating room is one of the proposed solutions to reduce preoperative anxiety [7]. The patient's visit to familiarize themselves with the operating room environment, devices, and staff can be conducted in two ways: in-person and through virtual reality.

The in-person method entails the individual's presence in the operating room and familiarity with its environment, staff, and equipment. Virtual reality is the use of computer modeling and simulation that enables a person to interact with an artificial three-dimensional visual or other sensory environment [8]. The results of the study by Vogt et al. (2021) showed that visiting the operating room through virtual reality does not affect reducing the anxiety of patients waiting for surgery [2].

Talai et al. (2011) concluded in their research that the patient's visit to the operating room environment and interaction with its staff one day before the surgery had little effect on reducing patients' anxiety and it was not statistically significant [8]. Simonetti et al. (2021) reported in a study that virtual reality helps reduce anxiety in children during surgery [9]. The findings of Arpag et al. (2023) showed that a patient's visit to the operating room accompanied by a nurse is effective in reducing anxiety and postoperative pain [10]. Esposito et al. (2022) demonstrated that the use of virtual reality in the form of video reduces anxiety in children who were candidates for surgery [11]. The study by Eijlers et al. (2019) indicates that employing in-person education is effective in reducing preoperative anxiety and pain. In their research, they recommended further studies in this field [12]. Given the contradictory results of studies and the high prevalence of anxiety in patients before surgery, researchers conducted a study to determine the effect of visiting the operating room using both in-person and virtual reality methods on preoperative anxiety in patients undergoing general surgery.

Methods

Study type & design

The present study was a prospective controlled observational study. This study was conducted in a specialized teaching hospital in Kashan, Iran, which has 20 operating rooms. The research population consisted of all patients who were candidates for general surgery between April and September 2022 and who met the inclusion criteria.

Participant selection

The study entry criteria included age between 18 and 60 years, having the ability to watch a video, candidates for general surgery (hernia, cholecystectomy, appendectomy,

hemorrhoidectomy, cesarean section, hysterectomy), not taking anti-anxiety drugs, and not having cognitive problems based on the Mini-mental state examination (MMSE) questionnaire. Exclusion criteria included concurrent use of complementary therapies to reduce anxiety (drug therapy, psychotherapy, etc.), non-continuation of participant cooperation, need for emergency surgery during the intervention, and cancellation of surgery for any reason.

Samples were conveniently selected from among hospitalized patients at the hospital in Kashan, Iran, who had been referred to this center for general surgery and met the study entry criteria. Then, the samples were randomly divided into intervention (in-person visit and virtual reality visit) and control groups using block randomization (10 blocks of 6) with the help of Sealed Envelope Ltd. 2017 software (www.s?al?d?nv?lop?.com).

Sample size calculation

According to Sattar et al.'s study (2021) [13], the mean anxiety score in the video education and control groups before surgery was 37.95±7.4 and 44.20±6.79, respectively. Considering a confidence level of 95% (α=0.05) and a power of 80% (β=0.2), and using the mean difference formula between the two groups, the sample size was calculated to be 21. Considering that three groups were examined, the sample size was calculated to be 27 using the formula $n' = \sqrt{K} * n$ (where k=1–3), and was rounded up to 35 people in each group to account for a potential loss of 15%.

$$n = \frac{(Z_{\alpha/2} + Z_{\beta})^2(\sigma_1^2 + \sigma_2^2)}{(\mu_1 - \mu_2)^2}$$

Intervention

Initially, the primary researcher visited the general surgery departments of the hospital in Kashan, Iran, from April to September 2022 and selected 130 patients. Of these, 16 patients did not meet the inclusion criteria, and 9 patients declined to participate in the study. Subsequently, the remaining 105 patients were randomly divided into three groups of 35 each: in-person visit, virtual reality visit, and control (Figure 1). The researcher then coordinated with the operating room supervisor at a time that did not interfere with surgical procedures. The in-person visit group was acquainted with the environment, equipment, and staff of the operating room, anesthesia devices and methods, the surgical method and its result, and nursing care after surgery for 30 minutes by being in the operating room.

The researcher then answered the patients' questions. In the virtual reality visit group, the researcher obtained permission from the operating room manager to prepare a live virtual video tour of the operating room environment, equipment, and staff and displayed it to patients in video format for 30 min on the day before surgery. This live video included all the items that the in-person group was familiarized with. After playing it, the researcher answered the patient's questions. In the control group, routine care such as hospitalization from the night before in the surgical department and drug therapy was performed. Each patient completed demographic data and Spielberger's questionnaires before intervention (the day before surgery) and then two hours before surgery in a separate room that was quiet and without any noise. The three groups were compared before and after the intervention.

Instrument

The demographic data questionnaire included age, sex, education, marital status, occupation, history of underlying disease, place of residence, type of surgery, surgical method (open, laparoscopic), and surgical history. The Spielberger's anxiety questionnaire includes 20 questions that measure situational anxiety. The items of the questionnaire are on a 4-option Likert scale: 1 being 'not at all anxious', 2 'somewhat anxious', 3 'medium anxiety', and 4 'very high anxiety'. Accordingly, each question's score is at least 1 and at most 4 points and the total score varies from 20 (minimum anxiety level) to 80 (maximum anxiety level). Scores of 20–40 are considered as low anxiety level, 41–60 as medium anxiety level and 61–80 as high anxiety level [14]. In Van Wijk et al.'s study (2014), the reliability of this questionnaire was confirmed by Cronbach's alpha coefficient of 0.90. [15]. In the present study, the reliability of the questionnaire was calculated as 0.89. The Mini-Mental Status Examination (MMSE) is an 11-item cognitive screening test that assesses awareness, registration, attention, calculation, recall, naming, repetition, and comprehension (verbal and written). Its maximum score is 30, and a higher score indicates better performance. The cutoff score is confirmed to be less than 24, with a Cronbach's alpha coefficient of 0.90 [16]. Cronbach's alpha coefficient for this scale in this study was calculated as 0.88.

Data analysis

We analyzed the data using SPSS V22 software. We assessed the normality of quantitative data using skewness and kurtosis indices, considering a range of ±2 as indicative of normal distribution. We used the analysis of variance test to compare normal quantitative variables across the specified groups, and the chi-square test to compare qualitative variables across these groups. We used a paired t-test to compare the scores before

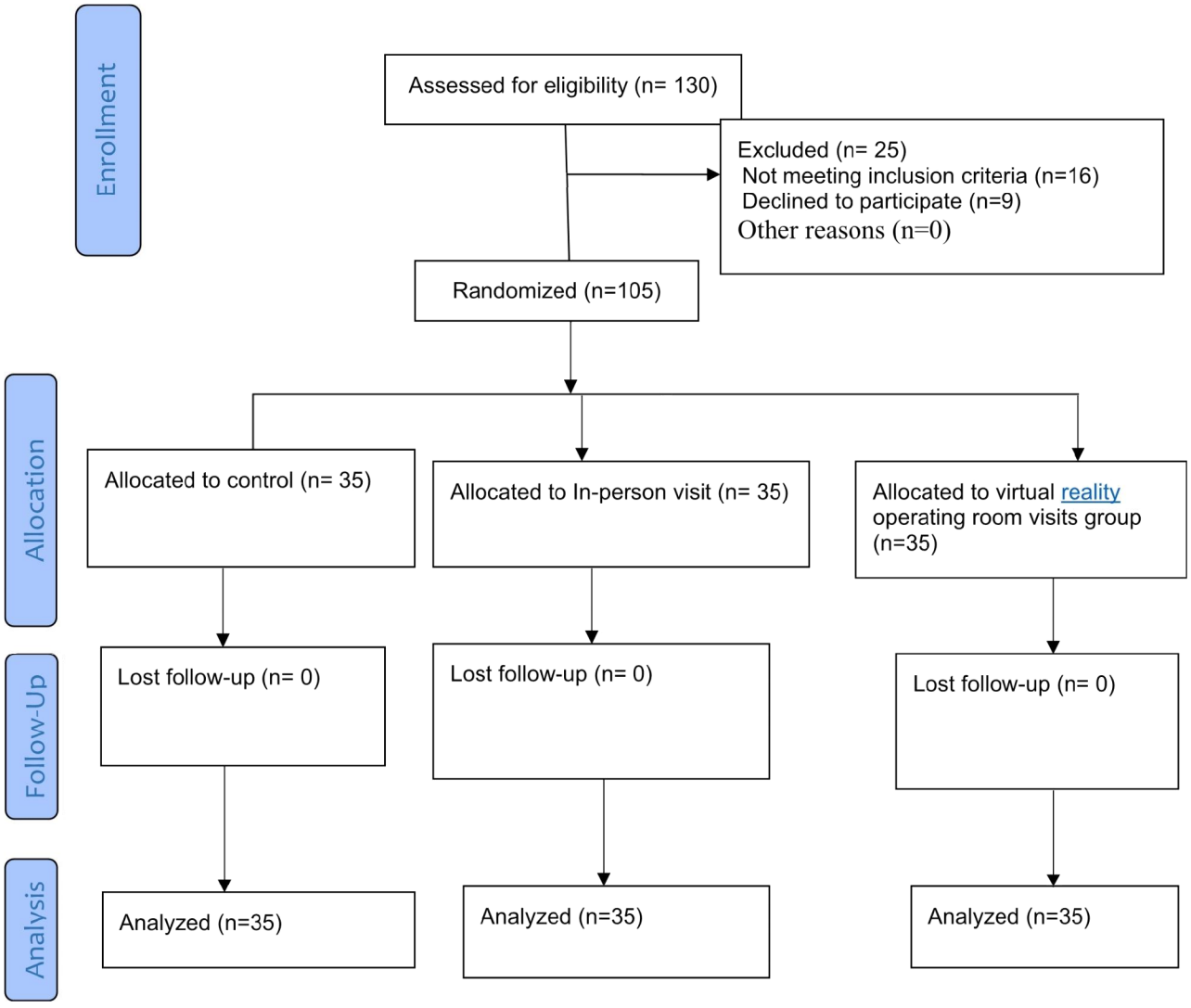

Fig. 1 Sampling flow diagram

and after the specified intervention in each group. We determined a significance level of 0.05.

Results

The results indicated that the mean age of the in-person visit group, virtual reality visit group, and control group were 41.77±13.07, 40.37±11.43, and 37.34±11.69 respectively. Also, 62.9% of the in-person visit group, 77.1% of the virtual reality visit group, and 57.1% of the control group were male. In most of the patients of the three groups, surgery was performed using the open method. There was no statistically significant difference among the three groups in terms of demographic data (age, sex, marital status, education, history of underlying disease, surgical history, type, and method of surgery) (Table 1). Additionally, the mean scores of pre-operative anxiety before the study in the in-person visit group, virtual reality visit group, and control group were 53.88±4.43, 54.80±4.63, and 55.62±4.89 respectively, with no statistically significant difference among the three groups (p=0.29). After the intervention, the mean score of anxiety in the three groups was 52.82±4.51, 54.48±5.04, and 53.42±4.62, respectively, and the three groups had no statistically significant difference (p=0.33). Also, the comparison of the mean anxiety score before and after the intervention in the in-person visit (p=0.13), virtual reality visit (p=0.10), and control (p=0.33) groups was not significant (Table 2).

Discussion

The findings of the present study showed that a 30-minute patient visit from the operating room has no significant effect on the preoperative anxiety of patients. Since surgery is a significant experience for patients and their families, it is natural for them to feel anxious [17]. In this context, various studies have noted that many patients

Table 1 D?mographic data of th? participants in th? thr?? groups

Variable		Group			p-value
		In-person visit (35 people) Number (%)	Virtual reality visit (35 people) Number (%)	Control (35people) Number (%)	
Gender	Female	13 (37.1)	8 (22.9)	15 (42.8)	* 0.05
	Male	22 (62.9)	27 (77.1)	20 (57.1)	
Education	Illiterate	4 (11.5)	3 (8.6)	4 (11.5)	* 0.16
	Diploma	9 (25.7)	7 (20)	5 (14.3)	
	Under diploma	11 (31.4)	13 (37.1)	14 (40)	
	Bachelor and higher	11 (31.4)	12 (34.3)	12 (34.2)	
Marital status	Single	9 (25.7)	7 (20)	4 (11.4)	* 0.38
	Married	26 (74.3)	28 (80)	30 (85.7)	
	Other	0 (0)	0 (0)	1 (2.9)	
Occupation	Employed	27 (77.1)	21 (60)	19 (54.3)	* 0.11
	Unemployed	8 (22.9)	14 (40)	16 (45.7)	
History of underlying disease	Yes	23 (65.7)	14 (40)	15 (42.8)	* 0.06
	No	12 (34.3)	21 (60)	20 (57.1)	
Place of residence	City	27 (77.1)	33 (94.3)	32 (91.4)	* 0.06
	Village	8 (22.9)	2 (5.7)	3 (8.6)	
Type of surgery	Hernia	5 (14.3)	7 (20)	6 (17.1)	* 0.96
	Cholecystectomy	5 (14.3)	5 (14.3)	6 (17.1)	
	Appendectomy	7 (20)	7 (20)	5 (14.3)	
	Cesarean section	6 (17.1)	5 (14.3)	6 (17.1)	
	Hysterectomy	3 (8.6)	5 (14.3)	4 (11.4)	
	Hemorrhoidectomy	8 (22.9)	7 (20)	8 (22.9)	
Method of Surgery	Open	27 (77.1)	28(80)	27 (77.1)	** 0.94
	Laparoscopic	7 (20)	8 (22.9)	8 (22.9)	
History of surgery	Yes	10 (51.4)	18 (34.3)	12 (34.3)	** 0.12
	No	25 (71.4)	23 (65.7)	23(65.7)	
Age (mean ± standard deviation)		41/77 ± 13/07	40/37 ± 11/43	37/34 ± 11/69	* 0.14

*Variance analysis test **Chi-square

Table 2 Comparison of the mean manifest anxiety in the three groups: in-person visit, non-in-person visit, and control

Variable	Group			p-value
	In-person education (35 people) mean ± SD	Virtual education (35 people) mean ± SD	Control (35people) mean ± SD	
Before intervention	53.88 ± 4.43	54.80 ± 4.63	55.62 ± 4.89	* 0.29
After intervention	52.82 ± 4.51	54.48 ± 5.04	53.42 ± 4.62	* 0.33
p-value	**P = 0.13	**P = 0.10	**P = 0.33	

*Variance analysis test **Paired t test

undergoing anesthesia and surgery experience untreated anxiety and stress on the day of surgery [17, 18]. The results of Chaudhury et al.'s study (2016) showed that 80% of patients have moderate to high levels of anxiety before surgery [19]. The results of Nazari et al.'s study (2014) showed that the stress factors of the physical environment of the operating room that cause anxiety in the individual include seeing the operating bed (24.2%) and seeing the unfamiliar environment (22.5%), seeing various unfamiliar devices in the operating room (19.2%) [20]. Therefore, it seems that the reason for not reducing the anxiety of patients in the intervention groups in this study is their encounter with these factors.

In line with this research, Vogt et al.(2021) showed that virtual reality visit to the operating room had no effect on patients' preoperative anxiety [2]. In addition, Momeni et al.'s study showed that training with a 25-minute compact disc and an educational booklet on the day before surgery has no effect on preoperative anxiety [21]. In the current study, the researcher created a live video of the operating room environment, its equipment, and staff, and showed it to the virtual reality visit group. However, in the above two studies, the video focused on the surgical technique. In their research, the operating room environment, equipment, and staff were not shown in the video.

Liguori et al. (2018) showed that an in-person visit to the operating room along with a video from the operating room was effective in reducing children's anxiety before surgery [22]. In line with the current research, the study of Talai et al. (2010) also demonstrated that patients' in-person visits of the operating room environment

and its staff and equipment on the day before surgery did not have an effect on reducing patients' anxiety [8]. One possible explanation is that as the time of surgery approaches, patients' fear of the unknown increases, leading to heightened anxiety. Also, being in the operating room and seeing scrubbed personnel and equipment intensifies surgical anxiety among them. Tu et al.'s study (2013) showed that the use of a virtual reality technique is effective in reducing patients' anxiety before bowel surgery [23]. In contrast to our findings, the study by Mirsanei et al. (2016) found that patient education through a surgical introductory video reduced patient anxiety [24]. In Mirsanei's study, education was about surgical technique and pre- and post-operative care for patients, while in the present study, education was about the operating room environment, equipment, and staff.

Although most studies suggest that patient education through new tools such as educational videos and virtual reality can significantly reduce preoperative anxiety by providing detailed information about postoperative care, step-by-step training, and frequent reviews [25], our study found that a 30-minute introductory video tour of the operating room environment, staff, and equipment did not affect patients' anxiety levels. Perhaps the reason for not becoming significant in the present study is related to each individual's personal characteristics in terms of anxiety, their culture, and the short duration of education (30 minutes on the day before surgery).

Studies state that beliefs and values, as cultural dimensions and results of life experience, can play a fundamental role in the onset, severity, and persistence of anxiety [26, 27]. The study by Bigdeli Shamloo and colleagues (2018) shows that in-person visit reduces anxiety in surgical candidates [27]. The difference between their study and the present research is in the method.

In the study by Bigdeli Shamloo et al., the training was conducted in-person and included the presentation of an educational booklet about surgical technique, anesthesia, and its complications. Additionally, the patient was visited in the intensive care unit (ICU). However, in the present study, in-person visit was conducted in the operating room. Karaveli et al. (2018) concluded that increasing patient information and awareness about the physical environment and staff of the operating room and anesthesia technique, surgery, surgical complications, and ways to manage anxiety could help reduce patient anxiety before surgery [28].

Unlike the present study, their research did not conduct training in the operating room environment. It seems that the tense environment of the operating room may be a factor in not reducing patients' anxiety in this study. In the present study, none of the methods of in-person visit and virtual reality visit had any effect on patients' preoperative anxiety. Thomas's study (2017) showed that in-person and video training can reduce anxiety in patients before abdominal surgery [29].

Wongkietkachorn's study (2018) found that in-person education reduced patient anxiety before surgery [30], a finding that isn't consistent with this research. In their research, education was not conducted in-person in the operating room environment. Instead, it was conducted in the form of face-to-face educational sessions in ward surgery, along with showing a video from surgery. It seems that seeing the environment of the operating room and its equipment before surgery can be stressful for the patient. Of course, the individual's culture and personality type also play a role.

Conclusion

A 30-minute visit to familiarize patients with the operating room environment, equipment, and staff, whether conducted in-person or virtually, does not significantly affect patients' preoperative anxiety or reduce their anxiety levels.

Acknowledgements

The researchers would like to express their deepest gratitude to the patients participating in the study, the Vice-Chancellor for Research and Technology of Kashan University of Medical Sciences and Health Services, and the Clinical Research Center of Shahid Beheshti Hospital in Kashan.

Author contributions

ZA and MZ was responsible for the study design, data collection, and drafting of the manuscript. NMA, ZS, and MH contributed to the study design, data analysis and interpretation, revisions in the manuscript draft, and study supervision. NMA also supervised the sampling process and intervention.

Funding

The present study is derived from the master's thesis of the first author, who pursued a degree in medical surgical nursing at Kashan University of Medical Sciences and Health Services. The research project received financial support from the Vice-Chancellor of Research and Technology of the University.

Data availability

On request from corresponding author.

Declarations

Ethics approval and consent to participate

The research proposal received approval from the Research and technology deputy and the ethics committee of Kashan university of Medical Sciences (code IR.KAUMS.NUHEPM.REC.1401.065). An introduction letter was obtained from the vice-chancellor of research and technology of Kashan University of Medical Sciences for referral to the hospital and sampling. Informed written consent was obtained from all participants. All research subjects were assured that personal information would remain completely confidential and that they could withdraw from the study at any time.

Consent of publication

Written informed consent was obtained from the patients to publish.

Competing interests

The authors declare no competing interests.

Author details

[1]Trauma Nursing Research Center, Kashan University of Medical Sciences, Kashan, Iran

[2]Autoimmune Diseases Research Center, Faculty of Nursing and Midwifery, Kashan University of Medical Sciences, Ghotb Ravandi Highway, Kashan, Iran

Received: 6 November 2023 / Accepted: 6 December 2023
Published online: 11 December 2023

References

1. Rosiek A, Kornatowski T, Rosiek-Kryszewska A, Leksowski Ł, Leksowski K. Evaluation of stress intensity and anxiety level in preoperative period of cardiac patients. Biomed Res Int. 2016;2016:1248396.
2. Vogt L, Klasen M, Rossaint R, Goeretz U, Ebus P, Sopka S. Virtual reality tour to reduce perioperative anxiety in an operating setting before anesthesia. J Med Internet Res. 2021;sep1(9):1–13.
3. Ahmetovic-Djug J, Hasukic S, Djug H, Hasukic B, Jahic A. Impact of preoperative anxiety in patients on hemodynamic changes and a dose of anesthetic during induction of anesthesia. Med Arch. 2017;71(5):330–3.
4. Friedrich S, Reis S, Meybohm P, Kranke P. Preoperative anxiety. Curr Opin Anaesthesiol. 2022;35(6):674–8.
5. Nikoseresht M, Hajian P, Alipor N, Babamiri M, Shirmohamadi N. The effect of anxiety before and during cesarean section on hemodynamic changes spinal anesthesia. Ibn Sina Journal of Clinical Medicine. 2017;24(4):291–8.
6. Jovanovic K, Kalezic N, Sipetic Grujicic S, Zivaljevic V, Jovanovic M, Kukic B, et al. Preoperative anxiety is associated with postoperative Complications in vascular Surgery: a cross-sectional study. World J Surg. 2022;46(8):1987–96.
7. Tola YO, Chow KM, Liang W. Effects of non-pharmacological interventions on preoperative anxiety and postoperative pain in patients undergoing Breast cancer Surgery: a systematic review. J Clin Nurs. 2021;30(23–24):3369–84.
8. Talaii A, Tofani H, Hojat K, Jamialahmadi Z. Investigating the effect of familiarizing the patient with the staff and the operating room environment the day before from tubectomy to anxiety before Surgery. Q J Fundamentals Mental Health. 2010;6(21):57–61.
9. Simonetti V, Tomietto M, Comparcini D, Vankova N, Marcelli S, Cicolini G. Effectiveness of virtual reality in the management of paediatric anxiety during the peri operative period: a systematic review and meta-analysis. Int J Nurs Stud. 2022;125:104115.
10. Esposito C, Autorino G, Iervolino A, Vozzella EA, Cerulo M, Esposito G, et al. Efficacy of a virtual reality program in pediatric Surgery to reduce anxiety and distress symptoms in the preoperative phase: a prospective randomized clinical trial. J Laparoendosc Adv Surg Tech A. 2022;32(2):197–203.
11. Arpag N, Öztekin SD. The effect of visits by operating room nurses before cardiac Surgery on anxiety and pain management. J Perianesth Nurs. 2023:S1089-9472(23)00061 – 8.
12. Eijlers R, Utens EMWJ, Staals LM, de Nijs PFA, Berghmans JM, Wijnen RMH, et al. Systematic review and meta-analysis of virtual reality in pediatrics: effects on pain and anxiety. Anesth Analg. 2019;129(5):1344–53.
13. Sattar D, Naghibeiranvand M, Adhami F, Sahebzamani M. The effect of educational video on anxiety before Surgery of patients candidates for eye Surgery by fico method. Complement Med J. 2021;11(1):44–55.
14. Abed MA, Hall LA, Moser DK. Spielberger's state anxiety inventory: development of a shortened version for critically ill patients. Issues Ment Health Nurs. 2011;32(4):220–7.
15. Van Wijk CH. The use of Spielberger's state-trait personality inventory (trait anxiety subscale) with naval subaquatic specialists. Int J Occup Med Environ Health. 2014;27(6):959–66.
16. Ansari NN, Naghdi S, Hasson S, Valizadeh L, Jalaie S. Validation of a mini-mental state examination (mmse) for the persian population: a pilot study. Appl Neuropsychol. 2010;17(3):190–5.
17. Gómez-Urquiza JL, Hueso-Montoro C, Urquiza-Olmo J, Ibarrondo-Crespo R, González-Jiménez E, Schmidt-Riovalle J. A randomized controlled trial of the effect of a photographic display with and without music on preoperative anxiety. J Adv Nurs. 2016;72(7):1666–76.
18. Le SH, Tonami K, Umemori S, Nguyen LB, Ngo LQ, Araki K, Nitta H. Relationship between preoperative dental anxiety and short-term inflammatory response following oral Surgery. Aust Dent J. 2021;66(1):13–9.
19. Chaudhury S, Saini R, Bakhla AK, Singh J. Depression and anxiety following coronary artery bypass graft: current Indian scenario. Cardiol Res Pract. 2016;2016:2345184.
20. Nazari Vanani R, Rahimi Madiseh M, Deris F. Evaluation of preoperative anxiety and stress, and ways to modify it, the patients in Kashani hospital operating room 2013. J Clin Nurs Midwifery. 2014;2(4):53–60.
21. Momeni L, Najaf Yarandi A, Haqani H. [Comparison of two methods of teaching VCD and booklets at two different times on preoperative anxiety in patients undergoing coronary artery bypass graft. Iran J Nurs. 2009;21(56):81–93.
22. Liguori S, Stacchini M, Ciofi D, Olivini N, Bisogni S, Festini F. Effectiveness of an app for reducing preoperative anxiety in children: a randomized clinical trial. JAMA Pediatr. 2016;170(8):e160533.
23. Tou W, Mah D, Karatassas A, Hewett P. Effect of preoperative two-dimensional animation information on perioperative anxiety and knowledge retention in patients undergoing bowel Surgery: a randomized pilot study. Colorectal Dis. 2013;15(5):e256–65.
24. Mirsane SA, Mirbagher AN, Shafagh SH, Aminpour J. The Effect of video and images of operating room on patients' anxiety before general Surgery: a Randomized Clinical Trial. Crit Care Nurs. 2016;2:1–5.
25. hreyas K, Jadhav A, Goel AD, Pathak M, Rathod K, Nayak S, et al. Effect of multimedia teaching tools in parental anxiety and comprehension of informed consent procedure in pediatric surgical procedures: a single centre Randomized Control Trial. J Pediatr Surg. 2023;58(10):2000–5.
26. Eberhart L, Aust H, Schuster M, Sturm T, Gehling M, Euteneuer F, et al. Preoperative anxiety in adults - a cross-sectional study on specific fears and risk factors. BMC Psychiatry. 2020;20(1):140.
27. Bigdeli Shamloo MB, Zonoori S, Naboureh A, Nasiri M, Bahrami H, Maneiey M, et al. Effect of face-to-face education on anxiety and pain in children with minor extremity injuries undergoing outpatient suturing in emergency department. Indian Pediatr. 2018;55(1):41–4.
28. Karaveli Çak ır S., Özbay ır T patient anxiety levels before and after Stoma 2018; 28:159–63.
29. Thomas M, Bruton A, Little P, Holgate S, Lee A, Yardley L, et al. A randomised controlled study of the effectiveness of breathing retraining exercises taught by a physiotherapist either by instructional DVD or in face-to-face sessions in the management of Asthma in adults. Health Technol Assess. 2017;21(53):1–162.
30. Wongkietkachorn A, Wongkietkachorn N, Rhunsiri P. Preoperative needs -based education to reduce anxiety, increase satisfaction, and decrease time spent in day Surgery: a randomized controlled trial. World J Surg. 2018;42(3):666–74.

Publisher's Note