



THE ROLE OF MULTIMEDIA BASED PREOPERATIVE EDUCATION IN IMPROVING SURGICAL OUTCOMES: A SYSTEMATIC LITERATURE REVIEW

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ABSTRACT

Preoperative education is an important part of surgical care to improve patient understanding, readiness, and engagement before surgery. The limitations of conventional educational methods encourage the use of multimedia as a more interactive educational medium. To evaluate the effectiveness of multimedia-based preoperative education in improving patient outcomes compared to conventional education. This study used a Systematic Literature Review method based on the PRISMA 2020 guidelines. Literature searches were conducted through PubMed and ScienceDirect using keywords related to multimedia, preoperative education, patient education, surgery, and surgical outcomes. The included articles were Randomized Controlled Trials (RCTs) and quasi-experimental studies in English for the period 2020–2025. A total of 199 articles were selected, 5 of which met the inclusion criteria and were described narratively. Multimedia-based education, such as Virtual Reality (VR), educational videos, informed consent videos, and mobile applications, were proven to be more effective than conventional education in reducing preoperative anxiety, increasing knowledge, compliance with surgical preparation instructions, psychological readiness, and patient cooperation during medical procedures. However, its impact on postoperative clinical outcomes still shows varying results. Multimedia-based preoperative education is effective in improving the quality of education and patient experience before surgery, but cannot replace direct communication with healthcare professionals and is therefore more appropriate as a complement to conventional education.

Keywords: educational video; multimedia; preoperative education; surgical outcomes

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INTRODUCTION

Preoperative education is an essential component of modern surgical care because it plays a role in preparing patients physically, psychologically, and cognitively before undergoing surgery. This education not only aims to improve patient understanding of surgical procedures, anesthesia, postoperative care, and potential complications, but also helps establish realistic expectations so that patients can actively participate in the decision-making and recovery process (Kimia et al, 2025). In the Enhanced Recovery After Surgery (ERAS) concept, preoperative education has become one of the primary interventions recommended to improve the quality of care, accelerate recovery, and optimize clinical outcomes after surgery. Research shows that patients who receive comprehensive preoperative education have better knowledge levels, higher adherence to medical instructions, increased satisfaction with care, and shorter hospital stays compared to patients who receive only limited information (Longo et al., 2023).

Preoperative anxiety remains the most common psychological problem experienced by patients undergoing surgery. Fear of surgical procedures, anesthesia, pain, complications, disability, and even death causes most patients to experience varying degrees of anxiety. Previous research indicates that more than 50% of surgical patients worldwide experience preoperative anxiety, while some studies report a higher prevalence depending on the type of surgery, patient characteristics,

previous surgical experience, and the patient's level of knowledge regarding the procedure. This situation indicates that preoperative anxiety is not merely a temporary emotional response, but rather a clinical problem that requires management through educational and non-pharmacological approaches. Identifying factors that cause anxiety and providing effective education are crucial responsibilities for healthcare professionals, particularly nurses, in preparing patients for surgical procedures (Daniel, 2024).

The educational methods used are still dominated by conventional methods, such as verbal explanations, leaflets, or printed brochures. These methods have several limitations that can reduce the effectiveness of information delivery to patients. Verbal explanations are generally given in the short time leading up to surgery, often preventing patients from fully understanding the information conveyed. This condition is further influenced by preoperative anxiety, limited consultation time, and differences in individual health literacy levels. Information received verbally is more easily forgotten because patients don't have the opportunity to review the explanation after returning home. Printed leaflets or brochures also have limitations because they only present information in simple text and images, making them less engaging and less helpful for patients to clearly understand surgical procedures. This results in less optimal patient understanding of the surgical stages, pre-operative preparation, and post-operative care (Oliveira et al., 2023). Several studies have shown that conventional educational methods result in lower levels of comprehension and information retention than educational methods using audiovisual media or interactive multimedia (Kessler et al., 2025; Duraiyarasan et al., 2026).

The development of digital technology has driven a transformation in health education through the use of various multimedia media that can present information in a more engaging, interactive, and easy-to-understand manner. Multimedia in health education includes educational videos, 3D animations, mobile applications, interactive websites, digital simulations, and virtual reality (VR) technology. The use of multimedia enables the delivery of information through a combination of text, images, sound, animation, and video, engaging the patient's various senses simultaneously in the learning process. This multisensory approach has been shown to improve attention, comprehension, memory, and information retention compared to traditional educational methods. Multimedia-based preoperative education is considered an effective approach to improving the quality of patient preparation before surgery (Bremer et al., 2024). Research shows that the use of educational videos, digital applications, and virtual reality technology can increase patient knowledge about surgical procedures, reduce uncertainty, decrease anxiety levels, increase patient satisfaction, and improve the overall perioperative experience. The visual and audiovisual presentation of information allows patients to understand the stages of surgery more clearly. A clearer explanation than verbal explanations alone. Multimedia media provides patients with the flexibility to re-access educational materials at any time, making the learning process more independent and sustainable (Agüero-Millan, Abajas-Bustillo and Ortego-Maté, 2023).

Research by Kathleen Tom and Phang (2022) found that most studies reported the benefits of using preoperative educational videos, but the results varied across the measured outcomes, making it difficult to conclude that multimedia is consistently superior to conventional educational methods. Research by Steves dan Scafide (2021) showed that multimedia can increase knowledge and reduce anxiety in the intervention group, but most studies found no significant differences when directly compared with traditional educational methods. This situation indicates that the scientific evidence regarding the effectiveness of multimedia in preoperative education is still heterogeneous, requiring a more comprehensive evidence synthesis.

Previous research also used a wide variety of multimedia media, making it difficult to compare results between studies. Most studies utilize educational videos as intervention media, while others utilize tablet-based applications, interactive computer programs, websites, audiovisual animations,

interactive PowerPoint voice-overs, and even virtual reality technology. These differences in multimedia formats lead to variations in information delivery, intervention duration, interactivity level, and patient engagement during the educational process. These variations also have the potential to influence research outcomes, such as anxiety levels, knowledge, patient satisfaction, hemodynamic stability, and adherence to treatment. In Indonesia, research conducted by Danche (2024) also showed that digital health education still utilizes various platforms and media, making the effectiveness of each medium difficult to compare directly. Research by Khonakdar (2025) emphasized that the lack of standardization of multimedia content, duration, and format is one of the main causes of differences in results between studies. Therefore, a systematic review is needed that can identify the various types of multimedia that have been used and evaluate their effectiveness on surgical patient outcomes more comprehensively. The purpose of this study was to evaluate the effectiveness of multimedia-based preoperative education in improving patient outcomes compared to conventional education.

METHOD

This study used the Systematic Literature Review (SLR) method to identify, evaluate, and synthesize scientific evidence regarding the effectiveness of multimedia-based preoperative education in improving surgical outcomes compared to conventional educational methods. The systematic literature review followed the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020) guidelines, which include identification, screening, eligibility assessment, and inclusion of articles, ensuring a systematic and transparent selection process.

This study established inclusion and exclusion criteria to identify articles relevant to the research objectives. The inclusion criteria included: (1) studies with a randomized controlled trial (RCT) or quasi-experimental study design; (2) respondents were adult patients undergoing surgery; (3) interventions in the form of multimedia-based preoperative education, such as educational videos, animations, mobile applications, interactive websites, or virtual reality; (4) studies comparing multimedia interventions with conventional education or a control group; (5) articles published in English; and (6) articles published between 2021 and 2026. Exclusion criteria included articles in the form of conference abstracts, protocol studies, editorials, case reports, and research involving pediatric patients, as these were not aligned with the research focus.

A systematic literature search was conducted in electronic databases, namely PubMed, Scopus, and ScienceDirect. The search process used a combination of keywords adapted from Medical Subject Headings (MeSH) terms and free keywords, namely multimedia, video education, mobile application, virtual reality, preoperative education, patient education, surgery, and surgical outcomes. These keywords were combined as follows: (multimedia OR video OR virtual reality OR mobile application) AND (preoperative education OR patient education) AND (surgery OR surgical) AND (outcomes).

The article selection process was conducted based on the PRISMA 2020 guidelines. The first stage began by identifying all articles obtained from each database. Next, duplicate articles were removed (duplicate removal), followed by title and abstract screening. Articles that met the screening criteria were then subjected to a full-text review to assess compliance with the inclusion and exclusion criteria. Articles that met all requirements were then included in the data synthesis process. All stages of article selection are presented using a PRISMA flow diagram.

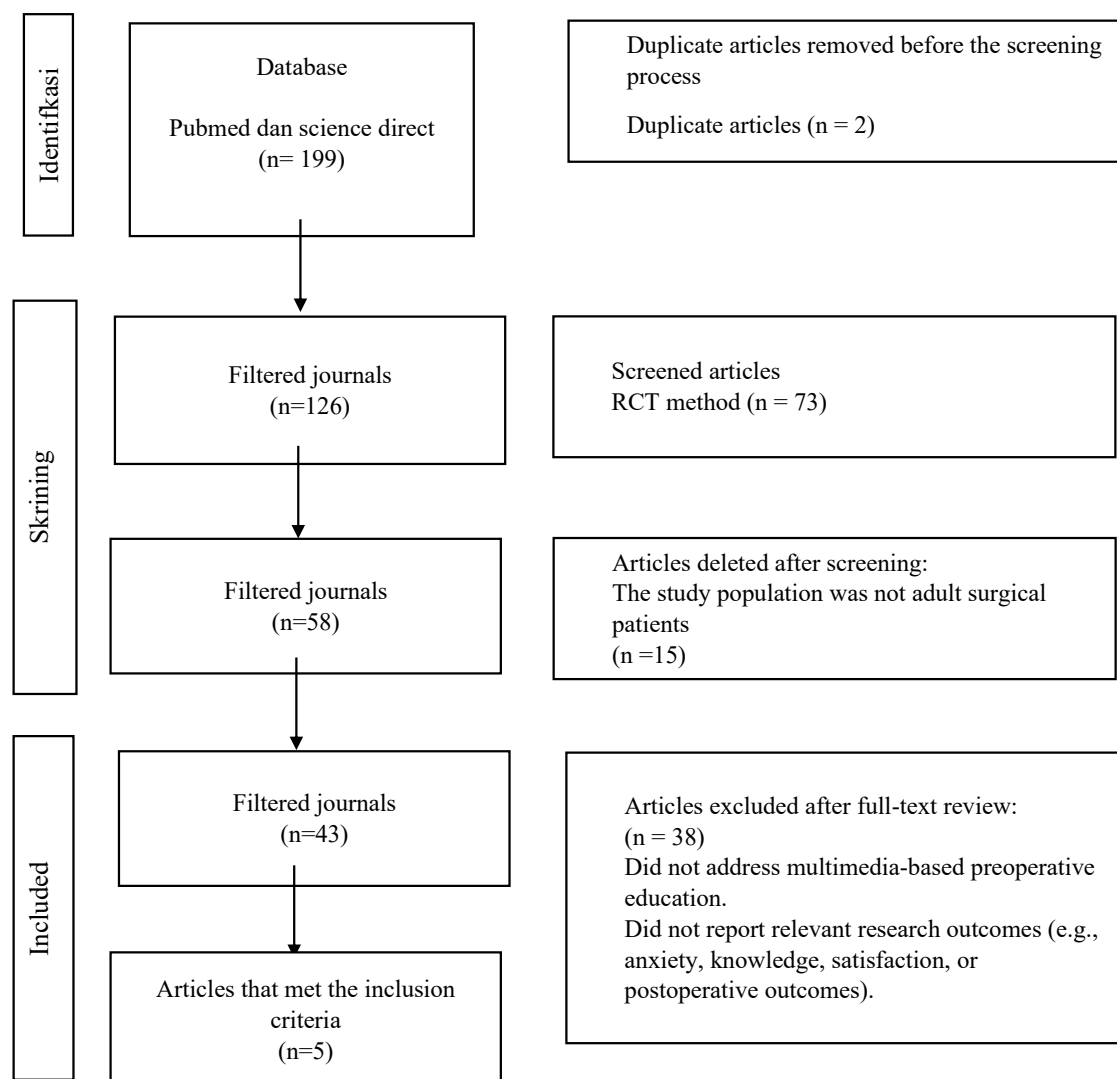


Figure 1. PRISMA flowchart for the literature selection process flow

RESULT

Characteristics of the Research Used

The results of the literature selection process indicated that five articles met the inclusion criteria and were included in the synthesis process of this systematic literature review. The characteristics of the articles analyzed are presented in Table 1.

Table 1.
Research Characteristics

No	Author	Year	Title	Intervention that given	Analysis Based on Outcome
1	Chiu <i>et al</i>	2023	Virtual-Reality-Based Intervention to Reduce Preoperative Anxiety in Adults Undergoing Elective Surgery	Participants were randomly assigned to an intervention group and a control group. The intervention group received an 8-minute 360° immersive virtual reality (VR) video simulating an operating room experience using a head-mounted display (HMD), while the	This study shows that Virtual Reality (VR)-based interventions are effective and feasible to be implemented to reduce preoperative anxiety in adult patients undergoing elective surgery.

No	Author	Year	Title	Intervention that given	Analysis Based on Outcome
				control group received preoperative education according to hospital standards.	
2	Bremer <i>et al.</i>	2024	Video consent significantly improves patient knowledge of general surgery procedures	The study involved 118 patients undergoing appendectomy, cholecystectomy, inguinal hernia repair, and fundoplication at two hospitals in Omaha, Nebraska. Patients were randomly assigned to either a standard informed consent process or a video-based informed consent process. Study outcomes included objective assessments of surgical knowledge through pre- and post-intervention tests, as well as satisfaction surveys conducted immediately after the informed consent process and after patient discharge.	The results of this study showed that there was a significantly greater increase in knowledge in the video group compared to the standard group, indicating that the use of video in the informed consent process is more effective in improving patient understanding of the surgical procedure to be undergone. Furthermore, both groups experienced a decrease in satisfaction levels after patients were discharged from the hospital. However, the magnitude of the decrease in satisfaction did not differ significantly between the standard and video-based informed consent groups.
3	Dao <i>et al.</i>	2023	Effectiveness of using a patient education mobile application to improve the quality of bowel preparation: a randomised controlled trial	The study involved patients undergoing colonoscopy on the same day as bowel preparation. The intervention group received education via a Vietnamese-language mobile application containing bowel preparation instructions, while the control group received conventional education with standard instructions.	Multimedia-based preoperative education in the form of videos has been proven effective in reducing preoperative anxiety, maintaining the stability of hemodynamic parameters, and increasing patient cooperation during the implementation of neuraxial block anesthesia.
4	Duraiyaran <i>et al</i>	2026	Comparison of the effect of preoperative multimedia video information on preoperative anxiety in patients undergoing procedures under central neuraxial block: a prospective, single-blind, randomized controlled study	This study involved 60 patients aged 18–60 years who underwent elective surgery under neuraxial block (Central Neuraxial Block [CNB]) anesthesia. Patients were randomly divided into two groups: a video group that received multimedia-based preoperative education in the form of videos	Multimedia-based preoperative education in the form of videos has been proven effective in reducing preoperative anxiety, maintaining the stability of hemodynamic parameters, and increasing patient cooperation during the implementation of neuraxial block anesthesia.

No	Author	Year	Title	Intervention that given	Analysis Based on Outcome
				and a non-video group that received conventional education. The primary outcome of the study was anxiety levels one hour before surgery. Secondary outcomes included hemodynamic parameters before CNB, namely heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP), as well as the level of patient cooperation during the CNB procedure.	
5	Kessler <i>et al</i>	2025	The Effect of Adding a Smartphone-Based Platform to the Metabolic Bariatric Surgery Nutritional Preparation Process: A Randomized Controlled Trial	This study involved prospective Metabolic and Bariatric Surgery (MBS) patients. All participants received 3–6 nutritional counseling sessions with a registered dietitian (RD). Additionally, the intervention group received access to a mobile app containing educational modules on bariatric surgery preparation and a communication platform for interacting with healthcare professionals.	A nutrition preparation program conducted with a nutritionist has been shown to improve patient knowledge about bariatric surgery, adherence to behavioral recommendations, perceptions of health status, and improvements in weight and functional ability. While participants perceived additional benefits from mobile apps, their use had only a limited impact on most study outcomes compared with conventional nutrition counseling. Mobile apps can be used as a supporting tool for preoperative education, but they cannot replace in-person counseling by healthcare professionals.

DISCUSSION

The analysis of five studies shows that multimedia-based preoperative education provides superior benefits compared to conventional education in preparing patients for surgery. The multimedia formats used in the studies included Virtual Reality (VR), educational videos, informed consent videos, and mobile applications. Although each study used different media and patient populations, all studies demonstrated that multimedia can improve the effectiveness of preoperative information delivery, particularly in terms of psychological aspects, knowledge, and patient compliance.

One of the most consistently improved outcomes is a reduction in preoperative anxiety. Research conducted by Pak Lung Chui et al. (2023) demonstrated that the use of immersive Virtual Reality (VR) videos effectively reduced anxiety in adult patients undergoing elective surgery. Similar results were also found by Richard E. Sanya et al. (2026), who found that preoperative educational videos reduced anxiety scores, maintained stable hemodynamic parameters, and increased patient cooperation during neuraxial block anesthesia. These findings demonstrate that delivering information visually and interactively can reduce patient uncertainty about surgical procedures,

thereby improving psychological preparedness before surgery. Patients who understand the surgical procedure tend to have a more realistic perception of risk and are better able to control their emotional responses than those who receive only verbal education.

Multimedia-based preoperative education has also been shown to improve patient knowledge of surgical procedures. Kristin Bremer et al. (2024) stated that the use of video in the informed consent process resulted in a significantly greater increase in knowledge compared to the standard informed consent process. Videos allow patients to receive more systematic, easy-to-understand explanations and integrate visual and audio elements, thereby helping to improve information retention. These results align with research by Yafit Kessler et al. (2025), which showed that a smartphone-based application used as a nutritional counseling companion improved patient knowledge regarding bariatric surgery preparation, adherence to behavioral recommendations, and perceptions of health status. These findings demonstrate that multimedia plays a role as an educational medium that can strengthen patients' preoperative learning.

Regarding patient compliance, research by Hang Viet Dao et al. (2023) menunjukkan showed that the use of a mobile application improved patient compliance with bowel preparation instructions before colonoscopy compared to conventional education. This increase in compliance suggests that digital media can help patients follow instructions more consistently because information is readily available and can be accessed as needed. However, the study also found that increased compliance was not accompanied by significant improvements in bowel preparation quality or colonoscopy clinical outcomes, such as polyp detection rates and adenoma detection rates. These results indicate that the success of a procedure is influenced not only by the quality of education but also by other factors, such as patient characteristics, clinical condition, and adherence to all stages of preparation.

While multimedia education provides benefits for various outcomes, research findings indicate that its impact on postoperative clinical outcomes remains inconsistent. Research by Yafit Kessler et al. (2025) showed that mobile applications provided only limited additional benefits compared to in-person counseling by a nutritionist. Research by Kristin Bremer et al. (2024) found that although video informed consent significantly improved patient knowledge, there was no significant difference in patient satisfaction levels after hospital discharge. These findings suggest that multimedia is more effective in improving educational and psychological aspects than short-term clinical outcomes. This is likely due to postoperative outcomes being influenced by various other factors, such as surgical technique, patient health, quality of perioperative care, and the postoperative rehabilitation process.

Overall, the results of this study indicate that multimedia-based preoperative education is an effective innovation for improving the quality of patient education before surgery. Media such as video, virtual reality, and mobile applications can convey information in a more engaging, interactive, and easy-to-understand way than conventional educational methods. The use of multimedia has been shown to provide significant benefits. The most consistent approach in reducing preoperative anxiety, increasing knowledge, enhancing adherence to instructions, and improving patient preparedness for surgery. Multimedia-based education cannot completely replace direct communication between healthcare professionals and patients. Multimedia implementation should be used as an adjunct to preoperative education so that patients still have the opportunity to discuss, ask questions, and receive clarification directly from healthcare professionals. A combined approach of face-to-face education and multimedia is expected to produce more optimal preoperative educational outcomes than using either method alone.

CONCLUSION

Based on the results of a systematic literature review of five studies, it can be concluded that multimedia-based preoperative education is a more effective educational method than conventional

education in preparing patients for surgery. Various forms of multimedia, such as Virtual Reality (VR), educational videos, informed consent videos, and mobile applications, have been shown to improve the quality of information delivered to patients by presenting materials in a more engaging, interactive, and easy-to-understand manner. Most studies demonstrate that multimedia-based interventions provide consistent benefits in reducing preoperative anxiety, increasing patient knowledge of surgical procedures, improving adherence to surgical preparation instructions, enhancing psychological readiness, and enhancing patient cooperation during medical procedures. The effectiveness of multimedia on postoperative clinical outcomes, such as the quality of surgical preparation, patient satisfaction after discharge, complications, and other clinical outcomes, continues to show variable results and therefore cannot yet provide consistent conclusions.

Multimedia-based preoperative education has the potential to be an effective strategy for improving the quality of preoperative education and the patient experience before surgery. However, the use of multimedia cannot completely replace the role of face-to-face education provided by healthcare professionals. Integrating multimedia with direct communication between healthcare professionals and patients is recommended as a more comprehensive approach to preoperative education.

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