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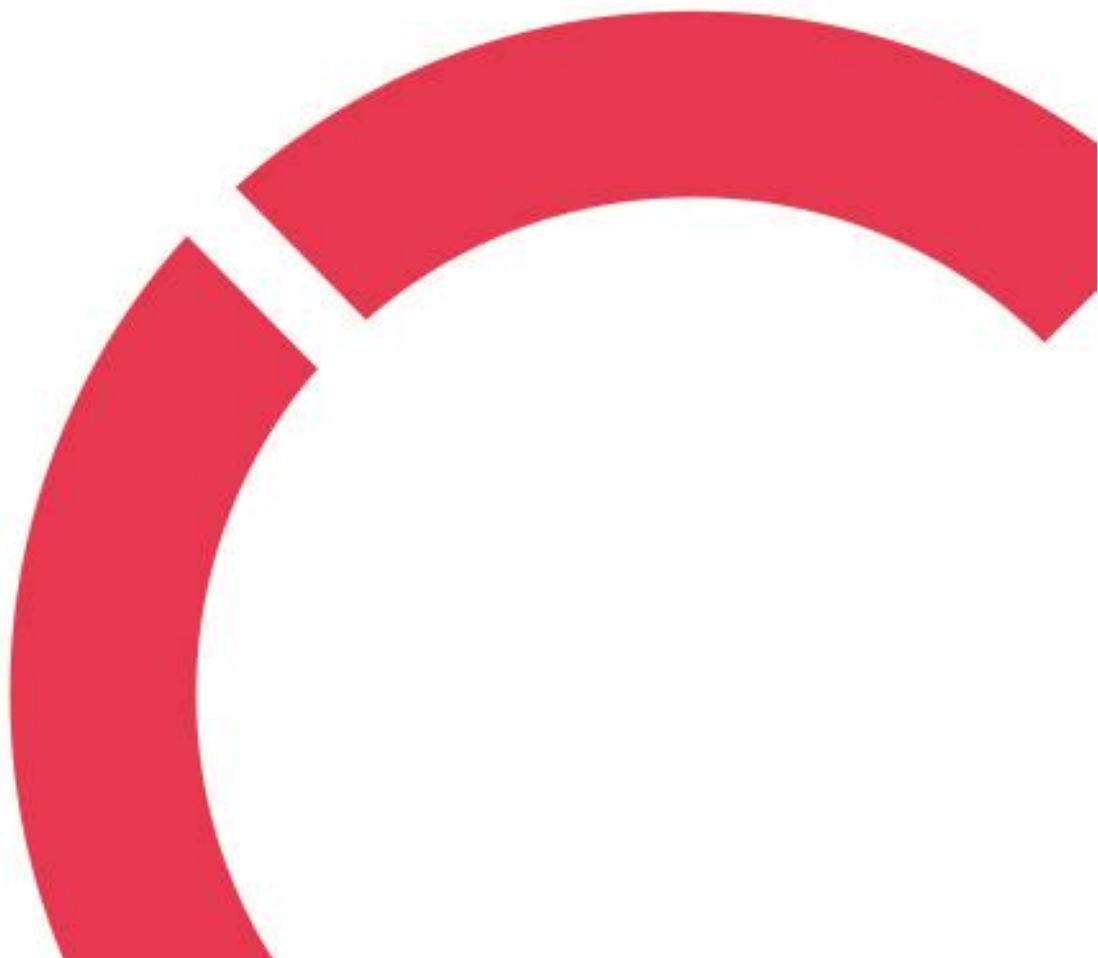
Operating room furniture and accessories. Instructional virtual tour for nursing students.

Thesis

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ABSTRACT

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<p>The aim of this thesis project was to create educational material about the operating room environment in a form of a 360-degree virtual tour to nursing students of Centria university of applied sciences. The virtual tour offers an immersive experience for students to learn more about the overall look of operating rooms as well as the accessories and equipment and medication used in surgical settings. The objective of the thesis is to help students visualise operational environment and nurses' responsibilities in the operating room. The interactive virtual tour offers an opportunity to educate students by using interactive material as a tool to provide new information. Offering students different forms of obtaining knowledge promotes an educational style that takes into account students varying learning styles.</p> <p>The interactive virtual tour allows the student to “move” in the virtual tour as they please and to familiarize themselves with the environment and different equipment and their purpose in the operating room. The virtual tour also focuses on providing the student with some knowledge on the most common medications used in surgical settings. The goal of our thesis project was to equip students with knowledge about the operating room setting before they enter the operating room environment in their clinical practices.</p> <p>The interactive virtual tour was produced in Kokkola at Soite hospitals operating room. Soite central hospital provided an opportunity to produce the project in an operating room that is in regular use. The real environment offers a realistic view of the working environment of the operating room staff and equips the student with up-to-date knowledge about what the operating room environment is like currently.</p>		
Key words Interactive virtual tour, learning tools, nursing education, nursing student, operating room furniture and equipment, visual learning.		

ABSTRACT8
CONTENTS

1 INTRODUCTION.....	1
2 OPERATING ROOM ENVIRONMENT	2
2.1 Types of furniture and equipment in operating rooms	2
2.1.1 Skin preparation equipment	2
2.1.2 Spinal and Epidural anaesthesia cart	2
2.1.3 The anaesthesia cart	3
2.1.4 Medications.....	4
2.1.5 Anaesthesia machine.....	4
2.1.6 Operating table	5
2.1.7 Operating room lights	5
2.1.8 Neptune machine.....	5
2.1.9 Electro Surgical Cautery Machine	5
2.1.10 End of surgery essentials cabinet.....	6
2.1.11 Operating room closets	7
2.2 Nurses' role in the operating room	7
3 INTERACTIVE VIRTUAL TOUR	9
3.1 Nursing education competences.....	9
3.2 Using visual reality and interactive material in nursing education.....	10
4 PURPOSE AND AIM	11
5 PROJECT IMPLEMENTATION/DEVELOPMENT	12
5.1 Idea phase of the production of the virtual tour	12
5.2 Planning phase.....	12
5.3 Development of the virtual tour	13
5.4 Finished product.....	13
6 ETHICAL CONSIDERATIONS.....	14
7 DISCUSSION	15
7.1 Methodological considerations and limitations	15
7.2 Relevance for nursing education.....	16
7.3 Reflection	16
REFERENCES.....	21
APPENDICES	

1 INTRODUCTION

Innovative and immersive learning experiences can open new ways of learning to students. As technology develops more methods of learning and ways to educate are becoming more available. For nursing students who are about to enter the operating room environments on their clinical practices, it is essential to provide the students with educational tools that help to bridge the gap in between theoretical knowledge and practice. This thesis project was created to offer a different learning platform for students in the nursing program to enhance their understanding of the operating room environment by allowing them to engage with it through a 360-degree virtual tour. This thesis aims to add into the virtual learning experience by implementing a virtual tour as part of nursing education.

Nursing is a profession which demands good critical thinking skills and multitude of practical skills to function well in a demanding working environment. Providing nursing students with as much knowledge and instructions on variety of topics in various different ways such as in simulations, written theory and instructional content in audio and visual forms will help improve nursing students' confidence, critical thinking skills and how to implement knowledge to practice from theory (Sundler, Pettersson & Berglund 2015).

This thesis project aims for the instructional virtual tour to be a part of the educational material for nursing students in Centria University for applied sciences. Nursing students who have had alternative teaching methods, such as videos as teaching material have been reported to have stronger professional competences compared to student who have not had video teaching material in their curriculum (Hristova & Georgieva 2021).

Students who are part of the digital generation tend to favour video material over reading text. The material offers a more impactful learning experience (Hristova & Georgieva 2021). We hope to offer the students an impactful learning experience with an authentic feel. Offering an authentic view of the operating room was important to us which is why our project was filmed and produced in a real operating room that is in use at Soite central hospital in Kokkola. Our project will supply students, who are entering their clinical practical placements at the operating rooms or advancing into the operating room environments after graduation from Centria university of applied sciences, with a change to familiarize themselves with the operating room space and some of the equipment's and medications that are used in the surgical settings.

2 OPERATING ROOM ENVIRONMENT

Surgical operations are an essential part of healthcare. Operating rooms provide the setting for a wide range of surgical procedures, whether conducted under general anaesthesia or local anaesthesia such as epidural or spinal anaesthesia. Proper organization and preparation of operating rooms are imperative to ensure smooth surgical procedures. Staff members must possess extensive knowledge of all equipment within the operating room, enabling them to effectively handle surgical events and respond promptly to any emergencies.

2.1 Types of furniture and equipment in operating rooms

Every operating room is individualized and designed to suit different types of surgical procedures. However, here are the basic equipment that are in every operating room:

2.1.1 Skin preparation equipment

The equipment in this cart is essential to ensure that the surgical area is clean to prevent infection, all the materials necessary for the preparation for the disinfection is included in this cart. There are two types of disinfectant used before surgery and small procedures: both are alcohol-based solutions that contain chlorhexidine gluconate (CHG) which has a long-lasting antimicrobial action (Hemani & Lepor 2009). While one is colourless and the other is coloured, combining them enhances their effectiveness as a skin disinfectant. To apply the disinfectant solution on the surgical area it needs to be as aseptic as possible. In the operating room in Kokkola, the instruments used are displayed all together in a package that contains sterilized materials: a metallic kidney bowl, forceps, and a small bowl. In addition, cotton balls and the disinfectant solution will be added to the bowl.

2.1.2 Spinal and Epidural anaesthesia cart

This cart contains the equipment needed for spinal and epidural anaesthesia. The type of anaesthesia that is going to be used for every patient is determinate by the surgeon, however the cart is always ready and fully stocked for when needed. The equipment available in the cart is an sterile kit called “Accessories Set Finland”, that the operating rooms in Soite use that contains the necessary equipment

for the procedure (1 cannula 19G, 4 compresses 7,5 x 7,5 cm, 1 drape with whole 75 x 90 cm, 1 syringe inject 5 ml, 2 Sterican needle 18G, 1 Sterican needle 22G and 1 cover drape 75 x 90 cm), spinal needle 27G and 25G, and the medications used for spinal, epidural and general anaesthesia: Bicain Pond Spinal 5 mg/ml that is the anaesthesia used for the spinal procedure. Fenylefrin Aguettant 50 mikrog/ml and Efedrin Aguettant 3 mg/ml are used for low blood pressure during the procedures. Ampres 10 mg/ml is a spinal anaesthetic used for short surgeries. Ropivacaine Fresenius Kabi 2 mg/ml is a local anaesthetic, Lidocaine 10 mg/ml is an anaesthetic used to block the peripheral nerves (EMC 2023), Bicain Pond Spinal 5 mg/ml is a spinal anaesthesia used for the region above the L1, for surgeries in the abdomen and groin area, childbirth and caesarean section (Pharmaca Fennica 2021). The extra equipment is placed on following drawers, so if the anaesthesiologist requires, the nurse anaesthetist is available to provide assistance.

2.1.3 The anaesthesia cart

This cart contains every instrument necessary for the surgeries, including intubation instruments, medications, medication preparation equipment and intravenous cannulation equipment. Before every surgery the nurse anaesthetist prepares the necessary medication that is going to be needed during surgery depending on the type of anaesthesia the surgeon has chosen to the patient. On the top of the cart are available syringes from 1 ml to 20 ml, 3 sizes of needles (Blunt fill needle 18G, Blunt filter needle 18G and Hypodermic needle 27G), gloves and hand disinfectant so that procedure will be as aseptic as possible. Also, there are stickers with the most used medications name so that the medications can be prepared in advance and safely identified. For convenient retrieval, two types of medications are positioned at the top of the cart. Efedrin Aguettant 3 mg/ml and Fenylefrin Aguettant 50 mikrog/ml are used for addressing low blood pressure associated with different forms and during anaesthesia (Fimea 2020). The nurse anaesthetist prepares for the intubation by verifying that the instruments are working correctly, for example: the endotracheal tube must be appropriately sized by taking into consideration the patient's gender and dimensions. Typically, a size 8 tube is suitable for adult male patients, while a size 7 is recommended for adult female patients. It is crucial to ensure that the cuff is adequately inflated, corresponding with the tube size. Generally, inflation is achieved using a 10-20 ml syringe filled with air. The laryngoscope should be available in two different sizes based on the patient's requirements, and it is essential to confirm the proper functionality of the instrument by verifying the correct operation of its light.

2.1.4 Medications

The medications that are available in the operating room drawer are: Atropine 1 mg/ml, it is used to reverse muscle relaxant and to help rise the heart rate. Glycopyrronium Bromide 200 mikrog/ml, this medication is a muscarinic antagonist, it is used to reduce saliva and mucus secretion and to reduce the acidity of the stomach acid. (S)-Ketamiini 5 mg/ml is used to maintain and induce the general anaesthesia, it can be used alone or with other anaesthetic medications. It is also used as a pain relief medication in emergency situations. Fentanyl 50 mikrog/ml is a short-term acting opioid used as an analgesic or anaesthetic. Ramifentanyl is an analgesic opioid with different strengths (1 mg/3ml, 2 mg/5ml and 5 mg/10ml). This medication is given to relieve pain during anaesthesia. Esmeron 10 mg/ml is a muscle relaxant used to facilitate tracheal intubation and it can be used in both adults and children. Sukolin 50 mg/ml is a muscle relaxant used in short term relaxation. Mivacron 2 mg/ml is a muscle relaxant that is used to help with intubation. Midazolam (1 mg/ml, 5 mg/ml) is a short acting medication that is given before anaesthesia to cause drowsiness and to help prevent memory of the event. Lidocain C. Adrenaline 5-20 mg/ml is used as a local and general anaesthesia for adults and children. Profast 10 mg/ml is a short acting sedative used during surgical procedures alone or combined with local anaesthetics in patients over the age of 16 years old. Typically, the responsibility for placing the intravenous canula on the patient for administering pain medication, anaesthesia, and infusion fluids lies with the anaesthesiologist or the nurse anaesthetist.

2.1.5 Anaesthesia machine

The anaesthesia machine is an essential equipment used for surgeries. Prior to administering anaesthesia, the nurse anaesthetist attaches the blood pressure cuff and oximeter to the patient. The measurements such as blood pressure, pulse, oxygen saturation, respiratory rate and level of consciousness are displayed on the monitor of the anaesthesia machine, allowing the nurse to monitor the patient's vital signs throughout the surgery. (Dosch &Tharp 2024). In the drawers of the anaesthesia machine, you'll find the necessary instruments for the anaesthesia process. The anaesthetic face mask is carefully placed over the patient's nose and mouth to ensure a snug fit to prevent any air leakage. Once the sedation medication is administered and once it has taken effect, the mask must be securely in place before initiating the intubation process (Intersurgical).

2.1.6 Operating table

The operating table is prepared for every patient procedure being performed by having the possibility of removing and placing parts to fit into the position needed, including removal or repositioned of the arm and leg rests (Getinge 2021). While under the effects of anaesthesia, the body's natural thermoregulatory defences are compromised. Without proper heating during the procedure, there is a risk of the patient becoming hypothermic. To mitigate this risk, a heating pad is positioned beneath the transfer sheet beneath the patient, ensuring they remain warm and protected from hypothermia throughout the procedure (Sessler 2016.)

2.1.7 Operating room lights

Effective illumination is crucial for patient safety and the comfort of the surgical team during procedures. It ensures clear visibility, shadow control, and deep cavity illumination at the surgical site. LED (light-emitting diode) lighting is widely employed in operating rooms due to its ability to provide bright, natural-coloured light consistently for extended periods without generating excessive heat. (Elias-Fogle 2020)

2.1.8 Neptune machine

The Neptune machine is very essential for surgeries such as urological and orthopaedic operations, to be used as a fluid waste extraction during surgical procedures. The machine contains 2 canisters, one sized 4 L and the other sized 20 L. The machine also evacuates surgical smoke if the electrocautery or laser is used in the surgical site. The machine is very efficient and a safe way of management of waste during surgery (Baker 2023.)

2.1.9 Electro Surgical Cautery Machine

There are many fields of surgery in which the electrosurgery method is used. This method uses electric current to produce heating to achieve different results, that include cutting, desiccation and cauterization of blood flow. There are two types of electrosurgery, monopolar and bipolar. The difference between them is how the current travels. In monopolar electrosurgery, the current flows through the active electrode device directly to the targeted tissue, resulting in the wanted results. Subsequently, it travels

through the patient's body to reach a dispersive pad electrode's placement. The dispersive electrode collects the current and returns the energy to the electrosurgical unit, completing the circuit. For the bipolar electrosurgery, the dispersive electrode is not needed, so the current travels from the active electrode and flows back to the device by the same device. (Bailey & Chiappone 2022).

2.1.10 End of surgery essentials cabinet

In the operating room there are many cabinets that are filled with necessary equipment so that nurses have easy access during the surgeries. In the operating room of Kokkola, there is a cabinet filled with equipment for the ending of the surgery part, including sutures, scalpels and bandages in different size and material.

In the cabinet, there are available different types and brands of sutures that the surgeons can choose from depending on the location and type of the incision. The sutures come in two types: absorbable and non-absorbable sutures. The absorbable sutures do not require to be removed, as a result, the enzymes on your body will digest them. The non-absorbable sutures require to be manually removed. In the operating rooms in Kokkola the types of sutures available are: Novosyn sizes 0-3/0, this type of suture is called Polyglactin, is an absorbable and synthetic braided suture and is good to be used for hand or facial cuts. PDS (Polydioxanone) sizes 0-1, is absorbable, synthetic monofilament, and can be used for many types of soft tissue. Monocryl (Poliglecaprone), sizes 3-0 and 4-0, is an absorbable, synthetic monofilament suture commonly employed for general soft tissue applications, typically utilized in conjunction with the invisible matter technique. For last, Ethilon (Nylon) in sizes 3-0 and 4-0 is a non-absorbable, natural monofilament suture. (Gonzales 2018)

The scalpel is a sharp instrument to make precise skin incisions that require a certain amount of technique to ensure the depth of the cut. There are many sizes available, including: 10, 11, 15 and 22, the size of the blade depends on the location of the incision and the purpose of use of the scalpel.

After there is a breakage in the skin during surgery, a bandage is necessary to cover the wound so the incision will heal, prevent infections and improve the quality of life of the patient. The most important goal is for the wound to heal fast and without complications. When choosing the right wound dressing, it is important to make sure it is the right size, right material for the type of wound, so that the wound is kept moist but not wet and so that the dressing is comfortable to wear. The type and size of the wound dressing is usually chosen by the surgeon and the products are all available in the operating room for easy access. (NCBI 2023)

2.1.11 Operating room closets

In the operating rooms of Soite there are closets that contain various materials that could be needed during the surgery including: Oxygen masks that are used after the surgery when the patient is waking up from the anaesthesia. Self-warming blankets, which are used during the surgery to help prevent hypothermia due to the anaesthesia that dysregulates the body's temperature while unconscious. I-gel is a supraglottic larynx mask used recently for the intubation for surgeries, they are available in different sizes, usually depending on the weight of the patient. Extra needed equipment for the various machines inside the operating room, like, a smoke evacuation pencil, used for the bipolar/monopolar machine and other tubing for the suction machine.

2.2 Nurses' role in the operating room

Nurses are an essential part of the surgical team in operating rooms. They play a very important role before, during and after the surgical procedure, working alongside with surgeons, to assist them during the surgery, with anaesthesiologists, with nurse colleagues, and patients, to help them feel as comfortable as possible, and have a pleasant experience during the surgery.

Prior to the patient's arrival, two instrument nurses typically prepare the operating room for surgery. They ensure all necessary equipment and machines required for the specific procedure are readily available. One of the instrument nurses will scrub efficiently and dress with the surgical gown and begins organizing and arranging sterilized instruments. Meanwhile, the nurse anaesthetist reviews the patient's file to confirm the type of anaesthesia and intubation required, as well as prepares the necessary medications. It's crucial for the nurse anaesthetist to verify the functionality of intubation equipment for the patient's safety. Upon the patient's arrival, the nurse anaesthetist checks vital signs and may insert an IV cannula, depending on the anaesthesiologist's availability. The instrument nurse then has the responsibility of positioning the patient correctly for surgery and then prepares the surgical site by cleaning, shaving, and disinfecting, ensuring that everything is ready for the surgery to be started. (Mathenge 2020)

Throughout the surgery, the instrument nurse assumes the role of the surgeon's assistant, providing necessary instruments, retracting, suctioning, and irrigating the site. Given the critical nature of this role, the instrument nurse must possess extensive knowledge of the surgical procedure, understanding its steps and require instruments. This enables the nurse to anticipate the surgeon's actions and require-

ments. After the surgery, nurses continue to monitor the patient as they emerge from anaesthesia, remaining alert for any signs of complications. Once the patient is considered ready for transportation, the nurse anaesthetist alongside with the anaesthesiologist, takes them to the recovery room for further monitoring. Here, the nurse anaesthetist provides a report on the surgical outcome, administered medications, and any other important factors that happened during surgery.

3 INTERACTIVE VIRTUAL TOUR

Our thesis is an interactive virtual tour of an operating room. The platform used to create the virtual tour is ThingLink. ThingLink is as Unesco award-winning Finnish-American-owned website and app program that aims to make digital educational content that engages the viewer (UNESCO 2021).

ThingLink offers an interactive platform that allows to add tags to video, images and 360-degree virtual reality shots. The tags are used to embed information such as links, pictures or audio into the pictures, video or 360-degree shots. ThingLink is often used to create educational material that aims to reach learners with different learning styles and skills. ThingLink is used by over four million teachers and students worldwide (ThingLink 2023).

ThingLink provided a great platform for our thesis project. The thesis will be used as educational material at Centria University of Applied Sciences so choosing a platform that is used in Centria was a practical choice. ThingLink also offered an adequate platform to execute our vision for the instructional tour. We wanted a 360-degree angle to the project, and we wanted to provide content that offers students a lifelike experience without having to physically visit an operating room.

3.1 Nursing education competences

In 1999 the Bologna declaration was signed by EU ministers of 29 European countries to develop the competitiveness of the European higher educational area (European Higher Education Area 2024). The declaration aimed to create comparable degrees across the European Union and to increase the international competitiveness of European higher education (European Higher Education Area 2024). The Bologna process requires that nursing education should follow a plan that requires the development of certain competences including 1. Theoretical-analytical competences. This will promote the ability to learn through analysis, observation, systematization, and reflection. 2. Practical competences to promote the ability to utilise problem solving skills. 3. Learning competences to promote the ability to obtain and apply new knowledge in different scenarios, and 4. Professional ethical competences to make sure that the student is able to recognize ethical justifications in relation to ethical guidelines and regulations (Silén-Lipponen & Korhonen 2020). Therefore, the basis of nursing programmes in the European Union is built upon theoretical and clinical knowledge.

Nursing education in Finland is offered by universities of applied sciences. The educational level is European level 6 which leads to a bachelor's degree of healthcare, the studies last 3,5 years. The nursing education follows a national guideline that states that nurses must have the professional competences on: professionalism and ethics, customer orientation, communication and multi-professionalism, management and skills in being an employee, information technology and recording, guidance and teaching expertise and support for self-care, health promotion, clinical nursing quality assurance, social and health care service system, patient and customer safety, evidence-based activities, utilisation of research data, decision-making and entrepreneurship and development (Studyinfo 2024).

Nursing education is described to consist of student-oriented teaching, independent studies, learning and evaluating methods and lectures that aim to activate students such as simulations, workshops, seminars, clinical practice, and projects (Studyinfo 2024).

3.2 Using visual reality and interactive material in nursing education

The core competences of nursing education include the ability to acquire clinical nursing skills that facilitate patient safety and impede the change of putting patients in danger because of insufficient skills (Chao, Chiu, Chuang, Hu, Huang & Tsai 2021).

The use of digital technology, such as virtual reality has increased in nursing education in recent years (Chao et.al 2021). Nursing is a field that requires theoretical knowledge and practical clinical skills. Simulations are a commonly used teaching method in nursing education. Simulation can offer the student an environment to repeat situations and to develop decision making and reflection skills (Chen et.al 2020). VR has been used to teach and to develop different aspects of nursing skills such as decision-making, leadership, triage and critical thinking (Chen, et.al 2020). VR simulations can offer nursing students a safe platform to practice their clinical skills without endangering the safety and wellbeing of patients. In one study a 98% majority of participants endorse the use of VR simulations in nursing education (Chen et.al 2020). Also, a study done in 2020 researched the degree of acceptance of VR applications in anatomy teaching in German nursing students. The study concludes that students with positive attitudes towards technology viewed the use of virtual reality applications favourably. The use of VR also increased the student's motivation to learn (Lange, Koch, Beck, Neugebauer, Watzema, Wrona & Dockweiler 2020).

The consensus varies on whether the use of VR is more effective than other more traditional teaching methods (Chen et.al 2020), but many studies have stated that students found learning more fun and beneficial.

4 PURPOSE AND AIM

The purpose of the thesis is to produce an instructional virtual tour for nursing students about the furniture and accessories in the operating room and what are their purposes during an operation. It is important that the nursing students that are interested in working in this area of nursing have knowledge and understanding about what kind of equipment is used in the operating room and how they are positioned.

The objectives of this thesis are to bring knowledge and to familiarize nursing students with the operating room environment. The students are given an interactive learning experience via an instructional virtual tour to demonstrate what the furniture looks like and what accessories and equipment is needed and used in the operating rooms.

5 PROJECT IMPLEMENTATION/DEVELOPMENT

The thesis is the final task of a bachelor's degree student to prove that they have an adequate comprehension of their chosen field and ability to understand and create academic text. Thesis project can offer an outlet to prove the students' competences to function in the working life. The thesis can help create a pathway that offers the student new opportunities for their future careers (Centria Guide for Thesis and Academic Writing 2022). Thesis is a project that requires a good planning phase. During the implementation phase the project plan is executed and put into action. A good plan will help complete the project and help to face challenges when they arise (Barron, Barron & Watt 2014).

5.1 Idea phase of the production of the virtual tour

When considering the topic of our thesis we had many ideas. We knew that we wanted to create educational material for nursing students preferably in video form. We considered couple of other topics for our thesis project, but those ideas were later scrapped because there was already material of those topics or because of complications of finding working life partners to complete the project with. The topic we ended up with was a recommendation for thesis topics by the teachers of Centria university of applied sciences. The recommendation was to create an educational video of the accessories and equipment of operating rooms. This topic felt very suitable for us, and we started planning our thesis.

5.2 Planning phase

The second stage of planning a thesis consist of making a thesis plan. In this thesis plan we decided upon the schedule of the thesis as well as contacted our working life partner Soite for the thesis contract. Once the contract was accepted by Soite, scheduling of the filming dates was decided. The planning stage also included choosing the equipment and accessories we wanted to include and highlight in our thesis. We contacted the IT department of Centria for guidance on the filming equipment. We were advised to change our thesis from a video format to a virtual tour because producing content in the 360-degree format was more practical for us and more engaging for the intended audience. Centria provided the 360-degree camera that we needed for our thesis project.

5.3 Development of the virtual tour

After organizing a shooting schedule with our working life partner, we had a general plan on how to produce our virtual tour. We scheduled one day for photographing the material that would be needed to make the virtual tour. Overall, producing the material at the hospital took around 3 hours. After gathering all of the material needed for the virtual tour, we started doing creating the virtual tour in ThingLink which is a platform that can be used to create 360-degrees pictures and virtual environments. Our virtual tour offers a 360-degree view from the operating room that shows the room from all angles. The virtual environment includes an interactive element for the students by having tags that can be clicked. When the tags are clicked a picture will open which shows the contents of drawers, medications and useful objects that are being used in the operating room. This interactive virtual tour will allow students to get a display of a real operating room and to learn more from the operating room environment.

The process took around a week to complete. The script we had prepared for the virtual tour made the process relatively quick and easy.

5.4 Finished product

The finished virtual tour consists of 4 different images that the viewer is able to independently guide through the tour. The virtual tour consists of 35 tags that the viewer can click, and a more detailed picture of the equipment will pop up and contain information about the certain furniture and their function in the operating room.

The virtual tour can be accessed with different devices making it easily accessible including, mobile phone, tablets, computer and VR headset. With this easy availability the user can have a pleasant and fun experience while learning about the layout, equipment and furniture in the operating rooms of Soite hospital in Kokkola.

6 ETHICAL CONSIDERATIONS

When writing a thesis, it is important to recognize the responsibilities and ethical conduct that should be taken into consideration. For instance, reliable research sources are needed to ensure that the information that is used is trustworthy. One of the most important student's responsibilities is to recognize and avoid plagiarism. "At its core, plagiarism is a misconduct characterized by misrepresentation." (Steward 2011, 25). The original observations and the research data that is gathered should not be modified to support a conclusion that is not factual or reliable. Also, it is important to apply for the research permit to have the authorization for the thesis, and to conclude a thesis contract before starting the thesis project.

When drafting a thesis, it is essential that the authors follow responsible guideline instructions to ensure responsible and ethical approach. The student must also remember that the thesis is a public document. The authors should also understand how to submit the thesis for ethical review if there is an apparent need for it. The authors must be informed about the ethical requirements of research and how to implement them in the writing process. The authors must also be well acquainted about the topic of their choice to ensure that factual evidence-based research sources are used in the writing process.

Every author who has created a literary or artistic work has copyrights (Copyright act. Subject matter (607/2015)). Copyright provides the right to control who has access, the right to reproduce and alter the finished product while making it available to the public. Our thesis project will be made available to nursing students in Centria University of applied sciences (Copyright act. Economic rights (607/2015)).

7 DISCUSSION

In this thesis discussion, we will explore the reasons behind selecting the topic, the significance of this project, and its potential benefits for future nursing students. The preoperative aspect of nursing holds great importance, as operating room staff must possess a thorough understanding of the furniture and its functionalities. Although our thesis does not encompass every detail about the operating rooms, focusing instead on one operating room at Kokkola Hospital and its most frequently utilized equipment, it serves as an initial step for nursing students to gain a foundational understanding of operating room setup, key equipment, and furniture.

7.1 Methodological considerations and limitations

When we started brainstorming for thesis ideas, we decided early on that we wanted to make a functional thesis. The thesis consists of a theoretical written part and an instructional virtual tour for nursing students. We decided upon a functional thesis because we wanted to create material that could directly be used by students themselves. Our personal learning styles and preference for using video/interactive technological learning material influenced our decision on choosing a practice-based thesis format as well.

One of the main limitations that we faced during this thesis project was the lack of reliable source material. Using virtual educational material is a relatively new concept, so finding well-founded source material proved to be a challenge. The quantity of peer-reviewed research material on virtual tours or virtual reality educational material is low, which means that the outcomes of the research knowledge already acquired may not be as reliable as could be if there were more research on this topic. The need for further research was stated in most of the research studies that we used as references in our thesis.

Further limitations included our own indecisiveness on how to implement our thesis. In our original thesis plan, we planned to create educational content in video format. We decided to abandon the idea because of the 360-degree aspect of our project. When drafting out the plan for our educational material production, we contacted Centria's information technology department. The information technology department shared suggestions and guidance on how to produce our thesis and suggestions on what platforms to use. We chose ThingLink because it is a platform that Centria University of Applied Sciences has used previously for VR projects.

After choosing the virtual tour format and ThingLink platform for our thesis, the planning and scheduling phase began. Because our plan for our thesis project was to introduce genuine operating room environment for nursing students it was necessary that the thesis project could be produced in a real operating room. Because of this the scheduling on the shooting time was slightly challenging. Thankfully after some emailing back and forth in between the operating room staff at Soite we could fit our schedules together and find a day that fitted our schedule as well as the schedule of the operating room staff.

7.2 Relevance for nursing education

During our academic journey, we engaged in a course named Acute and Outpatient Clinic Nursing, which included a segment on perioperative nursing studies, which was a very interesting topic. However, we found a lack of comprehensive information regarding this subject from Finnish hospitals. Consequently, with the help of our supervisor, we conceived the idea of offering future nursing students a detailed and immersive glimpse into the operating room environment.

To realize this vision, we seized the opportunity to visit a functioning operating room at Kokkola Hospital, Soite, and observe all the equipment available in the room and how they function. Our goal was to provide future nursing students with a comprehensive understanding of the operational dynamics of an operating room, thereby better preparing for their internships.

With the development of a 360-degree virtual tour, we wanted to allow the students to virtually explore the complexity of an operating room. By providing this immersive experience, we aimed to provide them with a deeper understanding of the equipment and layout typical to a local operating room.

7.3 Reflection

In conclusion, we think that the thesis project was successful. We have reached our project goals and aims. Our base idea was to create a functional thesis with educational material for nursing students and prepare better them for practical placements in the operating room environment.

The departure from creating the material in video format to a virtual tour was a better layout for our thesis purpose, since we wished the learning material to be immersive and to offer the student to explore the material freely.

Because both of us had some experience from previous practice placements that took place in an operating room environment, it was easier to narrow and highlight the aspects we wanted to explore and include in our thesis. However, we encountered some difficulties on the way, but with the guidance from the Centria's staff we were able to overcome the issues and reach satisfactory results.

Learning on how to work as a team was an essential part of our project and beneficial for our future working environment since nursing requires an ability to work as a functional part of a team. A crucial part of managing our thesis project comprises of to learning how to schedule and manage time when combining theory studies at school and writing the thesis. Overall, we both are pleased on how our idea and production phase developed, and how the thesis turned out. The results exceeded our expectations.

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APPENDIX

Script of the virtual tour

360-degree picture 1: A 360-degree picture of an operating room on the right side of the room. The picture has interactive tags that the viewer can click and get more information about the furniture and accessories in the room.

Tag (picture) 1: The skin disinfectant cart. Showing the needed equipment for the surgical wash used to prep and clean the operating site.

Text 1: Making sure that the skin is clean is an important part of infection prevention. The WHO global guidelines state that the skin should be disinfected with an alcohol solution containing 2% CHG and 70% isopropyl alcohol (WHO 2018). Here on the disinfection cart, you can see the alcohol solutions that are poured on the white cotton balls that are placed in the metal kidney bowl. The soaked cotton balls are then used to clean the surgical site. The technique of preparing the surgical disinfection should be done as sterile as possible.

Tag (picture) 2: Skin disinfection cart first drawer. Picture of the drawer of the skin disinfection cart showing equipment that might be needed during the disinfection.

Text 2: In this drawer you can see some equipment that can be needed during the skin disinfection. There are some under pads that can be used to protect areas from getting wet or dirty. There are some disinfectant wipes, making sure that surfaces are clean in the operating room is very important, shaver blades that be used to remove hair from the surgical site and also cotton swabs used to clean small and hard to reach with the cotton balls, for example the navel area.

Tag (picture) 3: Second drawer of the skin disinfection cart.

Text 3: Here is some extra disinfectant equipment in a sterile package. It is practical to have extra equipment ready to use inside of the operation room.

Tag (picture) 4: Patient transfer board.

Text 4: The operation room staff need to transfer the patient from the bed to the surgical table and vice versa after surgery. The use of a transfer board ensures that the patient can be easily moved while not being completely awake ensuring that the operating room staff or the patients are not injured during the process.

Tag (picture) 5: Spinal and epidural cart. Ready equipment for epidural anaesthesia.

Text 5: Before every surgery, it is needed that epidural equipment's are placed in an easily accessible table. It depends on the surgery whether epidural, spinal or general anaesthesia is used. The anaesthesiologist is the one that administers the anaesthesia decided for the patient.

Tag (picture) 6: Ready anaesthesia medication and others that might be needed during surgery.

Text 6: Here you can see medications that can be used or needed to administer general anaesthesia, epidural or spinal anaesthesia.

Fenylefrin Aguettant 50 mikrog/ml is used to treat low blood pressure during epidural, spinal or general anaesthesia. The normal dose for adults is 50-100 micrograms. The dose can be repeated until desired effect has been reached. Bolus dose cannot exceed 100 micrograms.

Efedrin Aguettant 3 mg/ml is used during surgery to treat low blood pressure, the usual dose per time for adults is 3-6mg (=1-2ml) as often as needed during surgery.

Ampres 10 mg/ml is a spinal anaesthesia used in adults for surgeries with the duration of less than 40 minutes.

Ropivacaine fresenius kabi 2mg/ml is a local anaesthetic that is administered for pain relief and can be used after surgeries. This medication can be administered to adults and children.

Lidocaine 10 mg/ml is an anaesthetic used to block the peripheral nerves.

Bicain Spinal 5mg/ml is the spinal anaesthesia medication. The dose for adults and children weighing over 40 kg should be under 4 ml. It is not recommended to administer more than 4 ml! The spinal anaesthesia takes effect 5-10 minutes after administration and can last for 1-3 hours.

Bicain Pond Spinal 5 mg/ml is a spinal anaesthesia used in anaesthesia above the region L1, for operations for example: abdomen surgery, groin area, c-section and childbirth.

Tag (picture) 7: The first drawer of the spinal and epidural cart. Showing medications used for spinal anaesthesia.

Text 7: Other equipment that might be needed for spinal or epidural anaesthesia.

Tag (picture) 8: Second drawer of the spinal and epidural cart. Showing extra equipment that might be needed when administering an epidural.

Text 8: In this drawer there are some epidural sets and spinal sets ready for use in sterile packages. Also more needles in different sizes (e.g. spinal needle 25G) and antibiotics (Cefuroxime 1,5 g) if the surgeon orders it for their patients.

Tag (picture) 9: Third drawer of the spinal and epidural cart. Showing extra equipment that might be needed when administering spinal/epidural anaesthesia.

Text 9: -

Tag (picture) 10: The anaesthesia cart. Showing syringes, needles, etc.

Text 10: Before every surgery, the anaesthesia nurse prepares the needed medications for the surgery at the anaesthesia cart. In the picture it shown the equipment needed to prepare and administer the medication, including syringes from sizes 1- 20 ml, different types of needles as well as well as cloves

and disinfectant so the medication is prepared as aseptically as possible. The nurse anaesthetist or the anaesthesiologists inserts the intravenous canula in the patient before any type of anaesthetic procedure.

Tag (picture) 11: Stickers that help to identify the medication.

Text 11: These stickers are put to medication syringes once the medication has been drawn up. The stickers ensure that the medication can be drawn up in advance, this will help with time management. The sticker will help to identify the right medication and help to ensure patient safety as well as help to prevent medication errors.

Tag 12 (text only): First drawer with medications used during surgery (Pharmaca Fennica 2023).

Atropine (atropiini) 1mg/ml is used to reverse muscle relaxant and to help rise the heart rate.

Glykopyrronium Bromide 200 mcg/ml. This medication is a muscarinic antagonist, so it helps to reduce saliva and mucus secretion and to reduce the acidity of the stomach acid. During surgeries medication called suksamenton is often used, which can cause bradycardia so glykopyrronium is given to prevent the patient from getting bradycardia.

(S)-Ketamiini 5mg/ml (Ketanest) is used to maintain and induct the general anaesthesia, it can be used alone or with other anaesthetic medications, also used a pain relief medication in emergency situations.

Fentanyl 50mcg/ml (Fentanyyli) is a short-term acting opioid used as an analgesic or anaesthetic.

Ramifentanil is an analgesic opioid. There are many different strengths (1mg/3ml, 2mg/5ml and 5mg/10ml) This medication is given to relieve pain during anaesthesia.

Esmeron 10mg/ml (Rokuroni) is a muscle relaxant used to facilitate tracheal intubation and it can be used in adults and children.

Sukolin 50mg/ml (suksametoni) is a muscle relaxant used in short term relaxation.

Mivacron 2mg/ml (Mivakuuri) is a muscle relaxant that is used to help with intubation.

Midazolam (1mg/ml, 5mg/ml) is a short acting medication that is given before anaesthesia to cause drowsiness and to help prevent memory of the event.

Lidocain C. Adrenaline 5 – 20mg/ml (Lidocaiini) used as a local and general anaesthesia for adults and children.

Profast 10mg/ml (propofoli) short acting sedative used during surgical procedures alone or in combination with local anaesthetics in patients over the age of 16 years old.

Tag (picture) 13: Second drawer of the anaesthesia cart. Iv equipment essentials.

Text 13: IV access is needed for the administration of the anaesthesia as well as for pain management and (possible) antibiotics. Every operating room has the equipment needed for iv cannulation. Equipment such as infusion fluids, Iv cannulas, IV lines etc.

Tag 14: Third drawer of the anaesthesia cart. Intubation accessories.

Text 14: During the anaesthesia process, there are some equipment that might be needed to, for example tape to keep the anaesthesia tube in place, the Oropharyngeal airway (Nieluputki) used to keep the airway open by not letting the tongue block the airway and many other needed supplies.

Tag (picture) 15: Fourth drawer of the anaesthesia cart. Showing intubation essentials.

Text 15: On this drawer there are the essential instruments for the intubation that includes: different sizes of endotracheal tubes (Intubaatioputki) the average size for adults being 7.0 for women and 8.0 for men but it depends on the size of the patient, Xylocain 2% is as a local anaesthesia and during surgery is used as lubricant so that the endotracheal tube is easier placed in the airway and also the laryngoscope (laryngoskoopin kieli) is used to keep the vocal cords visible so that the pathway to insert the tube is open.

Tag (picture) 16: Ready intubation instruments on top of the anaesthesia carts works station.

Text 16: Before every operation, the nurse anaesthetist prepares the intubation station with the essential equipment that are going to be used during the intubation and also verifies that they are working properly such as if the light in the laryngoscope is working and if the cuff on the endotracheal tube inflates properly with the syringe of 10ml and the pressure inside of the cuff is adequately for the patient.

Tag (picture) 17: The screens of the anaesthesia machine.

Text 17: The anaesthesia machines. Monitors the patients' vital signs such as breathing rate and lung function, circulation and heart function, oxygen saturation as well as the level of consciousness, pain and fluid balance. Monitoring the patient's condition is carried out by the nurse anaesthetist as well as the anaesthesiologist (Terveyskylä 2021)

Tag (picture) 18: First drawer of the anaesthesia machine. The intubation equipment and oxygen masks.

Text 18: The anaesthesia machine mask is used by spontaneous and/or manual ventilation, for example after the needed medications for anaesthesia are administered, the mask is fitted on the patients nose and mouth, and with the mask every patient receives a filter so that the anaesthesia machine stays as septic as possible, and then the mask is connected to the anaesthesia machine.

Tag (picture) 19: Second drawer of the anaesthesia machine. Equipment to take/monitor vitals.

Text 19: In this drawer it is stored equipment to measure vital signs, such as an extra blood pressure cuff, thermometer and others.

Tag (picture) 20: Third drawer of the anaesthesia machine. Cleaning wipes and other accessories.

Text 20: On the last drawer of the anaesthesia machine there are some cleaning wipes, kidney bows, that can be used to remove excretions, and extra stickers for the heart monitor.

Tag (picture) 21: The operating table.

Text 21: The operating table is the place where the patients lay during surgery. The table can be positioned in numerous ways that can be changed according to the type of surgery that is being performed. The hand rests change positions and can be completely removed. The patient can lay on their back, stomach, side etc. The perioperative team positions the table and the patient according to the surgery.

Tag (picture 1) 22: Heating pad on the operating table. **(picture 2)** Showing the control for the heating pad.

Text 22: Anaesthesia causes changes in thermoregulation that can lead to hypothermia (Sessler 2016.), so it is important that the patient stays warm during the procedure. The heating pad is used to keep the patient warm during the surgery. When the surgery is over the patient is transferred to a bed and a heating blanket is placed on the patient to ensure that they stay warm while the effects of anaesthesia fully wear off and thermoregulation returns to normal.

Tag (picture) 23: The lights over head the operating table.

Text 23: Good lighting is essential in operating rooms. The surgeon and surgical staff should have an unobstructed view of the operating site. The lights have handles that are covered by sterile protective covers during the surgery to ensure that the area around the patient stays clean and sterile. If the position of the lights needs to be changed, it is done by the instrument nurse who is dressed in a sterile gown.

360-degree picture 2: 360-degree picture showing the left side of the operating room.

Tag (picture) 24: The suction machine. Front and screen.

Text 24: The suction machine removes and collects waste fluids from the surgical site. The suction machine also evacuates smoke if electrocautery or laser is used during surgery. The fluid waste travels through the drain tubes to the collection cannisters. There are two cannisters, sized 4 litres and 20 litres.

Tag (picture) 25: Back of the suction machine.

Text 25: At the back of the suction machine is the control system of the machine.

Tag (picture) 26: Electrosurgery machine.

Text 26: During many surgeries, it is used the electrocautery to dissect tissues and cauterise the blood flow. There are 2 types of electrosurgeries, Bipolar electrosurgery happens that the electrode happens between the forceps, and it returns to the machine, Monopolar machine is the most commonly used by its diversity of effects, and is used that the electrode happens between the forceps and its returned to some other part of the patient's body, the current passes through the patient as it completes the circuit of active electrode (Covidien 2008). The cables and equipment to connect to this machine are in a sterile closed package.

Tag (picture) 27: End of surgery equipment cabinet. Suture types.

Text 27: Diverse types of sutures are used for different surgical wounds. Sutures come in varying sizes and types. Distinct types of sutures are used for different surgeries. Sutures come in two types: absorbable and non-absorbable. The non-absorbable need to be removed after the wound has healed, the absorbable dissolve in the body during the healing process (Chaudhary 2023). The Suture technique and size are based on the size, type, and location of the wound. Here you can see some different type of sutures.

Tag (picture) 28: Scalpels

Text 28: “Scalpel is a very sharp knife that is used for cutting through skin and flesh during an operation” (Cambridge dictionary 2023). Scalpels come in various sizes, here in the picture you can see scalpels in size 10,11,15 and 22.

Tag (picture) 29: Wound care equipment.

Text 29: After surgeries where there was a skin breakage it is essential to put the right type and size of bandage. “Choosing the correct dressing will lessen the time of healing, provide cost-effective care, and improve the patient’s quality of life” (NCBI 2023). There is a big diversity of types of wound bandages, used for different types of wound and size, usually the surgeon is the one that chooses the type of bandage best for the patient’s wound.

Tag (picture) 30: Cabinets.

Text 30: Here are two cabinet that are pass through cabinets, which means that they can be opened from the operating room as well as from the hallway as well. This means that items/equipment can be delivered to the operating room without compromising the cleanliness and/or sterility of the operating room. Here you can see different items that might be needed before, during or after surgery divided into 2 cabinets, the anaesthesia side and the surgical side.

Tag (picture) 31: First drawer of the anaesthesia cabinet. Picture of an oxygen mask.

Text 31: In this drawer you can find an oxygen masks. After a patient leaves surgery and the intubation tube is removed, the patient will be given oxygen through an oxygen mask to ensure good oxygenation while the patient is waking from anaesthesia.

Tag (picture) 32: Second drawer of the anaesthesia cabinet.

Text 32: Warming blankets are kept in this drawer. This self-warming blanket will activate once it is taken out of the package and exposed to air. Keeping the patient warm after surgery is important so that the patient is protected from peri-operative hypothermia (Torossian et.al 2016, 13-17). It takes about 30 minutes for the blanket to reach the ideal temperature. The blanket stays warm for about 10 hours (Mölnlycke 2023).

Tag 33: Third drawer of the anaesthesia cabinet. Igel.

Text 33: Igel is used for airway control during surgery. As you can see in the picture, there are different sizes according to the weight of the patient, the size number 3 is for patients that weight 30-60kg, Size number 4 50-90kg and size number 5 for more than 90 kilos.

Tag 34: Surgical cabinet (left), second drawer.

Text 34: Smoke evacuation pencil, used for the bipolar/monopolar machine.

Tag 35: Fifth drawer of the surgical cabinet

Text 35: Instruments used with the suction machine.