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Research Article

Comparison of the Effectiveness of Multimedia and Face-to-Face Education on the Level of Preoperative Anxiety of Patient Undergoing Coronary Artery Bypass Graft (CABG)

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ABSTRACT

Background: Preoperative anxiety is a prevalent and potentially detrimental factor in the perioperative experience, affecting both patients and the healthcare team. This study aimed to investigate and compare the impact of multimedia and face-to-face education modalities on preoperative anxiety in patients undergoing coronary artery bypass surgery.

Methods: This quasi-experimental study was conducted in 1403 in 98 CABG surgery patients. Patients were randomly assigned to two groups: multimedia and face-to-face. The multimedia group received education through an educational film, while the face-to-face group underwent traditional in-person instruction. Preoperative anxiety was assessed at three time points: before the intervention, immediately after the intervention, and one hour before surgery. The Amsterdam Preoperative Anxiety and Information Needs Scale (APAIS) was used to measure anxiety levels.

Results: Regarding anxiety scores, no significant correlation was found between the two groups at any of the three time points examined ($p > 0.05$). Both groups experienced a decrease in average anxiety scores following education.

Conclusion: The findings of this study demonstrate that the implementation of theses educational methods, can effectively reduce preoperative anxiety in patients undergoing CABG surgery. By mitigating anxiety, these interventions can enhance patient cooperation with the treatment team, ultimately leading to improved treatment outcomes. Therefore, the utilization of educational strategies is strongly recommended to alleviate preoperative anxiety levels in this patient population.

Introduction

Cardiovascular disease (CVD) has emerged as the foremost global health challenge, accounting for approximately 31% of all deaths worldwide. Among the various CVD subtypes, coronary artery disease (CAD) represents a significant portion, contributing to approximately 53% of CVD-related mortality [1]. While various therapeutic approaches exist, coronary artery bypass Graft (CABG) surgery continues to be a cornerstone of management for patients with advanced CAD which constitutes approximately 4/1 % of all surgical procedures [2]. Preoperative anxiety is a frequent occurrence among patients undergoing CABG surgery. In a seminal study by Fat'hi et al. (2014), the incidence of preoperative anxiety was reported to be as high as 80%. These findings underscore the importance

of addressing anxiety in this patient population to optimize perioperative outcomes [3]. CABG surgery, a complex and potentially life-saving intervention for patients, is often accompanied by significant preoperative anxiety. This emotional state stems from the inherent threat to bodily integrity posed by surgery, coupled with the specific concerns associated with CABG. The high mortality risk, the intricate nature of the procedure, the anticipation of extended hospitalization and recovery, the fear of death, personal experiences with CAD-related mortality, and the general uncertainty surrounding the surgical process all contribute to heightened anxiety levels in CABG patients [4]. Anxiety, characterized by feelings of apprehension, unease, and vague fear, is often triggered by perceived threats or unfamiliar situations. These threats can be directed towards oneself or others, and may involve perceived danger, harm, or uncertainty [5]. Preoperative anxiety can have a profound impact on perioperative outcomes. It has been associated with a range of adverse effects, including hemodynamic instability (such as arrhythmias), increased pain, changes in patient behavior and emotions, disrupted sleep patterns, electrolyte and body fluid imbalances, prolonged wound healing, increased risk of infection, and even alterations in postoperative immune responses [6]. The adverse effects of preoperative anxiety can extend beyond the immediate perioperative period, impacting healthcare resource utilization and costs. Increased hospitalization, elevated care costs, delayed discharge, and reduced patient satisfaction are all potential consequences of unaddressed preoperative anxiety. These factors collectively contribute to a significant economic burden on healthcare systems [7-8]. Preoperative anxiety often stems from the fear of the unknown and a lack of understanding about the surgical process. Providing patients with detailed information regarding the anticipated procedures, tasks, and potential outcomes can significantly alleviate the anxiety. By equipping patients with knowledge, healthcare providers can empower them to actively participate in their care and reduce the psychological distress associated with the unknown [9]. While providing information is a crucial component of preoperative education, effective anxiety reduction requires a more comprehensive approach. By incorporating interactive educational techniques that address patients' emotional needs and concerns, healthcare providers can foster a sense of control and preparedness. Therefore, with an effective education to the patient that goes beyond providing information, it is possible to reduce the patient's anxiety [10].

Traditional preoperative education for patients often involves face-to-face interactions with a member of the anesthesia team, typically scheduled for the evening prior to surgery or the morning of the operation. However, due to the limitations inherent in such encounters, healthcare providers have increasingly turned to alternative communication methods, such as pamphlets, videos, and online educational resources. These modalities offer the potential to reach a wider audience and provide patients with flexibility in accessing information at their convenience [11-12]. In a study conducted by Fitzgerald, a one-page booklet detailing the anesthesia process was found to significantly reduce preoperative fear in over 40% of the participating patients. These findings underscore the effectiveness of targeted preoperative education in mitigating anxiety and improving patient outcomes [13]. These methods, such as pamphlets and booklets, offer several advantages, including their low cost and widespread availability. However, these materials also exhibit certain limitations. They may struggle to effectively convey complex procedural information in a visually engaging and dynamic manner, and may be inadequate for patients with lower literacy levels. These shortcomings highlight the need for complementary educational approaches that can address the diverse needs of patients [14-17].

The burgeoning accessibility of hardware and software has propelled multimedia education to the forefront of patient education strategies. This approach leverages a confluence of media formats, including text, images, sound, and dynamic elements, to foster a deeper understanding of medical procedures. The strengths of multimedia education are numerous. Firstly, it facilitates the practical representation of complex actions and procedures through the combined use of visuals and animations. Secondly, it engages both auditory and visual senses simultaneously, enhancing information retention for patients with varying learning styles. Thirdly, multimedia resources can be surprisingly cost-effective, offering potential scalability and wider dissemination compared to traditional methods. Finally, the inherent flexibility of this approach allows for tailoring content to cater to patients with varying literacy levels. Despite its advantages, multimedia education is not without limitations. The primary constraint lies in the dependence on electronic devices, potentially creating accessibility barriers for individuals lacking the necessary equipment or technical skills [18]. Tou et al. (2012) demonstrated that education with two-dimensional animations was associated with a significant reduction in anxiety levels [19]. However, Momeni et al. (2006) found that education with films did not yield a statistically significant difference in preoperative anxiety compared to traditional educational manuals [20].

While numerous studies have investigated the efficacy of different educational tools in mitigating preoperative anxiety, the optimal method for delivering this information remains a subject of ongoing debate [21-22]. Despite significant advancements in science, technology, and educational methods, the optimal approach to reducing preoperative anxiety in patients undergoing CABG surgery remains unclear. Contradictory findings

in previous studies may be attributed to the use of suboptimal educational methods [23]. Therefore, the purpose of this study is to compare the effectiveness of multimedia and face-to-face education on the level of preoperative anxiety in patients undergoing CABG surgery at Hazrat Rasool Akram and Shahid Rajaei Educational and Therapeutic Centers of Iran University of Medical Sciences.

Methods

This quasi-experimental study, titled "Comparison of the Effectiveness of education in Two Multimedia and Face-to-Face Methods on the Preoperative Anxiety of Patients Undergoing Coronary Artery Bypass Graft Surgery," was conducted in 1403 across three stages. The initial phase involved a comprehensive search of authoritative foreign databases, including Google Scholar, Scopus, and PubMed, as well as domestic Iranian databases such as Magiran and SID. This search focused on three key areas: preoperative anxiety, multimedia and face-to-face education, and anxiety assessment tools (questionnaires). The objective was to gain a thorough understanding of existing research and identify relevant methodologies for the study.

The second phase centered on the development of a comprehensive educational intervention. Up-to-date resources and guidelines, such as the American Heart Association (AHA) guidelines, Miller's Basics of Anesthesia and Nurse Anesthesia were utilized to compile an informative script encompassing the surgical and anesthetic journey of coronary artery bypass graft (CABG) surgery. This script detailed the process from entering the operating room to post-operative care, both in the ward and at home. Subsequently, the content was transformed into a multimedia educational film using software like Microsoft PowerPoint and Wondershare Filmora. This film incorporated audio narration, video clips, dynamic elements, and music to engage multiple sensory modalities and enhance audience comprehension. To ensure visual and content quality, a validated evaluation scale was distributed to a panel of 22 specialists in the field. The feedback received confirmed the adequacy and clarity of the narrative within the educational video.

The third stage focused on participant recruitment and intervention administration. Ninety-eight patients fulfilling the inclusion criteria (age $\geq$ 18 years, fluent communication in Farsi, no history of mental illness, and no current use of anti-anxiety medications) were enrolled. Random allocation divided them into two groups: multimedia and face-to-face. Following informed consent on the day preceding surgery, all participants completed a demographic questionnaire (age, gender, education level, employment status, marital status, surgical history) and the Amsterdam Preoperative Anxiety and Information Scale (APAIS). The APAIS is a six-item tool with subscales for preoperative anxiety (questions 1, 2, 4, and 5) and need for preoperative information (questions 3 and 6). (Table 1) The APAIS questionnaire employs a five-point Likert scale (strongly disagree to strongly agree) to measure preoperative anxiety and the need for preoperative information. Scores within the 7-10 range indicate low anxiety, 11-15 suggest moderate anxiety, and 16-20 signify high anxiety. Similarly, scores of 2-4 suggest no or little need for information, 5-7 indicate average need, and 8-10 denote a high need for preoperative information [24].

Table 1- the Amsterdam Preoperative Anxiety and Information Scale (APAIS)

Item	Titles	Grade				
		1	2	3	4	5
1	I am worried about the anesthetic					
2	The anesthetic is on my mind continually					
3	I would like to know as much as possible about the anesthesia					
4	I am worried about the procedure					
5	The procedure is on my mind continually					
6	I would like to know as much as possible about the procedure					

The validated Persian version of the APAIS demonstrates good internal consistency (Cronbach's alpha of 0.84 for anxiety and 0.82 for information needs). We recalculated the internal consistency within our sample using Cronbach's alpha (0.80), confirming its suitability for assessing anxiety and information needs. The validity and reliability of the APAIS have been previously established. Nikandish et al. (2016) reported a high correlation coefficient (0.68) between the APAIS and Spielberger's State-Trait Anxiety Inventory (STAI) for the anxiety subscale, indicating good concurrent validity. However, the correlation between the APAIS information needs subscale and Spielberger's Situation Anxiety Inventory (SAI) was moderate (0.50), suggesting a more nuanced relationship. Internal consistency was also demonstrated with Cronbach's alpha coefficients of 0.84 for the anxiety subscale and 0.82 for the information needs subscale [25]. To ensure the instrument's suitability within our specific sample and research context, we recalculated internal consistency using Cronbach's alpha. The resulting coefficient of 0.80 confirmed the APAIS's

adequacy for measuring preoperative anxiety and information needs in our study population.

Baseline anxiety (A1) was measured before delivering the intervention. In the multimedia group, participants viewed the educational video individually on smartphones, presented by the researcher. The face-to-face group received the same educational content delivered verbally by the researcher. Following the intervention, both groups completed the APAIS questionnaire at two additional time points: immediately after education (A2) and one hour before surgery on the following day (A3). Data analysis employed SPSS v26 software for descriptive statistics (mean and standard deviation) and inferential tests (independent t-test, chi-square test, Fisher's exact test, paired t-test) to compare anxiety levels and information needs between the two groups at various time points.

Results

To assess the comparability of the two educational groups regarding demographic and background characteristics, independent t-tests were conducted for quantitative data (age) and chi-square or Fisher's exact tests for qualitative data (gender, education level, employment status, marital status, and history of surgery). The results, presented in (Table 2), demonstrate no statistically significant differences in the distribution of these variables between the multimedia and face-to-face groups. The average age in both groups was similar,

with the multimedia group at 56.8 years and the face-to-face group at 57.5 years. The gender ratio was also comparable, with 58 (59.2%) males and 40 (40.8%) females in each group. The education level distribution was consistent across both groups, with 39.8% having a sub-diploma, 27.6% a diploma, and 32.7% an academic degree. Employment status was similar, with 78.5% employed and 21.5% unemployed. Marital status also showed no significant differences, with 79.6% married and 20.4% divorced or widowed. Finally, 82.7% of participants had a history of surgery, while 17.3% had no surgical history. To investigate potential confounding effects of age, gender, education level, employment status, marital status, history of surgery, and ethnicity, an analysis of covariance (ANCOVA) was conducted. No confounding effects were observed for any of these variables (P value > 0.05).

(Table 3) presents the average anxiety scores for the face-to-face and multimedia groups at three time points: baseline (A1), immediately after education (A2), and one hour before surgery (A3). The results indicate no significant difference between the two groups in the overall average anxiety scores. (Figure 1) illustrates the temporal changes in anxiety scores for both groups. Following education, the average anxiety scores decreased in both groups. However, the scores increased again at the pre-surgery time point (A3). This pattern suggests a significant interaction between anxiety and the time factor, which was confirmed by repeated measures analysis (P value < 0.001).

Table 2- Frequency distribution of Characteristics of the study Participants

Variable	Multimedia Group (n=49)	Face to Face Group (n=49)	P value
*AGE (Year)	56/8 ± 7/246	57/5 ±6/414	0/60
**SEX			0/68
Male	30 (61/2%)	28 (57/1%)	
Female	19 (38/8%)	21 (42/9%)	
***Educational status			0/74
Under the diploma	22 (44/9%)	17 (34/7%)	
Diploma	12 (24/5%)	15 (30/6%)	
Academic	15 (30/6%)	17 (34/7%)	
**Occupation			0/46
Employed	36 (73/5%)	41 (83/7%)	
Unemployed	13 (26/5%)	8 (16/3%)	
**Marital status			<0/05
Married	39 (79/6%)	39 (79/6%)	
Divorced/Widowed	10 (20/4%)	10 (20/4%)	
**Surgery history			0/42
Yes	39 (79/6%)	72 (85/7%)	
No	10 (20/4%)	7 (14/3%)	

 * Independent T test, ** Chi-squared test, *** Fisher's exact test

Table 3- The mean scores of anxiety levels at different time intervals

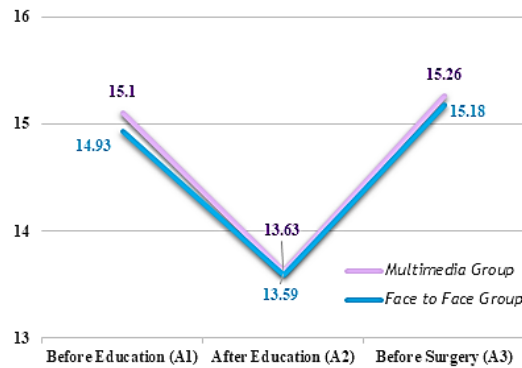| Time intervals	Multimedia Group	Face to Face Group	P value
Before intervention (A1)	15/10 ± 2/06	14/93 ± 2/86	0/93
After intervention (A2)	13/63 ± 2/00	13/59 ± 2/66	0/74
Prior to Surgery (A3)	15/26 ± 1/81	15/18 ± 2/50	\0/85

 Independent T-Test

Figure 1- Changes in anxiety scores for both groups

Discussion

This study aimed to compare the effectiveness of multimedia and face-to-face education in reducing preoperative anxiety among patients undergoing coronary artery bypass surgery. The findings indicate that the reduction in anxiety levels was not significantly influenced by demographic factors such as age, education level, marital status, or previous surgical experience (Table 2). These results align with the findings of Zafarniya et al. (2014), suggesting that the observed reduction in anxiety is primarily attributable to the intervention itself [26]. While Jalala et al. (2010) reported a gender-related difference in anxiety among patients undergoing regional anesthesia in England, our study did not observe a similar correlation. This discrepancy may be attributed to differences in the study populations, surgical procedures, or other factors [22].

Comparing anxiety scores indicate that both educational methods were effective in mitigating anxiety levels, although no statistically significant differences were observed between the two groups (Table 3). These findings are in alignment with the results reported by Abdi et al. (2019) in their investigation of the impact of surgical educational film screening on the anxiety levels of patients undergoing lumbar disc surgery [27]. A key strength of the present study, in contrast to the research by Fahimi et al. (2018) entitled "Investigation of the effect of education through multimedia on the pre- and post-operative anxiety of patients undergoing coronary artery surgery: a clinical trial," is the implementation of a two-group design [28]. By randomizing patients to receive either multimedia or face-to-face education delivered at separate hospitals, this approach minimizes selection bias. This robust methodology strengthens the internal validity of the study, allowing for a more confident attribution of any observed anxiety level differences to the education modality itself.

The mean anxiety score in the multimedia group was 13.63, while in the face-to-face group it was 13.59. These

findings indicate that both educational modalities led to a reduction in average anxiety scores, but no statistically significant difference was observed between the two groups (P>0.05). It is noteworthy that the results of the present study align with those reported by Mousavi et al. (2017) in their investigation titled "Comparison of the effect of face-to-face education and video education on the anxiety of bone marrow transplant patients in Afzalipur Hospital, Kerman: a randomized clinical trial study," which highlighted the efficacy of education in mitigating preoperative anxiety [29]. One potential explanation for the observed reduction in anxiety lies in the novelty of the intervention. The education process itself, regardless of its specific modality, may mitigate preoperative anxiety due to its unique and unfamiliar nature. This reduction may be attributable to the creation of hope, an increase in awareness and understanding of surgical procedures and care, as well as the fostering of a sense of participation and control over the treatment, all of which were integral components of the educational content in this study.

Comparative analyses of mean anxiety scores before surgery between the multimedia group (15.18) and the face-to-face group (15.26) revealed no statistically significant differences (P value> 0.05). In contrast to previous studies, such as those conducted by Saleh Moghaddam et al. (2014) and Momeni et al. (2015), which were limited to pre- and post-Education anxiety assessments, the present study has made a significant contribution to the evaluation of educational interventions by incorporating an additional measurement of anxiety one hour prior to surgery [20, 30]. This innovative approach allows for a more accurate assessment of the education method's actual impact on patients' anxiety in the final moments before surgery, when anxiety levels are typically at their peak, thereby providing a more comprehensive understanding of the effectiveness of these interventions.

The primary objective of this investigation was to examine the fluctuations in anxiety levels of patients across three distinct time points: before education (A1), immediately following education (A2), and one hour prior to surgery (A3). Statistical analyses revealed no statistically significant disparities between the two educational groups (multimedia and face-to-face) in terms of average anxiety scores. However, the results unequivocally demonstrate a significant temporal reduction in patient anxiety levels, suggesting the efficacy of education in mitigating anxiety. These findings are in alignment with the results reported by Saki et al. (2013) in their study entitled "Comparison of face-to-face and electronic educational methods on the anxiety of patients with acute myocardial infarction," which concluded that both face-to-face and electronic educational modalities were effective in reducing patient anxiety, although no statistically significant differences

were observed between the employed educational methods [31].The findings of Fahimi et al.'s (2017) study revealed that education through multimedia, despite the absence of statistically significant differences compared to routine methods, generally resulted in a reduction in anxiety levels among patients undergoing coronary artery surgery [28]. In contrast, Rabiei et al.'s (2011) investigation entitled "Investigation of the effect of using educational multimedia on the level of anxiety before cesarean section" demonstrated a statistically significant difference in anxiety levels between the intervention group (receiving multimedia education) and the control group [32]. Additionally, Saleh Moghadam et al.'s (2015) study reported a significant decrease in anxiety levels among patients in the intervention group (receiving educational videos) [30]. The variability in findings across these studies may be attributed to several factors, including cultural differences, medical history, type of surgery, and the specific characteristics of the study populations. For instance, Rabiei et al.'s study focused exclusively on pregnant women, while other studies examined more diverse populations.

In contrast to the findings of Sachin et al. (2021), this study observed a gradual increase in patient anxiety levels as the surgery approached, regardless of the education provided [33]. Potential contributors to this escalating anxiety MAY include feelings of helplessness regarding the surgical outcome, apprehension about postoperative complications, disruptions to daily routines such as dietary restrictions and physical limitations, and separation from loved ones, all of which can significantly amplify stress and anxiety. Moreover, the inherent risks associated with the surgery and concerns about adverse consequences can further exacerbate preoperative anxiety. A notable strength of this research lies in the meticulous and comprehensive design of the educational content. Researchers meticulously identified factors that contribute to preoperative anxiety and incorporated these elements into the education program, ensuring that the intervention fully addresses patients' needs. The utilization of diverse educational elements, such as animation, sound, images, and text, created a more engaging and enriching learning experience for patients. This variety fosters active participation and enhances the effectiveness of the Education.

Beyond the robust educational content, this research achieved reliable results through the application of accurate measurement methods and a sound research design. Measuring anxiety one hour before surgery allowed for an assessment of the training's impact on patients' anxiety at the most critical moment. Random sampling and the division of patients into two groups across different hospitals minimized sampling error, ensuring that observed differences in anxiety levels were attributable to the education type. Furthermore, the utilization of a standardized and validated questionnaire specifically designed for measuring preoperative anxiety, rather than a general anxiety assessment tool such as the Spielberger questionnaire, significantly enhanced the accuracy and validity of the results. These factors collectively contribute to the study's strength and reliability in the field of preoperative anxiety reduction. Notably, all research objectives were met, and no specific limitations were identified.

For future research, it is recommended to explore the application of multimedia education modalities such as virtual reality or augmented reality. Additionally, implementing education at various time points, including a week before surgery and the day before, may be beneficial. Combining complementary medicine with multimedia education and tailoring education programs to individual patient needs and literacy levels are further avenues for investigation.

Conclusion

This study sought to compare the effectiveness of multimedia and face-to-face education methods in reducing preoperative anxiety among patients undergoing coronary artery bypass surgery. The findings demonstrate that both educational approaches were effective in mitigating anxiety levels, although no statistically significant differences were observed between the two methods. While the initial reduction in anxiety following education was evident, the study also revealed a subsequent increase in anxiety as patients drew closer to the surgery.

These findings underscore the crucial role of preoperative education in reducing patient anxiety and enhancing the overall surgical experience. By mitigating anxiety, educational interventions can potentially contribute to improved patient satisfaction, reduced complications, lower healthcare costs, and shorter hospital stays. Future research may explore strategies to sustain anxiety reduction over time and tailor educational approaches to address the specific needs of individual patients.

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