T.R.N.C

NEAR EAST UNIVERSITY

INSTITUTE OF GRADUATE STUDIES

Effectiveness of Game-Based Teaching Method on Nursing Students' Knowledge of Enhanced Recovery After Surgery

PhD IN NURSING

IBRAHIM S.S. ABUMETTLEQ

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Advisor

PROF. DR. NURHAN BAYRAKTAR

NICOSIA 2023

Approval

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Effectiveness of Game-Based Teaching Method on Nursing Students' Knowledge of Enhanced Recovery After Surgery

SUMMARY

Abstract

Background: Technology is a creation of humans, so when an educator can implement technology in teaching, it is also innovative. New technology allows educators to provide various ways for media to address diverse learning styles, such as animation, live video, gaming, etc.

Methods: The study was planned with a quasi-experimental design and was applied with pre- and post-test assessments. The y was implemented in March 2022 and the study was performed at a near east university faculty of Nursing. The students were designated erratically to the experimental grouping or control grouping (80 and 40 players in each group) through the census method. The Kahoot application which the game could be used by phone or by computer.

Finding: The findings of the study showed the improvement of the student's performance in the overall mean scores of all enhanced recovery after surgery after the educational intervention through game-based learning.

Conclusions: The findings indicate that game-based teaching improves quality outcomes for students' education. The method can be valuable for creating educational methods in nursing schools and nursing education, as evidenced by our results, which show that it is effective in educating nursing students about improved recovery after surgery.

Keywords: Game-based teaching, Enhanced recovery after surgery, nursing students, online education.

STATEMENT (DECLARATION)

I hereby certify that the research for this thesis is entirely mine, that I did not engage in any unethical behaviour during the preparation of the thesis or while it was being written, and that I obtained all of the information for the thesis in accordance with academic and ethical standards, and that I cited all of the data and observations gathered for the thesis. This thesis investigation was unable to find such references, but they were included in the reference list. Throughout the course of the study, there were no instances of patent infringement or copyright infringement.

IBRAHIM S.S. ABUMETTLEQ

05/05/2023

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IBRAHIM S.S. ABUMETTLEQ

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ABBREVIATIONS

Items of Abbreviations	**Context**
ERAS	Enhanced recovery after surgery
CCU	Cardiac critical unit
ICU	Intensive care unit
ER	Emergency room
GBL	Game-based learning
GBT	Game-based teaching
IRB	Institutional Reviews Board
K-12	12 years of basic kindergarten education
VR	Virtual reality learning
AR	Augmented reality

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CHAPTER I

1. INTRODUCTION

1.1 Problem Definition

It is important for students to learn about current teaching trends since it increases their confidence in learning about specialized areas and shows them how rapidly they may develop an aptitude (Brull S., 2016). Students get the opportunity to practice teamwork and socialization in the classroom, which is a crucial life skill. Students can learn the value of developing relationships with one another through projects, activities, and even involvement in after-school sports (Finlayson S, 2016).Modern technology is combined with digital learning games to enable a brand-new level of participation, teamwork, and a singular learning experience (Kowitlawakul Y, 2015). In fact, research has shown pairing both analogue and digital learning games to facilitate the most effective multi-sensory learning experience (Chow Y.L.,2015). Gamification and Immersive Learning With VR And AR, Gamification usage is primarily seen in the K–12 education sector (Koivisto J. M,2016).

The reason is that students are immediately engrossed in gaming videos or focused on improving their game scores, and it is used in higher education (Johnsen H.M,2016). Moreover, STEAM and Social Media In Learning, furthermore, Additionally, it fosters an atmosphere that is safe for students to express and experiment with their ideas while thinking outside the box. Additionally, the convenience of experiential learning encourages students to work more effectively with others (Niemi H.2016).

Important resources including text lessons, audio lectures, videos, and video assignments can be stored on a school's cloud terminal.The implementation of innovative teaching methods can boost interest and motivation (Kaczmarczyk J,2016). Consequently, encouraging a learning style in which students internalize information and comprehend the enhanced Recovery after Surgery standard through their own experimentation and observation (Feng J,2016). For example, the game can be played by a single player or by a class of students by projecting the questions and answers on the gaming platform. In addition to responding more rapidly, students will perform better if they provide the majority of the correct answers (Vivekananda-Schmidt P, 2016).

Game-based learning is an effective teaching strategy that offers several advantages for students, including improved self-confidence, project management, and critical thinking (Eriksson E.2016). Studies have demonstrated a strong correlation between game-based learning and considerable gains in students' test scores, attendance, and online classroom engagement

(Davidson R.2016). Regardless of gender, age, or educational level, digital educational games can inspire students and provide a suitable atmosphere for various learning groups to work together to achieve shared learning objectives. Educational video games may also aid teachers in their efforts to instruct various student types (Wouters P,2017). Students can now use the new innovations to access online learning, live and web-based simulations, apps, reference materials, and electronic textbooks, which is essential for all education, but is especially important for nursing programs (Popil I.2015). Studies It has been shown that adding educational material into digital games can successfully immerse students in active and upbeat learning (Reid Searl K, 2014). According to a Davidson research, 88% of nursing students said that nursing instruction should employ games and other new media more frequently. (Davidson, S.J, 2016). Students can now use the new innovations to access online learning, live and web-based simulations, apps, reference materials, and electronic textbooks, which is essential for all education, but is especially important for nursing programs. A set of rules for enhanced recovery after surgery is employed by the surgical nursing division to guarantee that the patient receives the greatest possible outcome from their surgical procedure (Ljungqvist O,2014). The ERAS components can be loosely categorized into pre-admission, pre-operative, intra-operative, and post-operative stages, each of which includes a range of distinctive components. These protocols include essential elements that take place before to, during, and following an operation (Scott M, 2017).

Patient safety must be ensured by the use of ERAS and evidence-based practice, according to ((Flynn R.,2017). Recent research suggests that nursing students may not be adequately prepared to use ERAS, despite the fact that educational measures to improve ERAS knowledge and skills are advised for students (etihavas, V, 2016). Students will be better equipped for comprehending ERAS by learning about nursing students' and educators' experiences with learning outcomes and impediments. (Ryan EJ,2016).

Gaming should be used in addition to conventional teaching methods because it improves the experience of nursing students compared to lecture alone (Subhash S, 2018). Benefits of game-based learning in the classroom and how it can better prepare students with life skills that will position them for success in the future. Students collaborate with one another and with members of the community while working on projects and gaining knowledge for careers and beyond. Students study problem-solving skills and learn how to address situations that are significant to

them, such as current neighborhood difficulties. Students use their creativity to come up with new ideas for projects and new product designs (Pearce PF,2017). Online gaming has grown in popularity recently since it can demonstrate students' motivation levels and their development of virtual communication and teamwork skills (Koivisto J-M, 2017). The ability to think critically about how the classroom pushes students to think differently and demands the use of new technical skills is something that students learn to do through online education (Moore-Cox, A., 2017).

It has long been understood that feedback in educational video games is crucial for improving learning and building skills (Venkatesh V, 2016). To increase the evidence for the usefulness of online games, studies are required. The students assigned to the current online game will be able to comprehend the notions of enhanced recovery following surgery, the stage of ERAS, protocols, as well as how they should care for patients before, during, or after an operation, at the conclusion of the current analysis.

1.2 The Aim of the Study

The purpose of the current study was to enhance how well nursing students' grasp of the ERAS was improved by the game-based teaching approach.Additionally, the study will assess students' levels of satisfaction by asking them about a variety of items related to their prior educational experiences, skill assessments, and ratings of different aspects of their chosen courses and programs.

1.3 Research Hypotheses

1.1 Student nurses who complete a game-based teaching program will demonstrate increased general knowledge of enhanced recovery after surgery compared with the control group.

1.2 Nursing Students who complete a game-based enhanced recovery after surgery educational program had more awareness of evidence-based practice compared with the control group.

2. BACKGROUND

2.1 Definition of Game-based learning (GBL)

In order to maximize the benefits for students, nursing instruction emphasizes both theoretical lectures and hands-on, skill-based learning (Davies BL, 2017). For students, keeping up with the latest innovations in education is crucial since it can boost their confidence in learning new things and developing. The power of games is harnessed as a teaching tool in game-based learning to establish and support learning objectives (Carreras, V. A., 2015). This is accomplished by the GBL environment through instructional activities that include elements like engagement, quick rewards, and friendly competition (Hoffmann K., 2020). All of this is done to keep students' motivation to learn high as they play (Sidebotham M, 2016). Extreme disruptions in education have been documented; it is estimated that 94% of the world's students (1.6 billion students) have been impacted, ranging from elementary school students to those in tertiary societies from more than professionally in a skill that can help a student grow exponentially (Scott S,2017).

2.2 Benefits of GBL

This study will concentrate on investigating how nursing students can absorb knowledge more deeply by adopting gaming techniques, as evidenced by numerous studies (Nunn-Ellison K, 2020). By using this technique, stress levels are reduced, critical thinking is sparked, nursing students are inspired to study, and they appreciate taking part in a relaxed setting free from threats and distractions (Melender HL, 2016).

2.3 GBT theories

Three broad categories can be used to categorize learning theories: behaviorism, cognitivism, and constructivism (Richardson et al ,2015). Behaviorism is the teaching of skills through the use of positive reinforcement for behavior, which should be conditional upon performance (John FP,2015). Contrary to behaviorists, cognitive psychologists actually hold that thinking, comprehending, organizing, and consciousness are key components of learning (Bayram et al., 2019). The use of creative instructional techniques can increase participation. Students will receive a more useful mark based on their response rate and, of course, the largest percentage of accurate responses (Szweda C,2017).

GBT History In 1968, students played The Sumerian Game, widely recognized as the world's first instructional video game. It was invented by Mabel Addis, the world's first video game writer, and it was introduced as an instructional approach at the university level by Jean Piaget and Lev Vygotsky (John FP,2015).

2.4 Study Tools

2.4.1 ERAS Knowledge Evaluation Form

The researchers developed an assessment exam based on the most recent ERAS preventive update from the American Association of Nurse Anesthetists. ERAS thoracic surgery recommendations from a surgical standpoint, 2019. The first component of the application asks five questions about the demographics of nursing students, including their age, gender, class level, cumulative grade point average (CGPA), and number of ERAS courses they have taken. 33 questions from the second session covered general information, risk factors, ERAS protocols, pre-surgery, during-surgery protocols, and post-surgery protocols. The Kahoot website, which assigned the game, asked the students who would be participating in the game to enter the game's code. Three experts from the surgical and nursing disciplines examined and approved the questionnaire's content and evaluation.

2.4.2 Training Method Evaluation Form for Experimental Group

This evaluation form was related to students' satisfaction with online education.

CHAPTER II

3. METHODOLOGY

3.1 Study Design

The current study used a randomized controlled design.

3.2 Sample and Setting

The current study was conducted in the Nursing Faculty of the Near East University which is located in North Cyprus. The nursing program at the university uses online technology to make students take part in lectures, exams, and quizzes that are watched over by the course advisors. The study included 80 international nursing students who had completed their first course. A total of 80 students (40 in each group) were randomly assigned to the experimental group or the control group using the census method. Students will only be enrolled in this study if they give their consent.

3.3 Statistical Analysis

The Statistical Package of Social Sciences (SPSS) version 20.0 application was used to enter the data. To determine the participant characteristics and determine the mean knowledge, descriptive statistics frequency and percentages were utilised. The correct response received a score of 1, and the incorrect response received a score of 0. The goal of the randomized controlled design's strategy was to predict differences between the experimental and control groups. After evaluating the intervention and the data, the dependent t-test was used to investigate pre- and post-test differences, and then a normal distribution was utilized to apply the student t-test. The independent t-tests were used to analyze gender differences in the first stage. By organizing and evaluating textual data, qualitative content analysis was used to evaluate the advantages and disadvantages of the game teaching technique.

3.4 Application of the study

Both groups participated in a three-phase education program on improved post-surgery recovery, including pre-and post-testing. In the pre-phase, the researchers collaborated with the nursing faculty to schedule an appropriate time for the game, explain the aim and rationale of the investigation to the students, and demonstrate how to register for an account on an online learning platform. After the participant assignment, the students were randomly divided into the control group and the experimental group.

4. Education content

4.1 General information about ERAS

Students who successfully finish this course will be endowed with abilities that will improve their understanding of the ERAS and contribute to the expansion of the health care sector by improving patient outcomes and enhancing operational functionality. The study's main goal is to help students develop sustainable patient-centered practices. This ERAS study emphasizes the value of educating prospective nurses so they can recognize their core competencies and nursing philosophies before they enter the workforce.

Students will be able to comprehend scientific and evidence-based knowledge, such as infection control, which is the first thing they should learn because patients who visit hospitals for treatment run the danger of contracting an infection that was acquired there; ERAS protocols will assist students in preventing this. Additionally, evidence-based practice prepares students how to make decisions regarding a patient's care using the best evidence from well-designed studies as well as the patient's values and preferences.

Preoperative care refers to the period of time prior to surgery during which physical and psychological preparations are undertaken for the procedure. The preoperative phase lasts from the moment the patient has been admitted to the hospital or surgical entry until the time the operation starts, depending on the specific needs of the patient. Preoperative counseling for all patients should include instruction on deep breathing exercises, quitting smoking and drinking 4 weeks before surgery, as well as a 15-minute telephone conversation with multimedia content.

The nurse should use short-acting anesthetics and avoid using too many opioids during the intraoperative stage, which is when the patient is undergoing surgery. Additionally, IV fluid

therapy and standardized care practices like maintaining normothermia, DVT prophylaxis, and minimizing catheters and drains should be used. Care and patient monitoring are required during the post-operative phase. During this stage, the patient is recovering from the effects of anesthesia and surgery. The patient should have stable hemodynamics, appropriate breathing, pain management, and should not drink too much salt or water.

Early Foley and tube removal, shorter postoperative fasting interval, and non-use of NGT are recommended (preferred day of or day after surgery). Primary nursing planning throughout the preoperative stage of patient and family education involves nursing care plans for preoperative patients. utilizing every opportunity while the patient is being evaluated and getting ready for surgery to provide information that will help the patient become more familiar with the procedure, which will help reduce anxiety and risk factors and prevent complications that could worsen the patient's health.

Enhanced recovery after surgery (ERAS) encompasses the evidence-based strategies to lessen perioperative stress, gastrointestinal dysfunction, infections, and postoperative pain and to encourage early mobilization and recovery. The preoperative, intraoperative, and postoperative phases of the patient's care journey are all covered by these multimodal care pathways. After completing this course, students will be able to comprehend the ERAS. The procedure includes normal anesthetic protocols, preoperative preparation and counseling, preoperative dietary status, preadmission education, lowering anxiety before surgery, avoiding preoperative carbohydrate loading, epidural opioid analgesia, and early mobilization. The use of short-acting anesthetics, fast recovery and emergence support, opioid-sparing pain management, DVT prevention, limiting the use of normal saline, and maintaining normothermia are further intraoperative techniques.

Students will have knowledge of midthoracic epidural anesthesia/analgesia, prevention of nausea and vomiting, early oral nutrition as tolerated, stimulation of gut motility, early catheter removal, avoiding salt and water overload, and reducing postoperative fasting period during the postoperative period. Students will also learn about how to preserve preoperative organ function, lower the risk of serious complications and infections, and lessen postoperative anxiety in patients in order to promote early recovery after surgical procedures. Furthermore, ERAS programs for patients following colorectal surgery have advantages over standard treatment for

these patients, including decreased frequency of issues, quicker recovery durations, and earlier hospital discharge, according to preliminary results from randomized controlled studies. Implementing outcomes improvements is highly challenging, as numerous studies have demonstrated. This is partially because some of the components are different from common surgical practice, and it's also because implementation requires a multidisciplinary team to work consistently together. Programs use different ERAS components than are suggested by recommendations. Finally, it's still not clear whether ERAS would be more advantageous for patients undergoing a laparoscopic procedure.

The term "ERAS" refers to a surgical program that was developed by incorporating evidence-based guidelines and rules designed to standardize care, improve patient outcomes, and subsequently reduce overall healthcare costs. Better patient outcomes include fewer postoperative issues, which is partly attributable to changes in fasting and postoperative nutrition regimens that promote early mobilization and judicious medication selection for anesthesia and analgesia.

Worldwide healthcare organizations refer to it as an accelerated or enhanced rehabilitation program. The current concept of fast-tracking (skipping phase I level of care) is distinct from ERAS because the latter's ideas frequently apply to difficult inpatient treatments in addition to the full spectrum of patient care, including the parts relating to patients, staff, and practices. It may be beneficial for an ERAS program's long-term effectiveness to be aware of these challenges as you create and improve your plan.

The process of successful change management and ERAS implementation includes several steps, including the development of a change initiative, implementation or trial of the pathway, sustained change with ongoing improvement, and leadership, the creation of a climate for change, engagement, and empowerment of those involved.The introduction of ERAS programs has prompted anesthesia nurses to familiarize themselves with the shared values and evidence-based best practices that form the basis of ERAS.

The active participation of nurses in multidisciplinary teams and opportunities for them to promote the best possible care for patients are necessary for the successful implementation of ERAS programs.

The successful implementation of ERAS programs depends on nurses' active involvement in multidisciplinary teams and chances for them to promote the best care for patients. Practitioners must be open to learning and applying novel, at first seem unconventional health care principles in order to foster a practice environment where the benefits of the ERAS philosophy of practice can be recognized.

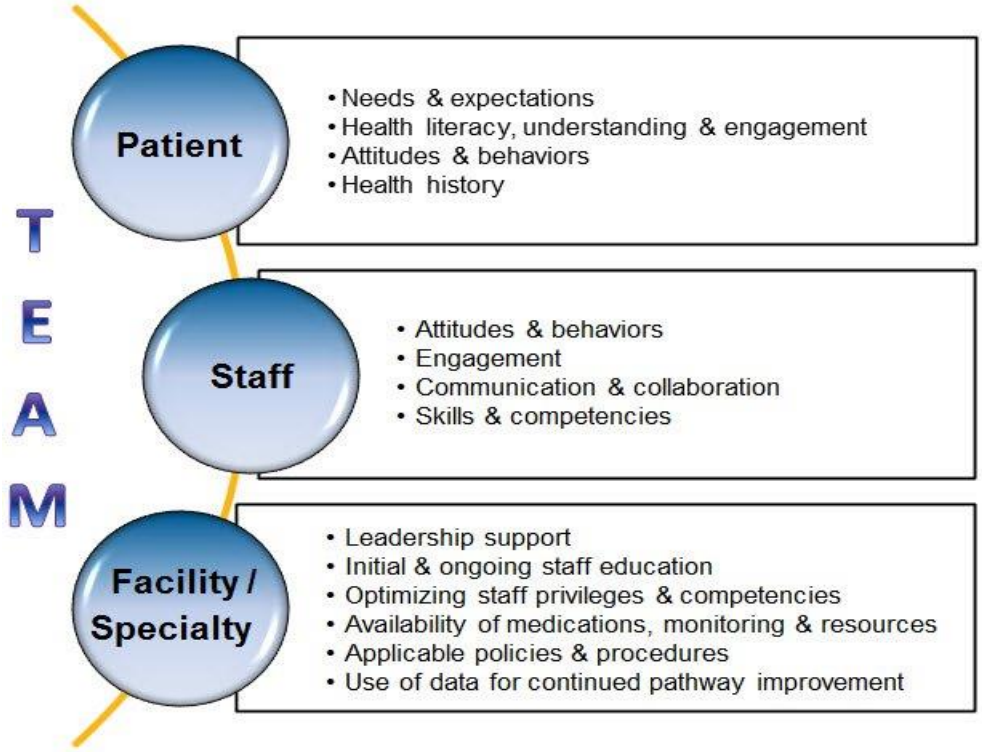

Figure 1. Team collaboration

Before being admitted, all patients should receive surgery-related information and counseling that explains the procedures and their involvement in the healing process. The nurse provides thorough instructions on how to perform laparoscopic surgery, use a mid-thoracic epidural, prevent fluid overload, and use a low-dose laxative like magnesium oxide. I.V. long-acting opioids should not be used during standard anesthesia, and a mid-thoracic epidural should be activated prior to the start of operation. PONV should be averted if two or more risk factors are present, and treatment should begin straight once using a multimodal approach.

Mid-thoracic epidural analgesia should be maintained for roughly 48 hours while providing explanation, education, and analgesia. For instance, following colonic resections and 96 hours following pelvic surgery.

Paracetamol should be added before beginning non-steroidal analgesics once the epidural has been removed. As the cornerstone of postoperative nutritional therapy, oral supplements should be given twice to three times per day following surgery until a regular food intake is achieved. For a few weeks following surgery, deficient individuals should continue taking oral supplements.

Patients should be awake for 2 hours out of bed on the day of surgery, with the intention of increasing that to 6 hours each day starting the following day. The multimodal analgesic approach is employed while treating postoperative pain because it has the advantage of reducing side effects and of treating pain through numerous cellular pathways.

Additionally, patients receive multimodal analgesia to improve postoperative pain management and speed recovery. Multimodal analgesia is the administration of two or more medications, either through the same route of administration or through distinct routes, each of which acts by a different mechanism to provide analgesia.

Therefore, the goal of multimodal analgesia is to increase pain relief while decreasing the need for opioids and the negative effects associated with opioid use. Opioids, local anesthetic methods, peripheral nerve blocks, epidural, and anti-inflammatory medications are some analgesic modalities that are currently accessible for postoperative pain management.

The care and pathways constitute an integrated continuum as the patient goes from home through the pre-hospital and preadmission, preoperative, intraoperative, and postoperative phases of surgery and discharge. The hospital will be in charge of giving assistance and knowing how to contact the patients, and the ERAS discharge plan covers the therapy and support the patient will get before being discharged.

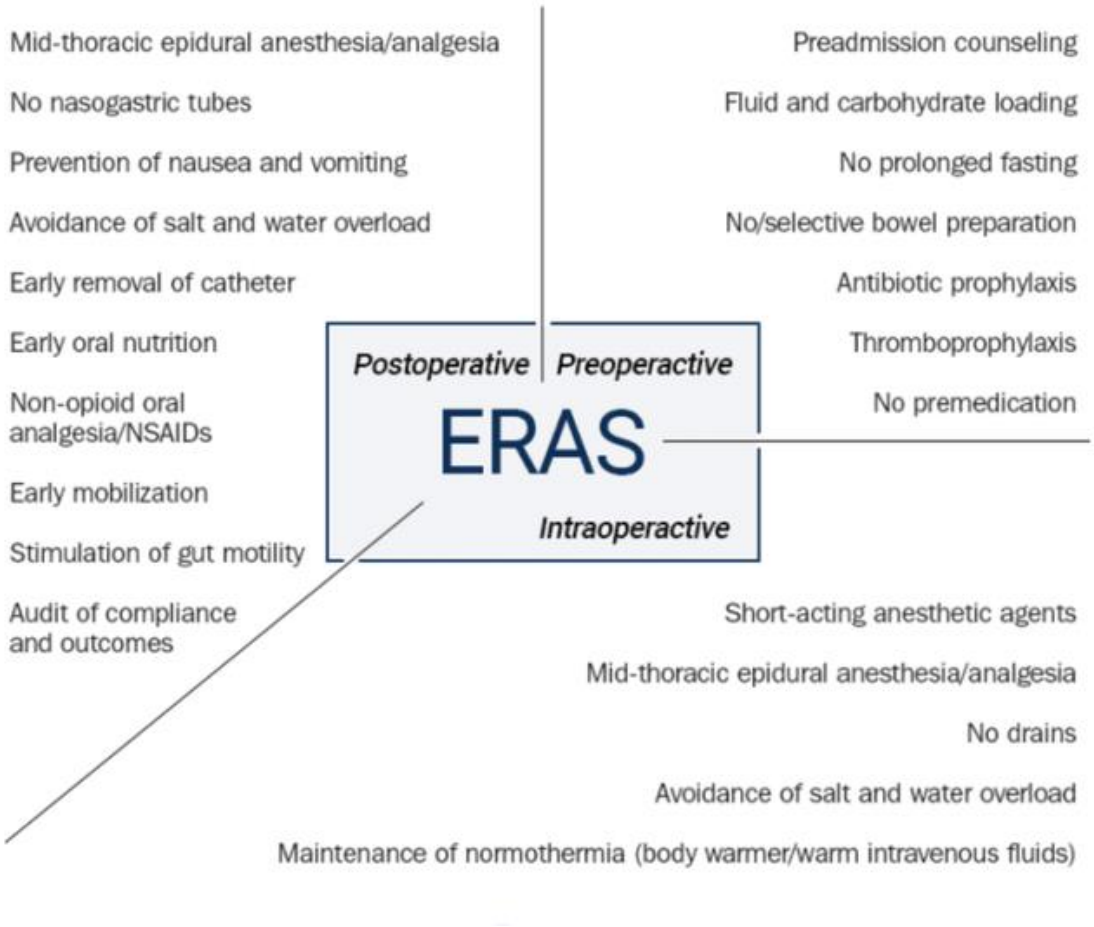

Figure 2. The steps of the patient before during and after the surgery.

4.2 Strategies of the hospital

4.2.1 Pre-hospital Strategies

The Pre-Hospital strategies starts by the counseling and supports via in-person meetings in the hospital or in the clinic by the on-site of event medical providers to develop treatment protocols for the management of serious patient concerns and stress about the procedure. Also prepare the patient bowl habit preparation by the fluid input and output management and health education for the medication use during the surgery and after the surgery and the purposes of it like the antibiotics to prevent the infection.And which route the drug will be administered for the majority of pharmaceuticals used in prehospital settings, the IV route continues to be the preferred way of delivery. By that point, the majority of patients have numerous inquiries and

expectations regarding the procedure and its results. The ERAS coordinator meets with the patient and clarifies and answers all of their questions. Pre-hospital fasting for examination must be a last resort.

ERAS regulations require a minimum fasting period of 6-12 hours for food and 2-5 hours for clear fluids to have elapsed before elective anesthesia or sedation in healthy people. The heart and lungs may not function as they should if smoking and drinking alcohol continue after the surgery. There is a higher risk of acquiring pneumonia and a respiratory condition if there are breathing issues before, during, or after surgery.

4.2.1.1 These key aspects of the ERAS protocols for the pre-hospital visit

- All patients should receive counseling should be provided to all patients via in-person classes.
- Comply with all prescriptions, such as for antibiotics and bowel preparation.Meeting with ERAS Coordinator, Surgeon and Anesthesia.
- Information on how to reach the nurses and doctors.
- Optimization and risk management to determine optimization needs, look at your history and physical.
- Enhanced recovery education and patient/caregiver expectations.
- Guidelines for fasting and details on CHO beverages.
- Quit smoking 4 weeks before surgery.
- Quit from alcohol 4 weeks before surgery

4.2.2 Preoperative strategies

The preoperative phase involves getting the patient physically and psychologically ready for surgery. Interventions are made to treat or lessen the patient's medical issues as well as to inform and support them during their surgical procedure. Guidelines and tactics for preoperative care the patient's medical history, a thorough physical exam, the results of any laboratory testing, and the blood type and crossmatch should all be done. The nurse is addressing the desired goal that the patient exhibits awareness of expected responses to the operational or invasive procedure by giving the patient the proper information and assistance during the preoperative phase.

Data gathering through patient assessment, patient and family education, emotional support, care planning for the intraoperative and postoperative periods, and patient communication with other members of the healthcare team are all nursing activities that are prioritized during preoperative planning. In order to address desired patient outcomes, such as skin integrity, electrolyte balance, injury- and infection-free status, and patient engagement in recovery, data from the preoperative evaluation is provided.

Electrocardiogram (ECG), chest x-ray, diagnostic techniques, written instructions for the patient, and informed consent. A number of perioperative conditions (including diabetes, anemia, and heart disease) will need to be specifically assessed in order to make sure they are optimized and that the right plans are developed for the perioperative pathway.

Pre-anaesthetic medications with long half-lives should be avoided. Use of antithrombotic prophylaxis is advised. A single dose of prophylaxis against both aerobes and anaerobes should be given an hour before surgery. The patient's medical history, thorough physical exam, laboratory test results, blood type, and crossmatch should all be obtained. Electrocardiogram (ECG), chest x-ray, diagnostic procedures, patient instructions in writing, informed consent, and signing.

To ensure that they are optimized and that the proper plans are established for the perioperative pathway, a variety of perioperative conditions (such as diabetes, anemia, and heart disease) will need to be specifically evaluated. Additionally, it should be strongly encouraged for all patients to stop smoking at least one week prior to surgery, with four to six weeks prior to surgery being ideal.

The use of early nutritional therapy for patients who are at a high risk of postoperative complications may be aided by nutritional status. As a result, the preoperative nutritional state needs to be a crucial factor in deciding which individuals will undergo surgery, and it will vary depending on the kind of procedure the patient will have.

Preoperative health education for patients to reduce the risk of complications and let the patients understand their surgery preparation and also any intervention delivered before surgery that aims to improve patients’ knowledge, health behaviors and health outcomes. Preoperative instruction can significantly reduce patient's anxiety before surgery.

By often communicating with the nurse, patients might lessen their preoperative worry. To lower the risk of aspiration, preoperative lengthy fasting is required according to ERAS standards. The recommended fasting period of 6 to 8 hours is typically increased to 12 to 16 hours for a variety of patient health concerns. Additionally, two hours prior to surgery, the patient should consume clear liquids and a carbohydrate-rich drink.

Bowel preparation, also known as bowel prep, is the process of making sure a patient's bowels are empty before surgery. A clear liquid diet is also recommended, laxatives are taken orally the day before surgery, and the patient is encouraged to follow this diet.

Antibiotics must be used by patients within 120 minutes of the surgical incision in order to reduce the risk of hospital-acquired infections and infections at the surgical site. Thromboprophylaxis, which advises patients to utilize it to avoid developing deep vein thrombosis (DVT) following surgery, uses mechanical means to encourage venous outflow from the legs.

In low rectal resections where the diverting stoma is intended, preoperative bowel preparation should be avoided in colonic surgery. Patients should be given clear liquids high in carbohydrates up to 2 hours before general anesthesia and surgery to prevent preoperative nocturnal fasting.

4.2.2.1 These key aspects of the ERAS protocols are specific to preoperative preparation

- Identification and treatment of medical comorbidities as soon as possible
- Stop smoking.
- enhanced nutritional condition.
- Getting ready for optimal physical fitness Pre-admission instruction should cover what to expect in terms of postoperative care and recovery.
- lessen the patients and their families' preoperative worries.
- Educate patients about reasonable expectations compliance with current recommendations for fasting (reduction of extended fasting).
- Clear fluid and carbohydrate-rich drink loading 2 hours before surgery.
- Absence of regular bowel cleansing treatments and selective bowel preparation.
- antimicrobial prophylaxis that is appropriate.
- Appropriate thromboprophylaxis.

4.2.3 Intraoperative strategies

The intraoperative phase lasts from the time the patient is brought into the operating room until they are moved to the recovery area. Nursing care for patients undergoing intraoperative care comprises specialized understanding on how to carry out a surgical procedure in a secure and efficient manner. Surgery carried out under local or regional anesthetic enables the patient to stay in a secure state of health.

The nurse ensures that the intraoperative setting is safe for the induction of anesthesia by verifying the gas supply, the gas cylinder machine's readiness for use, the O2 supply, the location of the emergency tray, and the recording of all medications that the nurse anesthetist deems necessary.

Using critical thinking abilities, the surgical team must also manage the patient's nursing care and coordinate the requirements of each procedure's team members. The patient's condition is also evaluated by the nurse before, during, and after the procedure.The intraoperative phase also includes the time the patient is brought into the operating room, the anesthesia is given, the procedure is completed, and the patient is transferred to the recovery area or post-anesthesia care

unit (PACU). The anesthetic agent is a medication used to produce anesthesia and cause a brief loss of sensation or awareness throughout the course of the procedure. Additionally, opioid-sparing analgesics include acetaminophen administered orally and intravenously (IV), as well as anti-inflammatory medications that can be administered in a variety of ways and anticonvulsants, which are particularly effective for neuropathic pain brought on by trauma.

Venous thromboembolism (VTE) prevention consists of methods to lower the risk of deep vein thrombosis (DVT) and pulmonary embolism (PE). Normal saline must be regulated in order to prevent any situation where salt retention is undesirable, such as edema, heart disease, fever, and infections. Nasogastric tubes are used after abdominal surgery to improve patient comfort, expedite the restoration of bowel function, avoid pulmonary problems, and reduce hospital stay. Patients receive a balanced electrolyte solution throughout the intraoperative phase to replace sensible and insensible losses like blood loss or body dehydration. The use of warming blankets is a common method of maintaining normothermia and preventing heat body loss.

During surgery, the body temperature should be controlled with an upper-body forced-air heating cover. To avoid both hypo- and hypervolemia, balanced intraoperative fluids are required. Intraoperative goal-directed fluid therapy should be considered on an individual basis.

Although it may be advised to use drains temporarily for resections below the peritoneal reflection, they are typically not advised for resections above this level. While suprapubic drainage is suggested for pelvic surgery, urethral catheters can also be used for colonic resections. Urinary catheters can be removed after 24 hours.

4.2.3.1 These key aspects of the ERAS protocols are specific to intraoperative patient care

- Usage of short-acting anaesthetic agents.
- Support rapid emergence and recovery.
- Opioid-sparing pain management.
- DVT prophylaxis.
- Restrict use of normal saline.
- Multimodal techniques to include pre-emptive regional anesthesia/analgesia.
- Avoidance of postoperative drains and nasogastric tubes help minimize discomfort and support early mobilization.

- Judicious management of intraoperative fluid replacement
- Maintenance of normothermia (body warmer/warm intravenous fluids).

4.2.4 Postoperative strategies

Prompt pain control, evaluation of the surgical site and drainage tubes, monitoring of the rate and integrity of IV fluids and IV access, evaluation of the patient's level of sensation, circulation, and safety, and monitoring of vital signs, airway patency, and neurologic status are all required ERAS protocols during the postoperative phase. Additionally, the healing process and recovery from surgery have started, the nurse must also supervise all dressing adjustments, local incisional care, removal of cutaneous sutures and staples, tube removals and changes, removal of tracheostomy tubes, and patient discharge services.

After major surgery, there may be three different postoperative phases: the immediate or post-anesthetic phase, the intermediate phase, which includes the hospitalization stay, and the convalescent phase. Quick pain management, examination of the surgery site and drainage tubes, monitoring the flow and integrity of IV fluids and IV access, and determining the patient's level of sensation, circulation, and safety are all included in postoperative care.

After thoracic and major surgeries, midthoracic epidural analgesia provides the best perioperative anesthesia and analgesia, reduces postoperative morbidity and mortality, and does so primarily by blocking sympathetic nerve fibers. In order to prevent nausea and vomiting during the postoperative, the use of regional anesthesia is advised and the patients should be avoiding reversal of neuromuscular and the patients must be kept well hydrated, well-oxygenated and using low doses of opioids.

Early enteral feeding following surgery lowers the chances of wound infection, pneumonia, intra-abdominal abscess, and anastomotic dehiscence; the patient's surgical type will determine the patient's nutrition status and type of nutrition. Following surgery, the patients were instructed to engage in regular aerobic exercise to improve gut motility. In order to achieve accelerated recovery after surgery (ERAS), early mobilization is essential and may lessen these postoperative issues. The ERAS advises that indwelling urinary catheters be removed within 48 hours of surgery in order to decrease catheter-associated urinary tract infections. The amount of

salt in the water must be kept to a minimum, especially during cardiac procedures, to avoid postoperative hemodynamic instability.

4.2.4.1 These key aspects of the ERAS protocols are specific to postoperative patient care

- Midthoracic epidural anesthesia/analgesia.
- Implementation of multimodal opioid-sparing analgesia to avoid delayed gut function.
- Avoid salt and water overload
- Prevention of nausea and vomiting.
- Early oral nutrition as tolerated.
- Stimulation of gut motility.
- Restricted amounts of intravenous fluids.
- Early mobilization.
- Early removal of urinary catheter.
- Decrease postoperative fasting period.

4.3 Educational Content and Tools

The following three areas of education were covered: an overview of ERAS and the ERAS protocol concept:

Module 1: Introduction to Surgery (Stages and Preparation for Surgery Basics).

Module 2: overviews of ERAS (definition of ERAS, preservation of normal physiology, stress during surgery, complications or readmissions, clinical characteristic).

Module 3: Evidence-Based Guidelines for ERAS.

The syllabus will be the same for study and control groups

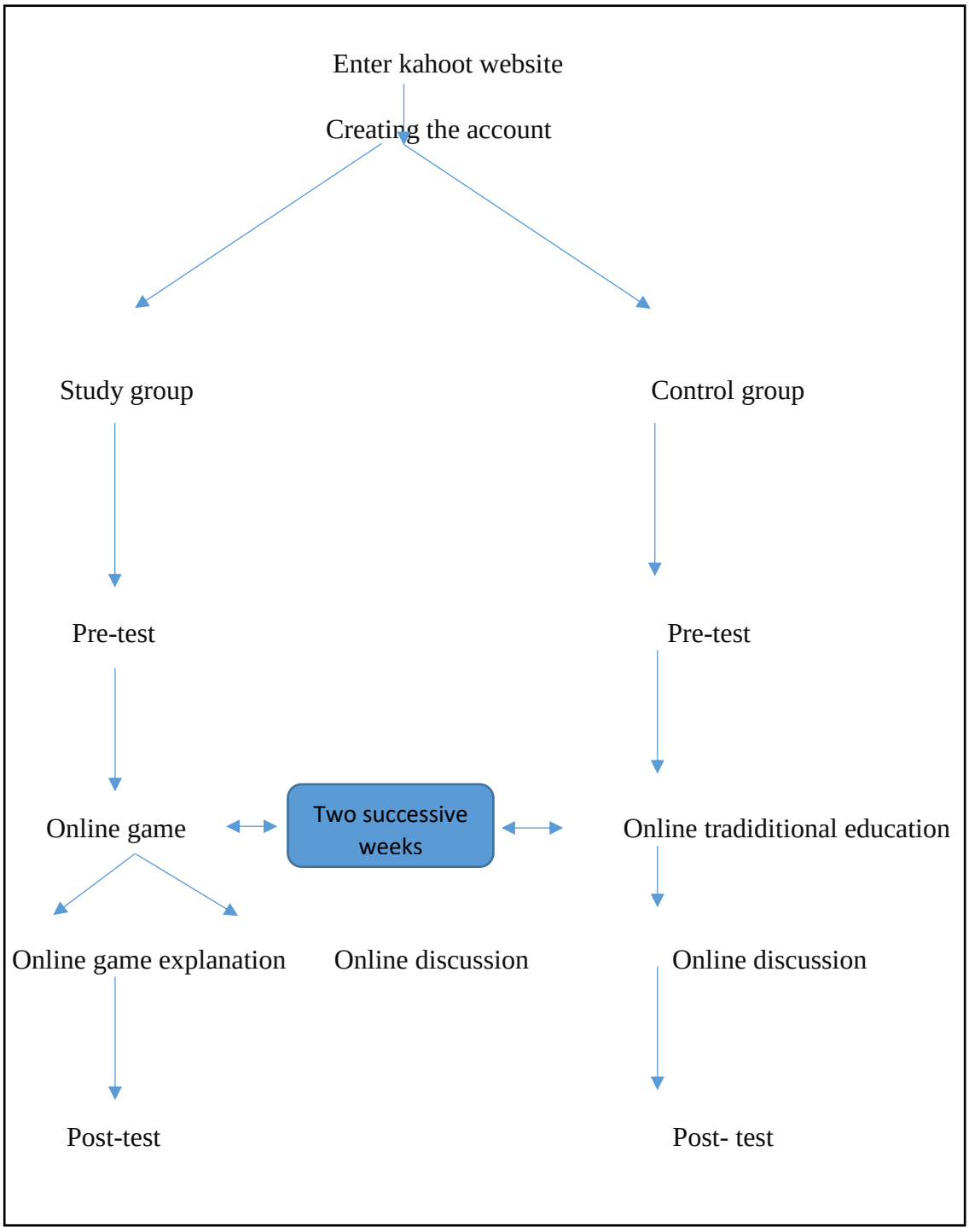

Figure 3. Study implementation

Pre- and post-testing were part of a three-phase ERAS education program that involved both groups. The researchers collaborated with the nursing faculty during the pre-phase to schedule an

appropriate time for the game, explain to the students the aim and objective of the study, and show them how to register for an online learning platform.. Following the assignment, we divided the participants into the control group and the experimental group at random. As a further assurance, participants who withdrew from the study were informed that they would not be exposed to risk in the future and that their results had been converted to missing data. The participants in this study were voluntary, did not receive any incentives, and had the right to withdraw from any phase. Additionally, data were saved and entered using numerical codes into the SPSS program.

5. Experimental group

5.1 Pre-test

An email asking for account creation for an online game was sent to the experimental group. After the student created an account and the researcher registered for a pre-test exam (ERAS Knowledge Evaluation Form) to assess their knowledge, the game took 40 minutes to finish.

5.2 Intra- phase

Students have access to an online classroom during the intraphase, which will take 20 to 25 minutes to help the students comprehend the game's rules and content. The instructor prepared an online conversation after the lecture. Additionally, students should use the official Kahoot website or application to play from the website page. By entering the PIN code and their nickname via Kahoot, the students' Players participate in the game using their own devices, such as a phone or computer. Once they've located a Kahoot, they'll see the play icon, click it, choose the game, and when prompted to enter a code, they'll do so. The game will then begin.

Once they signed up for the online game, they received an e-code message indicating that they were ready to participate in the study. The researchers made plans with the adviser to reserve the necessary time and permission to explain to students the aim and objective of the study as well as how to access the code for the online game. Additionally, the game will be played in total privacy and secrecy. The duration of the game was 30 to 45 minutes.

The online game will be created using Kahoot. It is a gaming-based learning tool that is employed in educational institutions like schools. Its multiple-choice quizzes, or "kahoots," are

educational activities that may be accessed by a web browser or the Kahoot app. A code to enter the game will be given to the kids who want to enter it. Students who will join our online game; will send an e-mail message that meaning this student is ready to participate in the study. Each student using Kahoot would need to have access to a device (laptop, iPad, phone, etc.) as the organizer would set up a series of questions and trivia. Participants would be given a specific amount of time to respond to questions that were posted. Everyone is playing simultaneously. Since the questions only display on the organizer's screen, the Kahoot organizer would need to be able to share their screen with the participants. The questions dealt with enhanced post-operative recovery and were true-false.

The launch configuration also lets you enable or disable a name generator. When the game first starts, all of the players appear on the examination screen. and a counter that indicated how many students was present was updated. The teacher has the right to execute a student if they use any offensive nicknames. The teacher clicked the "Start" button on the lobby screen to begin the game. Additionally, there is a screen in the center that displays the distribution of answers along with which answers were correct after the students begin the questions. Additionally, the scoreboard displays the top five players, and each student's screen displays their score for the previous question, overall score, rank, distance from the player in front of them, and answer streak. By the end of the game, the students can also give the quiz a star rating of one to five, indicate whether they learned anything from it, whether they would recommend it, and whether they felt happy, indifferent, or sad.

5.3 Post-test

In the study's posttest phase, which essentially duplicates the pretest measure (second half of the ERAS Knowledge Evaluation Form), students in the online classroom group were asked to answer two open-ended questions about the advantages and disadvantages of improved recovery following surgery.

6. Control group:

6.1 Pre-test

A pre-test exam (the ERAS Knowledge Evaluation Form) will be given in the virtual classroom to the control group.

6.2 Intra- phase

The teacher will set the time for the online session, give a lecture the week before with the same information on PowerPoint slides, and offer printouts for each subject.

6.3 Post-test

In the end, the online session will conclude with a review of the pretest material (second section of the ERAS Knowledge Evaluation Form).

7. Ethical aspects

The information collected from the students will be kept private and confidential, and they shouldn't ever feel pressured to participate in the study. The students grades and GPA won't be impacted by this study. The Near East University's institutional review board (IRB) and ethical committee approved the study's application.

8. Analysis of data

SPSS Software Statistics is used for interactive or batch statistical analysis.Frequencies, cross-tabulation, and bivariate statistics are just a few of the fundamental statistical operations offered by SPSS's Statistics software.Additionally, it makes use of percentages and frequencies for categorical variables to analyze descriptive statistic variables.Version 20.0 of the Statistical Package of Social Sciences (SPSS) program.

When a statistic was found to be significant, $p < 0.05$ was used as the level of significance. The following knowledge classification was based on the typical correct responses for each domain: Excellent knowledge level is defined as having an average correct answer rate of 80% or higher. Very Good knowledge level is defined as having an average correct answer rate between 60% and 79%. Good knowledge level is defined as having an average correct answer rate between 40% and 59%. Weak knowledge level is defined as having an average correct answer rate of 39% or less.

CHAPTER III

9. RESULTS

Table 1. Descriptive characteristics of students (N: 80)

Characteristics	***Control***		***Experimental***		***P value***
	N	**%**	**N**	**%**	
Gender					
Male	41	51.97	24	56.34	.24
Female	39	48.03	16	43.66	
Received ERAS courses					
Received	71	91.10	28	61.10	.41
No	9	8.90	12	38.90	
Age (Mean 38.04±28.86**)**					
< = 25	69	88.11	27	60.97	.39
26 – 30	7	9.57	10	36.80	
> =31	4	2.32	3	2.23	
CGPA (Mean 64.48±19.37**)**					
< = 68	29	33.24	12	39.89	.59
70-80	39	49.68	21	51.78	
> =90	12	17.08	7	8.42	

The students average age was 38.04±28.86. The average age was < =25 (88.11%) for the control group and 60.97% for the experimental group. Before the start of the current study, the majority of the students in both the control group (91.10%) and the experimental group (61.10%) took

ERAS courses. With 51.97% of the male population in the control group and 56.34% in the experimental group, the male population was also higher than the female population. The majority of the students had cumulative grade point averages (CGPA) between 70 and 80, with the experimental group having a higher CGPA (51.78%) than the control group (51.68%). In terms of descriptive features, there was no statistically significant difference between the control and experimental groups, demonstrating the homogeneity of the groups ($p>0.05$).

Table 2. The frequency of the correct answers by students regarding preoperative care knowledge of Enhanced Recovery after Surgery (ERAS) (N=80)

ERAS Knowledge	***Experimental group (N=40)***				**Control group (N=40)**			
	Pre-test		***Post-test***		***Pre-test***		***Post-test***	
Preoperative care knowledge of ERAS	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
1. Prior to the surgery, pre-admission counselling for patients must be provided.	19	50.11	36	96.37	35	95.74	39	99.10
2. The goal of patient optimization prior to surgery is to minimize the risk of postoperative complications and decrease the length of stay in the hospital and figure out what issues stand between patients and a surgical solution to their problems.	37	98.14	34	95.10	33	94.81	37	98.19
3. Thromboprophylaxis or anti-embolism stockings are recommended after surgery to prevent the development of DVT and embolic events.	30	90.91	35	95.27	23	53.10	31	91.25
4. Patients are most successful when they are able to actively engage in lifestyle activities, such as exercise to lose weight or stop smoking prior to surgery.	26	59.30	31	91.25	30	90.91	38	98.80

5. Premedication is recommended by the ERAS routinely to prevent amnesia, drowsiness, cognitive impairment, and anxiety.	28	63.88	36	97.81	28	63.88	36	97.74
6. Prior to the surgery, a health education for patients and their families is important to increase knowledge and clarify misconceptions and learn strategies to cope up with psychosocial responses to disease and disability.	31	91.25	34	95.64	33	94.81	39	99.10
7. Mechanical bowel preparation or enema is indicated routinely prior to surgery to clear fecal material from the bowel lumen.	29	64.74	40	100	22	52.90	27	62.92
8. To help the risk of postoperative infections the nurse should administer antibiotic prophylaxis (cefazolin) within one hour before surgical incision, with the physician order.	33	94.81	34	94.87	30	90.91	38	98.80
9. Smoking and alcohol consumption should be avoided preoperatively, since they can alter hepatic metabolism and impair wound and tissue healing.	20	50.84	36	97.81	28	63.88	36	97.74
10. One day prior to the surgery the patient should load carbohydrates and fluid by taking 5 to 7 grams of carbohydrate per kilo of patient weight and 2.7 liters of fluids.	30	90.91	38	98.91	21	51.83	33	94.81
11. Before the surgery the patients were advised to take light meals up to 6 hours	36	97.74	40	100	40	100	38	98.80

and carbohydrates beverages up to 2 hours before the surgery and clear fluids up to 2 hours prior.								

Table 2 presents the frequency of the correct answers by students regarding preoperative, intraoperative, postoperative and general knowledge of ERAS. Result showed an increase of the correct answer rates in posttest for the majority of the items in both groups regarding knowledge of ERAS.

Preoperative ERAS knowledge results revealed that in the experimental group, entirely of the students answered with full correct answers (100%) in posttest for items 7 and 11. Moreover 98.91% of them answered the item 10 correctly. The least frequent correct answer was for item 4 (91.25%) in posttest. Control group students' most frequent correct answers were in items 1, 6 (99.10%) and items 4, 8 (98.80%) in posttest.

Table 3. The frequency of the correct answers by students regarding Intraoperative care knowledge of Enhanced Recovery after Surgery (ERAS) (N=80)

ERAS Knowledge	***Experimental group (N=40)***				**Control group (N=40)**			
	Pre-test		***Post-test***		***Pre-test***		***Post-test***	
Intraoperative care knowledge of ERAS	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
1. Muscle relaxants and short-acting anaesthetic agents such as alfentanil can be used for pain relief.	39	99.21	35	95.84	30	89.80	33	93.61
2. Hypovolemia is an expected condition and normovolemia cannot be provided during the surgery.	34	94.10	37	97.87	40	100	35	95.10
3. The purpose of administering the mid-thoracic epidural anaesthesia is to block pain fibres from the surgical site and to	30	89.80	34	94.10	36	96.10	38	98.29

block the adrenal glands; therefore, reduce the metabolic and endocrine response, enhance the performance of respiratory, cardiac, gastrointestinal and metabolic benefits.								
4. Euvolemia through goal-directed fluid therapy is maintained through cardiac function monitoring for high-risk patients.	30	89.80	34	94.10	40	100	35	95.10
5. Hypothermia should be prevented by using a body warmer, warm intravenous fluids, an open area heating system, and covering the patient with a blanket.	34	94.10	39	99.21	36	96.10	39	99.21
6. Drains are recommended routinely to remove the secretions.	30	89.80	40	100	34	94.10	40	100

Table 3 shows the intraoperative care knowledge of ERAS, in the experimental group, all of the students answered full correct answers (100%) in posttest for item 6 and 99.21 % of them answered the item 5 correctly. All of the control group students answered item 6 (100%) and 99.21% of them answered item 5 correctly in posttest.

Table 4. The frequency of the correct answers by students regarding Postoperative care knowledge of Enhanced Recovery after Surgery (ERAS) (N=80)

ERAS Knowledge	***Experimental group (N=40)***				**Control group (N=40)**			
	Pre-test		***Post-test***		***Pre-test***		***Post-test***	
Postoperative care knowledge of ERAS	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
1. Fluid and salt overload should be provided to prevent postoperative hypovolemia.	28	69.40	30	91.74	29	70.10	39	99.12
2. The nurse should educate the patient and patient family to prevent and deal with any postoperative complication.	32	93.21	36	97.90	36	97.90	40	100
3. Early mobilization after surgery can improves blood flow, speeds wound healing and prevent the hospital acquired infections and long stay in hospital.	39	99.12	40	100	40	100	33	93.91
4. Multimodal analgesia is current postoperative pain management strategy which combines local anesthetics, opioids and NSAIDs for prevention of all intensity types of pain.	37	90.12	39	99.12	31	91.93	35	95.10
5. Postoperative nasogastric tubes are recommended to hasten the return of bowel function, and prevent pulmonary complications and increase patient comfort and shorten hospital stay.	36	97.90	37	98.39	40	100	38	98.20
6. The nurse can encourage early mobilization unless otherwise to prevent complications, eg. DVT.	39	99.12	40	100	34	94.23	36	97.90
7. Before discharge, the nurse should instruct the patient on any risk factors that can increase the complication after the surgery and how to prevent them.	27	68.64	30	90.10	32	93.21	37	98.11
8. In order to prevent the nausea and vomiting after the surgery the nurse should administer antiemetic medications with the physician order.	35	95.10	38	98.79	29	70.10	34	94.23
9. Early oral nutrition is not recommended after surgery, oral feeding should begin after 24-48 hours postoperatively.	39	99.12	40	100	37	98.11	40	100
10. Early removal of nasogastric tubes, urinary catheters, and drains help promote postoperative feeding and mobilization,	40	100	40	100	40	100	38	98.20

avoid dehydration and promote patient comfort.								
11. In post-discharge period, continuity of the care is important and patients are scheduled for follow-up appointments.	26	67.84	30	90.10	32	93.21	37	98.11

Results on table 4 showed that, all of the experimental group students answered correctly items 3, 6, 9, and 10 (100%) in posttest regarding postoperative care knowledge of ERAS. In the control group, entirely students have answered correctly items 2 and 9 (100%). Moreover, a 99.12% of them have correct answers in item 1.

Table 5. The frequency of the correct answers by students regarding General care knowledge of Enhanced Recovery after Surgery (ERAS) (N=80)

ERAS Knowledge	***Experimental group (N=40)***				**Control group (N=40)**			
	Pre-test		***Post-test***		***Pre-test***		***Post-test***	
General care knowledge of ERAS	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
1. Studies show that there is no relation between implementation of ERAS protocols and healthcare-associated infections.	31	91.80	40	100	34	94.10	40	100
2. Benefits of ERAS implementation include shorter length of stay, decreased postoperative pain and more rapid return of bowel function and decreased complication and increased patient satisfaction.	30	90.74	34	94.97	40	100	35	95.41
3. ERAS pathways were developed with the main goal of maintaining normal physiology in the perioperative period and optimizing patient outcomes without increasing postoperative complications and readmissions.	32	92.27	36	96.15	36	96.13	40	100
4. ERAS analysis on surgical patients showed a significant decrease in postoperative morbidity by the hospitals and health centres implementing the protocols.	38	98.94	39	99.81	40	100	39	99.10

5. The goal of decreasing surgical stress and helping the body to consequences of such stress is achieved by the implementation of the ERAS protocols and guidelines.	28	70.88	32	92.27	31	91.80	40	100

Regarding the general knowledge and protocols care knowledge of ERAS, in the experimental group, all of the students answered item 1 (100%) and 99.81% of them answered item 4 correctly in posttest. Results showed full correct answer rate for items 1, 3 and 5 (100%) in the posttest of the control group.

Table 6. Comparison of the means of the correct answers of the knowledge of Enhanced Recovery after Surgery

Knowledge of enhanced recovery after surgery	**Number of items**	**Correct answer means**					
		Pre-test			**Post-test**		
		Control group	**Experimental group**	**t.p**	**Control group**	**Experimental group**	**t.p**
		Mean±SD	**Mean±SD**		**Mean±SD**	**Mean±SD**	
Preoperative care knowledge of Enhanced Recovery after Surgery	11	6.47±2.01	5.87±1.95	.431 .174	7.78±.1.75	10.44±12.4	5.411 .000
Intraoperative care knowledge of Enhanced	6	4.20±1.02	3.91±1.11	.362 .125	5.31±2.47	5.70±1=3.50	4.719 .000

Recovery after Surgery							
***Postoperative* care knowledge of Enhanced Recovery after Surgery**	11	5.24±1.32	5.81±1.41	0.640 .317	7.47±2.45	10.51±2.84	6.135 .000
***General knowledge about the protocols and the* care knowledge of Enhanced Recovery after Surgery**	5	3.21±1.17	2.87±1.34	0.249 .113	4.31±1.01	4.95±2.13	-1.4 .000
Overall Values	33	5.10	3.10	2.14 .137	7.10	9.52	6.01 .000

Table 6 compares the students' correct answer means on the pre- and posttests for Enhanced Recovery after Surgery. For all aspects of the increased recovery after surgery, there was no statistically significant difference between the experimental and control groups in the pretest ($p>.05$). On the other hand, a statistically significant difference between control and experimental groups correct answer means in post-test ($p<.05$). The experimental group students' correct answer means were greater than the control groups' mean values across all dimensions of the accelerated recovery following surgery. Although there was no statistically significant difference between the overall knowledge means of the control and experimental groups in terms of the descriptive

characteristics, a comparison of the students' characteristics and overall knowledge means of enhanced recovery after surgery did not reveal this ($p>.05$).

Table 7. The satisfaction of the nursing students from game-based learning (N=40)

Items	Very satisfied		Somewhat satisfied		Neither satisfied nor dissatisfied	
	Mean	SD	Mean	SD	Mean	SD
Graphical design for game-based learning	7.03	3.81	4.3	1.9	1.1	.7
Designing game-based learning for improving cognitive of students	6.24	2.52	5.5	2.7	1.7	.8
Game-based learning style can easily be accessed	7.80	3.90	6.3	1.4	1.8	.4

Sequencing play of the Game-based learning for students	8.6	4.41	4.6	1.9	1.8	.6
Transferring knowledge of game-based learning to students	7.30	3.20	5.0	2.1	1.7	.9
Language is clear by game-based learning	6.11	2.44	6.2	1.7	1.9	.3
The benefit of game-based learning to be applied for the classroom	7.71	4.23	6.5	1.8	1.6	.8
Enjoyment from playing the game-based learning	4.80	1.75	5.4	2.5	1.9	.8
Impression in game-based learning	7.87	3.92	4.3	1.9	1.8	.6
Overall satisfaction in game-based learning	6.47	2.79	5.1	1.9	1.7	.2

Table 7 results revealed that the majority of the experimental group's students were pleased with the game-based approach to instruction.

CHAPTER IV

10. DISCUSSION

Game-based learning is gradually becoming a cutting-edge teaching method in the field of nursing education. The primary focus of game-based learning is instructor-based learning, which helps students recall concepts that were previously covered in lectures (Niemi, H., 2017). Because game-based learning is still a relatively new practice, particularly in higher education and nursing school, we who are interested in it at the institution have formed a special interest group. Online learning games can raise students' knowledge and academic achievement. (Rodriguez-Benitez, 2015).

Results from earlier studies suggested that using gaming simulation education as a pre-clinical education tool for surgical nursing students would be a suitable educational approach (Al-Blushi, 2016). The current study's objective was to assess how well nursing students understood ERAS after using game-based teaching methods. The majority of students in both groups had previously taken an ERAS course. In the population, there were more men than women. Additionally, the descriptive characteristics between the control and experimental groups did not differ statistically significantly, illuminating the groups' homogeneity.

The pretest correct answer means of the students for each ERAS domain were compared, and it was discovered that there was no statistically significant difference between the experimental and control groups for any of the ERAS domains. The post-test, however, revealed that in every ERAS area, the correct answer means of the experimental group students beat the mean values of the control groups ($p<0.05$). This outcome demonstrates the potency of the game-based learning approach. This outcome demonstrates the potency of the game-based learning approach. Recent studies have proven that the gaming education technique is an effective teaching strategy for enhancing the learning outcomes of nursing students. In particular, gaming encourages problem-based learning, improves knowledge retention, and increases student engagement in learning among nursing students (Zehler, A,2021).

Students have the opportunity to learn how to collaborate with others in the classroom, which is a crucial ability (Multisilta, J, 2017). Students are more motivated to learn, pay attention, and participate in assigned tasks when playing games. Games encourage students to take ownership of their own learning and to work as a team. They can also be an excellent tool for classroom management and motivation (Hu, J, 2020).

For example, in a study reported by (Alba, B., 2018), during the pretest and post-test scores, students performed better in Group B than Group A with respect to the knowledge score, and the difference was statistically significant between both groups. Several studies in the literature demonstrate a similar outcome for the students regarding the effectiveness of gaming with the current study. Nursing students' motivation, acceptance, and ability to retain knowledge, as well as their willingness to learn more and improve their communication skills, are all impacted by students' preferences for gaming education methods, according to studies done in the past on the subject (Beal, L.C., 2020).

Students noted that GBL was a distinct, engaging, entertaining, and novel learning technique during the game (Carpenter, T.S, 2020). According to a study, GBL helped students understand the subject matter better and had a higher level of student satisfaction than regular tutorials. These games foster self-learning and increased engagement in group learning activities for nursing students by incorporating concepts and adult learning principles and they are also fun. (Gunderson, B, 2017). Another study by (Leeanne, L, 2018) shows that there is a difference and statistically significant and the game was effective.

The game was applied to students related to nursing education and the evaluations of identified games found generally positive results regarding the usability and effectiveness of videogames in nursing education. By becoming actively involved in the learning process, the students' level of understanding and aptitude to integrate and synthesize material is enhanced in the present challenge to find new approaches to make learning more stimulating, motivating, and entertaining (Chavez, O,2017).

The preoperative phase lasts from the time the patient is scheduled for surgery until they are taken to the operating room or surgical suite (Lasater, K., 2018). The outcome of the surgical procedure depends on an efficient preoperative planning process. Results from posttests indicated a pleasing right answer rate for numerous topics pertaining to preoperative care and ERAS knowledge. Accordingly, a study by (Ard N, 2020) show that the scores significantly increasing for every student in the part of the ERAS that was used from the pre- to posttest demonstrates the effectiveness of game-based instruction in relation to the preoperative stage. The teaching-learning strategy, which aimed to promote engagement and knowledge retention, was well received by the students. (Wu H 2019).

In the posttest, the experimental group's most common responses related to bowel preparation and preoperative fasting. Preoperative lengthy fasting before receiving anesthesia is not advised by ERAS recommendations; instead, the normal fasting period of 6 to 8 hours is advised. 2017 (Fearon KC). Regarding daily activities, the correct response was least frequently given. During the pre-test, the students' knowledge of patients' participation in lifestyle activities was at a low level; however, during the post-test, their knowledge improved. In order to help patients, relax and prepare for surgery, ERAS advises patients to adopt healthy lifestyle practices during the preoperative phase, including activities like yoga and jogging. Setting expectations for the surgery and creating a care plan to reduce patients' stress both before and after helps with information, education, and counseling. (Hübner M,2020).

The vast majority of students in the control group are familiar with pre-admission counseling. However, students' knowledge of the subject of preventing the development of DVT and embolic events was low during the pre-test, but it was improved during the post-test. (Rebecca A,2015). Most regular students are familiar with the several forms of infections that can occur during surgery and how to manage them if they do. The implementation of pre-counseling and teaching regarding surgical preparation, as well as the significance of educating patients about antibiotic prophylaxis and associated complications, is advised by ERAS during the preoperative period. (Rebecca A,2015). ERAS advises their patients to take aspirin, employ mechanical and intermittent pneumatic compression devices, and prevent DVT using graduated compression stockings (Svensson PJ, 2020).

Because it safeguards patients by continuously monitoring the central nervous system (the brain, spinal cord, and nerves) when it is at risk during surgery, intraoperative nursing care is a crucial phase for students to understand (Hamilton, B.K, 2015). During the intraoperative ERAS recommend implementing the short transverse and the avoidance of the postoperative drains and most importantly avoiding hypothermia and epidural anesthesia and the prevention of the nausea and vomiting. The majority of the experimental group's students are familiar with hypovolemia and normovolemia, and their proficiency level with regard to the question asking why mid-thoracic epidural anesthesia should be administered rose from the pre-test to the post-test. The majority of students that show up to class are conversant with the topic of hypothermia and how to avoid it during surgery. The majority of students are familiar with drains and how they work.

The majority of the students in the control group are familiar with hypovolemia and normovolemia. The student's level was poor regarding the subject of muscle relaxants and short-acting anesthetic medicines during the pre-test, but it increased during the post-test (Woodid, S,2020). However, during the post-test, students' levels were raised in relation to the item on hypothermia and its prevention. The majority of regular students are fully knowledgeable in the area of drains that are frequently installed and removed. The results of the current study are congruent with those of the one carried out by (Chai, S., 2015) showing that the students have knowledge of intraoperative ERAS care. Another study stated by (Woodid, G, 2020) found that most of the participants showed good knowledge in terms of vein catheter removal and hand hygiene, and flushing and locking cannula.

The application of early removal of the nasogastric and urinary catheterization tubes during the postoperative phase is advised by ERAS, as well as patient education regarding the advantages of early enteral nutrition and how to stimulate bowel motor activity (Scott M, 2017). In the experimental group, students' pre-test scores were as low as they could have been given their lack of familiarity with salt and fluid overload and the need to avoid postoperative hypovolemia. The majority of students are fully knowledgeable on the topics of increased blood flow and early mobilization following surgery (Scott, M,2017).

Additionally, the students provided complete and accurate answers, demonstrating their understanding of the question regarding early mobilization to avoid complications and the porosity of DVT. The pre-test level of students was low, but the post-test level of students grew in relation to the subject of the risk factors that can raise the complication after the surgery. Additionally, in both tests, students demonstrated a high level of knowledge in relation to the item regarding the early removal of tubes and catheters (JeonK.D,2015).

In the control group, pre-test performance in the area of preventing postoperative hypovolemia was at a low level, and post-test performance improved to practically complete full answers. Students' understanding of health education for patients and their families was restricted during the pre-test, but it significantly improved during the post-test for the vast majority of students. Moreover, regarding the prevention of nausea and vomiting after the surgery during the pre-test student performs low and during the post-test the student's level increased continuously. In the oral feeding item, the majority of the students have the information, and during the post-test, their performance was at a complete understanding level.

The use of ERAS and its guidelines will help patients prepare psychologically and physically, learn how to prevent potential infections, prevent difficulties that might occur after surgery, and ensure a favorable post-operative outcome for the patient (Conn LG, 2015). According to the most current findings of the students regarding general awareness about ERAS and protocols care, the majority of students have practical knowledge regarding the application of ERAS protocols and healthcare-associated infections, postoperative complications, and readmissions (Conn LG,2015).

Students in the experimental group had low pre-test awareness about the connection between using ERAS protocols and healthcare-associated illnesses, but their knowledge level had increased by the time of the post-test. Additionally, the student's performance and level improved during the post-test, and their knowledge of the benefits of ERAS implementation during the pre-test was specific. In contrast to the post-test, where answers increased, student performance fell during the pre-test (Cheong, W,2016).

When it came to the implementation of ERAS protocols and healthcare-associated illnesses, the control group's students' knowledge was limited during the pre-test, but most of them answered all the questions correctly at the post-test. The main objective of maintaining normal physiology,

optimizing patient outcomes, and reducing surgical complications was the question on the ERAS that students most frequently answered with full answers during the pre-test to demonstrate that their understanding had increased by the time they took the post-test. On the topic of decreasing surgical stress the student's performance was low in the pre-test with the student's performance during the post-test answered all questions.A similar study by (Cheong, W, 2016) shows that gaming base teaching was reported to have higher scores and was more effective than normal teaching in the way students understand.

A comparison of the student characteristics and ERAS overall knowledge means reveals no statistically significant difference between the control and experimental groups' overall knowledge means in terms of gender, age, the number of ERAS courses taken, or grade point average. Numerous research findings can be found in the relevant literature on this subject. The study's conclusions concurred with one by (Bayram et al,2019), which discovered that both the experimental and control groups' post-test gaming learning abilities were higher than their pre-test scores for nursing students.

Among the students who received ERAS courses the results show that the most of students received and have information related to the ERAS and there is no statistically significant difference in descriptive characteristics of the students. In terms of the CGPA most of the students have a GPA of around 68.

The results showed that most of the experimental group's students preferred the instructional strategy of using games. The kids noted that they liked the graphical design, increased cognition, accessibility, and sequencing play. Students also acknowledged pleasure with the effective information transfer, enjoyable nature, and impact of game-based learning.

According to a study that supports the current study, according to (Almalki SA, 2017), the majority of students claimed that happiness and the game helped them to relax and that they were content with using it and playing it again in the future. Students were also quite happy that game-based learning was being used in the classroom because it is really beneficial. The results of a prior study conducted by (Ali WGM, 2016) demonstrate that students' exposure to and readiness for gaming e-learning is very satisfactory and students' overall satisfaction with e-learning.

Regarding the nursing students' opinions, a majority of the students stated positive views about game-based teaching method (heng b,2020). The study illustrates that the student has previous experience in online gaming before and the majority of students have had online gaming before the current study was implemented. Furthermore, a majority of the students believe that game learning is very useful in only theoretical classes and other clinical classes will not be useful. In a similar study implemented by (heng B, 2020) The most important facilitating aspect for students was a successfully completed course assignment.

Students were very satisfied and wanted to take additional courses in the future because of how nicely the online courses were managed for them. Additionally, in the current study, all participants agreed that online game-based learning is beneficial and that they would continue to participate in it in the future. Most students admitted that they enjoy online gaming for learning and that games have a beneficial influence on them. In a study, students opinions and evaluations on gaming were significantly more positive and upbeat than those in the tutorial group.

The majority of students' comments about GBL were positive, active engagement, enjoyable, and novel (Mayer, S. 2020). An analysis of the benefits of videogames in nursing education, according to a different study, revealed potential gains for decision-making, logistical and motivational support, recurrent exposure, and financial value (Leeanne, L, 2018).

There are a couple of somewhat satisfied students in the item of graphical design for game-based learning as well as the game-based learning style that can easily be accessed and the reason that sometimes the students have an issue in the internet and or issues with their computers that make them hard to enter the game (Mayer, S.2020). The majority of students were pleased and content with the game's graphics and gameplay. The language and medical words that three of the students still did not understand during their studies were another difficulty for them. There were some students who were on the verge of disliking playing the game-based learning, and this was due to the students' schedule being inconvenient since they had exams, were on their study break, or were attending class at the time.

10.5 Strengths of the study

This study demonstrated the benefits of teaching students through gaming, encompassing four categories of abilities such as critical thinking, decision-making, problem-solving, and fulfilment. Students are taught oversight and quick decision-making skills, critical thinking, patience, and the ability to deal with sudden and unforeseen problems in the current study.

10.6 Limitation of the study

Despite the advantages and strengths of this study, there are some issues that need to be resolved. Prior to the exam period, students were reviewed, and the results of the evaluation were evaluated. Second, some students have problems connecting to the internet while doing their homework. Furthermore, this approach can take a lot of time because teachers need to create and prepare the game. Choosing the right game and planning how to use it might be challenging. Additionally, it takes a lot of materials and resources to give the students the most practical knowledge, so some students might struggle with a lack of resources.

10.7 Conclusion and recommendations

The findings of this study show that, when compared to the control group, nursing students' grasp of ERAS was significantly increased by the game-based teaching method to education. The majority of students liked the visual appeal of the game and had fun responding to the questions. Most frequently occurring students were content with the game-based learning approach, and it was simple for them to access. They all agreed that teaching students about game-based learning was their favorite part of the experience, and they were all excited about using it in the classroom. Students can begin to comprehend the learning process with the use of educational strategies. Additionally, strategies aid students in overcoming their areas of weakness and performing at their potential. Strategies can encourage flexible thinking and teach students the value of adapting their approaches to various tasks and methodologies. Technology gives students quick access to knowledge, rapid learning, and enjoyable opportunities to put what they've learned into practice. The game-based learning will enable students to explore new subjects and deepen their understanding of difficult concepts. Important ERAS knowledge gaps have been shown by the study and might be filled by implementing educational strategies that emphasize students' post-graduation careers. Game-based learning can be implemented into nursing courses for better learning results.

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Appendix 1 Ethical Approval Near East Institutional Reviews Board (IRB)

YAKIN DOĞU ÜNİVERSİTESİ
BİLİMSEL ARAŞTIRMALAR ETİK KURULU

ARAŞTIRMA PROJESİ DEĞERLENDİRME RAPORU

Toplantı Tarihi :27.01.2022
Toplantı No :2022/99
Proje No :1480

Yakın Doğu Üniversitesi Hemşirelik Fakültesi öğretim üyelerinden Prof. Dr Nurhan Bayraktar'ın sorumlu araştırmacısı olduğu, YDU/2022/99-1480 proje numaralı ve **"Effectiveness of Game-Based Teaching Method on Nursing Students' Knowledge of Enhanced Recovery After Surgery (ERAS)"** başlıklı proje önerisi kurulumuzca değerlendirilmiş olup, etik olarak uygun bulunmuştur.

Prof. Dr. Şanda Çalı
Yakın Doğu Üniversitesi
Bilimsel Araştırmalar Etik Kurulu Başkanı

Kurul Üyesi	Toplantıya Katılım	Karar
	Katıldı(✓)/ Katılmadı(X)	*Onay(✓)/ Ret(X)*
Prof. Dr. Tamer Yılmaz	✓	✓
Prof. Dr. Şahan Saygı	✓	✓
Prof. Dr. Nurhan Bayraktar	✓	✓
Prof. Dr. Mehmet Özmenoğlu	X	X
Prof. Dr. İlker Etikan	✓	✓
Doç. Dr. Mehtap Tınazlı	✓	✓
Doç. Dr. Nilüfer Galip Çelik	✓	✓
Doç. Dr. Emil Mammadov	✓	✓
Doç. Dr. Ali Cenk Özay	X	X

https://etikkurul.neu.edu.tr/

1. Characteristics of Students **Student Number:**		
1. Age		
2. Gender	□ Male	□ Female
3. Class	□ 1 □ 2	□ 3 □ 4
4. Did you take classes with online gaming education before?	□ Yes	□ No
5. What are the educational resources for Enhanced Recovery After Surgery (ERAS)?	□ School □ Courses □ Web resources	□ In-service education □ Congress/conferences □ Other
6. Do you need for education on Enhanced Recovery After Surgery (ERAS)?	□ Yes	□ No

Appendix 2 Data Collection Tools and Materials

2. Effectiveness of Game-based Teaching Method on nursing student's knowledge of Enhanced Recovery after Surgey (ERAS)	***True***	***False***	***I don't know***
Preoperative care			
1. Prior to the surgery, pre-admission counselling for patients must be provided.	**T**		
2. The goal of patient optimization prior to surgery is to minimize the risk of postoperative complications and decrease the length of stay in the hospital and figure out what issues stand between patients and a surgical solution to their problems.	**T**		
3. Thromboprophylaxis or anti-embolism stockings are recommended after surgery to prevent the development of DVT and embolic events.	**T**		
4. Patients are most successful when they are able to actively engage in lifestyle activities, such as exercise to lose weight or stop smoking prior to surgery.	**T**		
5. Premedication is recommended by the ERAS routinely to prevent amnesia, drowsiness, cognitive impairment, and anxiety.		**F**	
6. Prior to the surgery, a health education for patients and their families is important to increase knowledge and clarify misconceptions and learn strategies to cope up with psychosocial responses to disease and disability.	**T**		

7. Mechanical bowel preparation or enema is indicated routinely prior to surgery to clear fecal material from the bowel lumen.		**F**	
8. To help the risk of postoperative infections the nurse should administer antibiotic prophylaxis (cefazolin) within one hour before surgical incision, with the physician order.	**T**		
9. Smoking and alcohol consumption should be avoided preoperatively, since they can alter hepatic metabolism and impair wound and tissue healing.	**T**		
10. One day prior to the surgery the patient should load carbohydrates and fluid by taking 5 to 7 grams of carbohydrate per kilo of patient weight and 2.7 liters of fluids.	**T**		
11. Before the surgery the patients were advised to take light meals up to 6 hours and carbohydrates beverages up to 2 hours before the surgery and clear fluids up to 2 hours prior.	**T**		
Intraoperative care			
12. Muscle relaxants and short-acting anaesthetic agents such as alfentanil can be used for pain relief.	**T**		
13. Hypovolemia is an expected condition and normovolemia cannot be provided during the surgery.		**F**	
14. The purpose of administering the mid-thoracic epidural anaesthesia is to block pain fibres from the surgical site and to block the adrenal glands; therefore, reduce the metabolic and endocrine response, enhance the	**T**		

performance of respiratory, cardiac, gastrointestinal and metabolic benefits.			
15. Euvolemia through goal-directed fluid therapy is maintained through cardiac function monitoring for high-risk patients.	**T**		
16. Hypothermia should be prevented by using a body warmer, warm intravenous fluids, an open area heating system, and covering the patient with a blanket.	**T**		
17. Drains are recommended routinely to remove the secretions.		**F**	
Postoperative care			
18. Fluid and salt overload should be provided to prevent postoperative hypovolemia.		**F**	
19. The nurse should educate the patient and patient family to prevent and deal with any postoperative complication.	**T**		
20. Early mobilization after surgery can improves blood flow, speeds wound healing and prevent the hospital acquired infections and long stay in hospital.	**T**		
21. Multimodal analgesia is current postoperative pain management strategy which combines local anesthetics, opioids and NSAIDs for prevention of all intensity types of pain.	**T**		
22. Postoperative nasogastric tubes are recommended to hasten the return of bowel function, and prevent pulmonary complications and increase patient comfort and shorten hospital stay.		**F**	

23. The nurse can encourage early mobilization unless otherwise to prevent complications, eg. DVT.	**T**		
24. Before discharge, the nurse should instruct the patient on any risk factors that can increase the complication after the surgery and how to prevent them.	**T**		
25. In order to prevent the nausea and vomiting after the surgery the nurse should administer antiemetic medications with the physician order.	**T**		
26. Early oral nutrition is not recommended after surgery, oral feeding should begin after 24-48 hours postoperatively.		**F**	
27. Early removal of nasogastric tubes, urinary catheters, and drains help promote postoperative feeding and mobilization, avoid dehydration and promote patient comfort.	**T**		
28. In post-discharge period, continuity of the care is important and patients are scheduled for follow-up appointments.	**T**		
General knowledge about ERAS and protocols			
29. Studies show that there is no relation between implementation of ERAS protocols and healthcare-associated infections.		**F**	
30. Benefits of ERAS implementation include shorter length of stay, decreased postoperative pain and more rapid return of bowel function and decreased complication and increased patient satisfaction.	**T**		

31. ERAS pathways were developed with the main goal of maintaining normal physiology in the perioperative period and optimizing patient outcomes without increasing postoperative complications and readmissions.	**T**		
32. ERAS analysis on surgical patients showed a significant decrease in postoperative morbidity by the hospitals and health centres implementing the protocols.	**T**		
33. The goal of decreasing surgical stress and helping the body to consequences of such stress is achieved by the implementation of the ERAS protocols and guidelines.	**T**		

Training Method Evaluation Form for Experimental Group:

1. Write the word positive if you are positive or negative on the boxes below:

Category	positive	negative	Answers and open comments
"Kahoot app" Overall positive			
Overall negative			
"The game platform"			

Overall positive			
"Group learning" Overall positive			

2. Write the word Yes or No in the chosen boxes below (choose one only):

Items					
	Very satisfied	Somewhat satisfied	Neither satisfied	Somewhat dissatisfied	Very dissatisfied
Graphical design for game-based learning					
Designing game-based learning for improving cognitive of students					
Game-based learning style can easily be accessed					
Sequencing play of the Game-based learning for students					
Transferring knowledge					

of game based learning to students					
Language is clear by game-based learning					
The benefit of game-based learning to be applied for the classroom					
Enjoyment from playing the game based learning					
Impression in game-based learning					

Questions:

- Do you know what the online gaming is?
- Have you ever had class as online gaming?
- Do you know what the purpose of online games is?
- Have you ever had a class or exam implement as a game?
- In your opinion do you think is it advantageous to get the classes online game?
- As online gaming do you think is a disadvantage?
- Is the education by the in-class education more accessible as an online game?
- Is online gaming useful?
- Are you satisfied with engaging in an online game class?
- Do you feel is it too difficult to on your schoolwork through online gaming education?
- Does online games education affect your studies in a negative way?
- Do you like online gaming education?
- Do online games affect a positive way and reflect on you?
- In your opinion is there any challenge about the current learning model that you would like to see improved?
- Do you want to work well with the current online gaming and you would like to see continue?
- Is there anything else you would like to share about online gaming engagement at this time?

TURNITIN REPORT

Thesis the last

ORİJİNALLİK RAPORU

%22	%18	%19	%
BENZERLİK ENDEKSİ	İNTERNET KAYNAKLARI	YAYINLAR	ÖĞRENCİ ÖDEVLERİ

BİRİNCİL KAYNAKLAR

1	www.researchsquare.com İnternet Kaynağı	%8
2	www.ncbi.nlm.nih.gov İnternet Kaynağı	%1
3	docs.neu.edu.tr İnternet Kaynağı	%1
4	O. Ljungqvist. "ERAS – Enhanced recovery after surgery", Journal of Visceral Surgery, 2011 Yayın	%1
5	Clifford, Theresa. "Enhanced Recovery After Surgery", Journal of PeriAnesthesia Nursing, 2016. Yayın	%1
6	Ibrahim ABUMETTLEQ, Nurhan BAYRAKTAR, Burcu DİKMEN. "Effectiveness of Game-Based Teaching Method on Nursing Students' Knowledge of Enhanced Recovery After Surgery (ERAS)", Research Square Platform LLC, 2023 Yayın	%1

CURRICULUM VITAE

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Masters	**Surgical Nursing\ Near East University**	**2018**
Undergraduate	**BS. Clinical nursing\ Applied Science University**	**2012**

Job Experience

Duty	**Institution**	**Duration (Year - Year)**
Clinical nurse specialist	**Royal Devon public clinic's**	**2021-persent**
Clinical nurse	**SMTCCO**	**2013-2016**