Ankle surgery site disinfection: An educational video

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Laurea University of Applied Sciences **Abstract**

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Surgical site infection (SSI) is a healthcare-associated infection that is found in surgical patients. With ankles, being particularly susceptible due to their anatomical location and exposure to environmental contaminants, it is at high risk of SSIs. Surgical site disinfection is one among the interventions recommended to prevent surgical site infections that reduce the load of microbes that are on the skin. Nurses play a crucial role in SSI prevention through effective communication and right documentation in patient´s records. The aim of this thesis was to produce an educational video of ankle surgery site disinfection for perioperative nursing students to utilize for training at school and practical placement in the operating room. The purpose of this thesis is to educate the method and technique of ankle surgery site disinfection to nursing students and to promote preventing surgical site infections.

Since this is a functional thesis, a video was made during the thesis and sent to English-speaking nursing students of Laurea UAS for survey. The survey was conducted through a Microsoft questionnaire to ensure anonymity. The survey questionnaire consisted of 5 questions. The questionnaire did not ask for personal data and the authors were not able to see who the responders were. All the data was deleted after the survey was evaluated. There were 20 participants in the survey. While most respondents provided positive feedback, a few of the respondents proposed some suggestions for how the video may be improved. However, due to the author´s limitations on time, these improvements could not be taken into effect.

For further development of the video, it would be beneficial to collaborate with nurses for a more comprehensive understanding of the relevant subject matter. Additionally Finnish subtitle could be considered in educational videos for English-speaking nursing students who wish to work in Finnish operating theatres.

Keywords: ankle, disinfectant, disinfection, infection, surgical, video

Contents

1 Introduction

Postoperative surgical site infection is frequently identified as the main complication arising after orthopaedic procedures involving ankle surgery (Hunter, Dawson, Soin, & Baumhauer 2016, 478). The unique anatomy of the human foot that is an ideal habitat for microbes, plays an important role in the higher infection rates associated with ankle surgeries. Additionally, this unique anatomy contributes to the potential reduction in the efficacy of preoperative skin disinfection. (Droll, Abouassaly, Cullinan, Puskas & Dubois 2022, E757.) Ankle surgical site disinfection involves the disinfection of the foot, presenting a challenge due to the presence of the nail, subungual area, and nailfold, which create a physical barrier to cleansing (Mehraban, Holmes, Lin, Lee, Hamid & Bohl 2020,1008). Therefore, in orthopaedic surgeries, eradicating bacteria from the foot area before surgery becomes more challenging. As a result, ankle surgery shows a relatively higher incidence of surgical site infections compared to other elective orthopaedic procedures. (Meng, Zhu, Li, Zhang, Qin & Zhao 2020, 2.)

According to Ovaska, Madanat, Mäkinen & Lindahl (2015), in Finland, approximately 5,000 ankle fractures requiring hospital treatment are treated annually. Surgical interventions for unstable ankle fractures are mostly linked to wound complications, causing challenges in treatment if they develop into deep infections post-surgery. These complications can lead to severe consequences, including the necessity for multiple surgeries, permanent joint dysfunction, amputation, and even fatalities. (Miller, Margules & Raikin 2012, 2047.) Furthermore, they contribute to significant additional hospital costs for both patients and healthcare facilities (Zhao, Meng, Sun, Wan, Qin, Zhang & Hou 2022, 1-2).

Surgical site infection (SSI) are the most reported healthcare-related infections in healthcare settings which has raised an increased interest on SSI prevention. Preoperative skin preparation during orthopaedic surgery stands out as a most important evidence-based recommendation supported by both the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) to minimize infections. The appropriate antiseptic and the techniques used for disinfecting the area may also have an impact on the effectiveness in reducing SSI. (Ory, Minh, Tien, Hai, Careno, Price, Andrieux, Crouzet, Dunyach-Rémy, Laureillard, Lavigne & Sotto 2022, 1-2.)

Educational videos have become an effective tool in providing higher education (Brame 2016, 1). The purpose of using videos as a study method is that they can be retained for extended periods, providing students more sensory learning environment, and facilitating a faster learning experience. Furthermore, it significantly impacts the student's stated motivation for learning process. Compared to conventional approaches, innovative educational videos are

more effective and have a positive effect on skill training. (Bahar, Arslan, Gokgoz, Ak & Kaya 2017, 1514-1515.)

2 Aim and purpose

The aim of this thesis was to produce an educational video of ankle surgery site disinfection for perioperative nursing students to utilize for training at school and practical placement in the operating room. The purpose of this thesis is to educate the method and technique of ankle surgery site disinfection to nursing students and to promote preventing surgical site infections.

3 Theoretical Background

This chapter explains surgical site infections, surgical site disinfection, different disinfectants used in disinfection of surgical site, ankle surgery site disinfection and nurses' responsibilities in ankle disinfection.

3.1 Surgical site infection

Surgical site infections (SSIs) are one of the healthcare associated infections (HCAIs) that are commonly found in surgical patients (Borgey, Thibon, Ertzscheid, Bernet, Gautier, Mourens, Bettinger, Aggoune, Galy, Lejeune & Kadi 2011, 59). SSIs amounts to one-fifth of HCAIs and are a cause of death among surgical patients (Bath, Davies, Suresh & Machesney 2022, 571). Even though there are new innovations in technology for surgeries and betterment of operating rooms, SSI still are the cause of mortality in surgical patients (Boga 2019, 1229). Mengistu, Alemu, Abdukadir, Husen, Ahmed, Mohammed & Musa (2023,1) defines SSIs as the infection that occurs in the operated part within a month of the operation or within 3 months if an implant is placed during an operation. SSIs was named by the US Center for Diseases Control and Prevention (CDC) in 1992 but before that it was called surgical wound infection (Kolasiński 2018, 41). SSIs put patients at risk and increase the financial costs by prolonged hospital stay (Borgey et al. 2011, 59). The number of SSIs continues to increase as the number of surgeries increases per year (Boga 2019, 1229).

SSIs can be categorized into 3 different types i.e. superficial incisional SSI, deep incisional SSI, and organ or space SSI (Onyekwelu, Yakkanti, Protzer, Pinkston, Tucker & Seligson 2017, 3). SSIs were classified into different types according to the depth of infection (Blachman-Braun, Gurayah, Mason, Hougen, Gonzalgo, Nahar, Punnen, Parekh & Ritch 2023, 455).

Ekanem, Ngene, Moodley & Konje (2023, 4) demonstrate this concept with a diagram by CDC which is reproduced in figure 1.

Superficial incisional SSI can be defined as those infections which are limited to skin and subcutaneous tissue. This kind of infection can be treated with antibiotics and local non-medicinal therapy such as warm/disinfection pads. (Lepelletier, Bourigault, Roussel, Lasserre, Leclère, Corvec, Pattier, Lepoivre, Baron & Despins 2013, 404.) Furthermore, superficial incisional SSIs must release pus from the surgical incision and organisms found in the culture of the infection site must be from an aseptically obtained specimen (Onyekwelu et al. 2017, 3).

Deep incisional SSI are those kinds of infections that take place in muscle and tissues surrounding the muscles beneath the site of incision. Organ or space SSI can occur within 30 or 90 days of the operation in any body organ or space between the organs in the body. (Ekanem et al. 2023, 5.) These kinds of infections often need antibiotic treatments, negative pressure wound therapy, re-surgery and drain placements. Moreover, the mortality rates and costs of treatment are higher in deep, and organ/space incisional SSI compared to superficial SSI. (Blachman-Braun et al 2023, 455e17.)

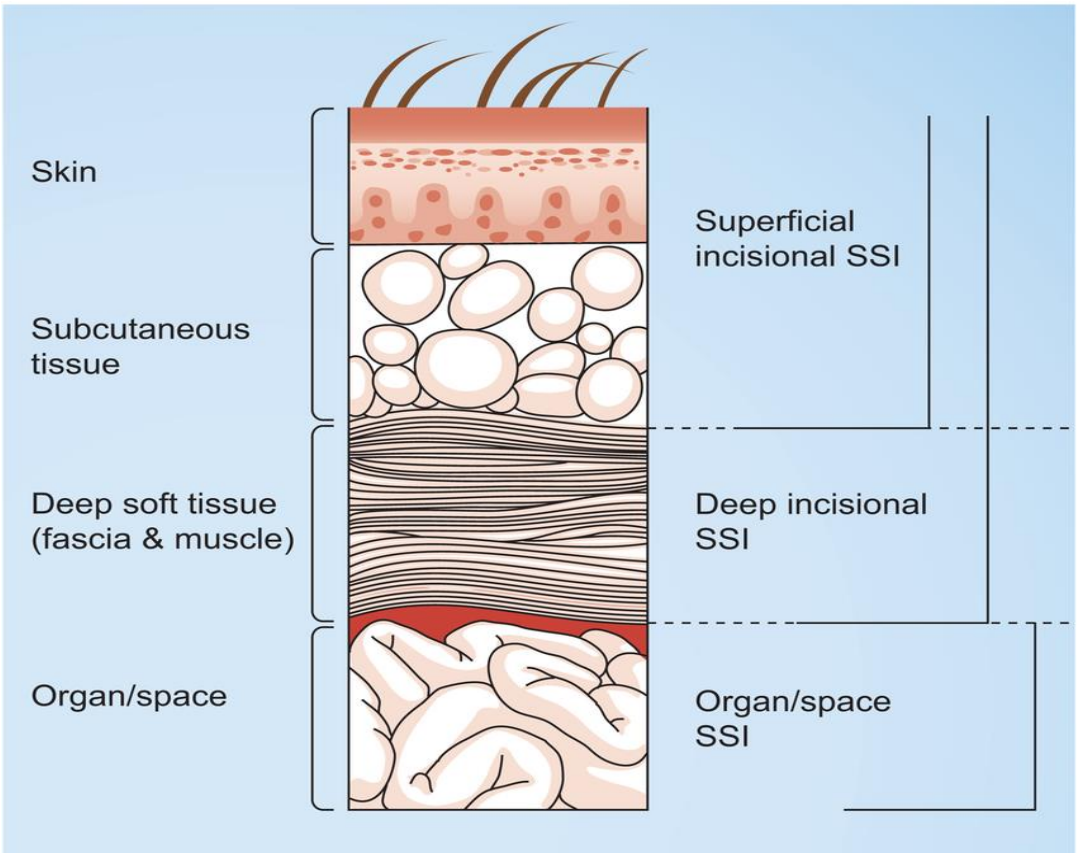

Figure 1: Classification of surgical site infections according to CDC National Nosocomial Surveillance System SSI: Surgical site infection (Ekanem et al. 2023, 4)

There are numerous patient-related and procedure-related factors that increase the risks of SSIs (Lepelletier et al. 2013, 404). The patient-related factors include age, obesity, underlying medical conditions, smoking, weak immune system, diabetes mellitus and immunosuppression (Bernstein, Bracken, Abeles, Orosco & Weissbrod 2021, 140). In addition, the patient's endogenous flora is responsible for the development of SSIs. The colonization of Staphylococcus aureus can result in S.aureus SSI. (Lepelletier et al. 2013, 405.) Moreover, the most frequent microorganisms that cause SSIs are Staphylococcus, Streptococcus, and Acinetobacter (Kolasiński 2018, 43). These microorganisms can be obtained internally or externally meaning that they are both patient-related and procedure-related (Lepelletier et al. 2013, 405). The length of the operation, the surgical site, sterile methods, the presence of an infection, and the skin quality at the surgical site are all procedure-related issues. Additionally, if the sterile environment has been compromised and the operating crew is unaware of it, the risk of surgical site infection (SSI) increases. (Zinn 2012, 274.)

The risks of developing SSIs can be predicted by using the surgical wound classification system (SWC). This system helps surgeons and healthcare workers to determine the probability of occurrence of SSI. The SWC system divides surgical procedures into four types based on the degree of contamination: clean, clean/contaminated, contaminated, and dirty/infected. (Onyekwelu et al. 2017, 2; Zinn 2012, 274.) Bernstein et al. (2021,139), Onyekwelu et al. (2017, 2) and Zinn (2012, 275–277) explain further about these classes with a table by CDC, which is reproduced in table 1. The classification can change during the operation if there is pus found in the operating area which was unknown before surgery. If the classification changes, then it is important to remember aseptic practices i.e. the instruments used in dirty/contaminated areas should not be used in clean areas. Moreover, the sterile gloves should be changed when touching the clean area after the dirty area. (Aura & Kinnunen 2022, 43.) The circulating nurse is responsible for documenting the patient's wound classification in their patient records (Zinn 2012, 274; Bernstein et al. 2021, 140). However, in Finland, if the aseptic area is broken that is if the gloves tear down or get contaminated, there is no need to change the classification. It is important to remember that every operating theatre has their own rule to change the wound classification. (Aura & Kinnunen 2022, 43.)

Classification	Definition	Examples of surgical procedure	Probability of occurrence of SSI
Clean (Class I)	Procedure that does not involve entering the urinary, vaginal, gastrointestinal, or respiratory tracts. Non-infected or non-inflammatory wounds. Primarily closed wounds or drained with closed drainage. Sterile area is not broken.	Vascular interventions, Mastectomy, Thyroidectomy, Exploratory laparotomy	2% or less than 2%
Clean-Contaminated (Class II)	Procedure which requires entering respiratory, GI, genital or urinary tract without any inflammation. The procedure is controlled meaning no infection should be present and no error in sterile technique.	Laryngectomy, Small bowel resection, Elective cholecystectomy, Bronchoscopy, Elective appendectomy, elective foot, and ankle surgery	5%-15%
Contaminated (Class III)	Procedure that involves major interruption in sterile technique and gross discharge from GI tract. Accidental wounds should be open and fresh (not older than four hours)	Appendectomy for inflamed appendicitis, Cholecystectomy with bile spillage, Diverticulitis, Open cardiac massage	>15%
Dirty/Infected (Class IV)	Procedure involving old wounds (older than four hours) which are already infected before the surgery. Break in sterile area.	Abscess drainage, Appendectomy for ruptured appendix, surgical removal of perirectal pus collection	>30%

Table 1: Centers for Disease Control and Prevention-Guideline for Prevention of Surgical Wound Infections (Bernstein et al. 2021,139; Onyekwelu et al. 2017, 2; Zinn 2012, 275-277)

The probability of developing SSIs can be influenced by a variety of other patient-related and procedure-related factors, therefore the prediction of their presence cannot be completely dependent on SWC (Kolasiński 2018, 42). However, SWC has become a traditional method for anticipating future risks and infection (Zinn 2012, 274). Moreover, SSIs can be prevented by supervising the risk factors in pre, per and post operative phase (Lepelletier 2013, 406). Nurses play an essential role in preventing SSI by communicating and documenting the right

data in patients' records (Zinn 2012, 277). Therefore, perioperative nurses should have knowledge of SSI, its preventive measures, SWC, symptoms of SSI, perioperative skin preparation and the people who are at greater risk of getting SSI (Boga 2019, 1230).

3.2 Surgical site disinfection

Surgical site disinfection is an important aspect in minimizing the risk of surgical site infections by reducing microbial contamination on a patient's skin and surrounding tissues at the site of a surgical invasive medical procedure. Infections at the surgical site are mostly caused by bacteria on the patient's skin that may penetrate the incision. (Peel, Watson, & Lee 2021, 663.) Accordingly, the aim of preoperative skin disinfectants is to effectively minimize the number of microorganisms at the planned surgical incision site. Furthermore, perioperative nurses have the primary responsibility of preparing the operating room in preparation for every patient, with the primary objective of preventing surgical site infections. (Murphy 2023, 127-128.)

Surgical site preparation is performed by perioperative teams, including perioperative nurses, surgeons, anaesthesia professionals and infection prevention personnel (Kang, Andrew, Farishta, Oltmann & Sreeramoju 2023, 278). Moreover, nurses play a significant role in infection prevention and control as they are more involved in the care and treatment of perioperative patients, including surgical site preparations (Levada & Osborne 2017, 57). Nurses are responsible for recording all information regarding the procedure and patient care in the patient information system since proper documentation is essential in providing patients with safe surgical care. (Aura & Kinnunen 2022, 21).

The principles of surgical site disinfection according to Finnish guidelines recommends that the surgical site should be clean, the disinfection should start from clean area to dirty area, the disinfection should be done at least twice each time making the area smaller. Also, remember the flow of disinfection liquid meaning that the disinfection should start from top areas to bottom where the disinfection flows. Moreover, while disinfecting gloves or clamps should not touch the skin. It should be avoided to be on top of disinfected area. Let the disinfected area dry before draping the area. (Aura & Kinnunen 2022, 197.)

According to Finnish guidelines, it is recommended that the patient take a shower the morning of the procedure. Patients should pay more attention to wash areas of the groin, armpits, genital areas, and navel. (Aura & Kinnunen 2022, 194.) This procedure aids in physically eliminating dirt, excretions, and microbes from the skin's surface that helps to reduce the risk of infection (Onetogether 2017, 14). According to Aura & Kinnunen (2022, 197), the principles of surgical site disinfection suggest that the surgical site should be clean, meaning there should not be any cuts or dirt in the area.

According to Edmiston, Griggs, Tanner, Spencer, Seabrook & Leaper (2016), removing hair is only recommended if it is likely to interfere with the surgical procedure and should be done only with clipper on the same day of surgery outside the operating room. Shaving the skin can lead to risk of micro cuts and abrasion that can lead to infection, hence using clippers helps to minimize the risk of microscopic skin cuts (Jolivet & Lucet 2019, S2). Along with that before entering the operating room, any jewellery and piercings must be taken off to prevent infections (Aura & Kinnunen 2022, 194).

Patient positioning during surgery is another important aspect of the perioperative process that is necessary for ensuring a safe and effective surgical procedure (Maya & Galeano 2023, 41(1)). Patient´s positioning depends upon the type of surgery involving the perioperative nurse, surgeon, anaesthesia professional and other personnel as needed to assure the patient's safety, accessibility, and well-being (Spruce 2018, 356-357). In a recent study (Bjøro, Ballestad, Rustøen, Fosmark & Bentsen (2023), it was found that safe positioning involves good communication and planning between operative room nurses, the anaesthesiologist and anaesthesia nurse. Ensuring patient safety, comfort, and maintaining optimal surgical access are paramount considerations when deciding on the appropriate positioning for each surgical procedure (Maya & Galeano 2023, 41(1)). The most common position for patients during surgery is the supine position, as shown in figure 2, where patients lie flat on their backs with their heads and shoulders slightly raised and supported by a pillow. Although many surgical operations can be performed in this position, there is the risk of developing pressure ulcers and nerve damage. (Armstrong & Moore, 2022.)

Figure 2: Supine positioning of the patient (Aura & Kinnunen 2022)

In orthopaedic surgeries, surgical site marking has become a standard procedure, wherein surgeons marked the patient´s skin before the circulatory nurse disinfect the incision site (Márquez, Gutiérrez, Martínez, Cano & Combalia 2011, 112). Indeed, correct surgical marking is aligned with the WHO surgical safety checklist which is essential in the preoperative management of a patient. This practice promotes ensuring accuracy and safety during the surgical procedure. (Masud, Moore & Massouh 2010, 214.)

According to the WHO guidelines, the disinfectant solution should be applied from clean to dirty areas. Before making the incision, the solution must completely air-dry, and the procedure must be carried out while following aseptic protocol. (World Health Organization 2016.) As well as the solution applicator should be sterile (Queensland Health 2015, 4). Additionally, as alcohol is highly flammable, the perioperative nurses make sure that a pool hasn´t formed below the patient prior to the procedure. This precautionary measure helps reduce the possibility of fire hazards in the operating room. (World Health Organization 2016.)

In addition to cleaning the surgical site with a disinfectant, the sterile nurse applies sterile drapes right prior to the incision and removes them after skin closure. Sterile drapes minimize contamination and establish a sterile field through surgery (Rezapoor, Tan, Maltenfort & Parvizi 2018, 1891). In addition to that, both the scrub nurse and surgeons adhere to recommended infection control practices by wearing sterile surgical gowns, gloves, caps, surgical helmet, and masks throughout the entire surgical procedure, as well as perform hand washing before surgery. This comprehensive approach helps to maintain aseptic field throughout the surgery. (Adams, Korniewicz & El-Masri 2011, 16.)

As the use of adhesive films on the skin create a mechanical barrier that separates the surgical wound and keeps alive microbes from contaminating both the skin incision made over the films and the surgical site (Goldberg, Elazar, Glatt, Camins, Datta, Takahashi & Seitelman 2021, 589-590). However, research conducted by Goldberg et al. (2021) suggests that plastic adhesive films may not consistently reduce but can even raise the risk of surgical site infection. Whereas (Mundi, Nucci, Ekhtiari, Wolfstadt, Ravi & Chaudhry 2022, 552) states that in orthopaedic surgery, the risk of wound contamination can be reduced using adhesive films. Moreover, adhesive films are widely used during orthopaedic surgeries (Mundi et al.2022, 552).

3.3 Different disinfectants used in surgical site disinfection

Skin disinfectants play a vital role in preventing infections during medical procedures as it reduces the microbial load on the skin surface. Several types of disinfectants are used for skin preparation prior to surgeries or invasive procedures. The most used disinfectants are chlorhexidine, iodophors and alcohol or their combination. (Dingemans, Spijkerman, Birnie,

Goslings & Schepers 2018, 1390.) However, alcohol-based preparations should not be applied to newborns, mucous membranes, nerve tissue, or skin that is impaired. In such cases, the use of aqueous solutions of chlorhexidine or povidone is suggested. Before placing the surgical drape, it is important to let the solutions airdry for at least three minutes. (Badia, Pérez, Manuel, Membrilla, Ruiz-Tovar, Muñoz-Casares, Arias-Díaz, Jimeno, Guirao & Balibrea 2020, 190.) The properties of active antiseptic agent in pre-operative skin preparations are shown in figure 3.

3.3.1 Chlorhexidine

Chlorhexidine is one of the commonly used skin disinfectants due to its broad-spectrum antimicrobial properties and relatively low skin irritation compared to other disinfectants. It provides broad coverage by eliminating both gram-positive and gram-negative bacteria, fungus, and viruses, and has a long-lasting effect while remaining intact at the skin's surface. It remains active even in contact with organic material. (Queensland Health 2015, 2-3.) The advantages of chlorhexidine include wide bactericidal window, fast onset of action, excellent continuous action on the skin, little evidence of allergy or irritation, and minimal absorption into the bloodstream. (Ngatard & Houtsonen 2023, 9). Chlorhexidine works for long procedures since it provides bactericidal activity for 24 hours after within two minutes of applying it to the skin. However, as it may cause permanent keratitis, conjunctivitis, and permanent sensorineural deafness, it should not be used for skin preparation around the eye and conchal bowl. (Bednarek, Nassereddin & Ramsey 2023.) Chlorhexidine gluconate concentration of 2% is the most effective for skin disinfection; higher concentration may result chemical burns or severe irritant contact dermatitis (Sandle 2016, 05). The presence of organic matters such as blood and moisture weaken the effectiveness of chlorhexidine, so the skin must be dry and clean before disinfection (Kapadia, Elmallah & Mont 2016, 2857).

3.3.2 Iodophors (Povidone-Iodine)

Povidone-iodine is a combination of hydrogen iodide, povidone, and elemental iodine. It has a microbicidal activity that kills a wide variety of bacteria, viruses, fungi, and protozoa, both gram-negative and positive. It creates salts with microbial proteins by oxidizing the lipids in the cell membrane through the process of iodination. After being applied to the skin, it begins to act quickly yet has few effects. (Bednarek et al. 2023.) Iodine should only be used to disinfect clean skin since it becomes inactive when it is in contact with organic materials. The applicable strength of povidone iodine ranges from 7-10%. (Queensland Health 2015, 2-3.)

3.3.3 Alcohol

In healthcare settings, ethanol and isopropyl alcohol are the most effective alcohol disinfectants. However, generally 70% ethanol is more effective and efficient than isopropyl

alcohol. Alcohol, at 60-70% concentration, is found to be accountable for their viricidal, bactericidal, tuberculocidal and fungicidal effects. Alcohol works as a disinfectant primarily by the denaturation of microbial proteins. (Aranke, Moheimani, Phuphanich, Kaye, Ngo, Viswanath & Herman 2021, 2.) Alcohol is effective in killing many viruses and fungi as well as a range of gram positive and gram-negative bacteria. Compared to povidone iodine or chlorhexidine gluconate, it kills microorganisms more quickly and with a better antibacterial activity that leaves no residual. Alcohol solutions are flammable, so it is important to let it dry and evaporate completely before starting the surgery. (Queensland Health 2015, 2-4.) The use of ethanol does not cause a delay in the start of surgery as it evaporates from the skin's surface quite quickly. To clean the surgical site, disinfectants with colour or those without can be used. It is beneficial to use coloured disinfectant since it makes the disinfected area easy to identify and darkens after multiple disinfections. However, coloured disinfectant isn't used during surgery when it's important to assess and monitor skin colour and blood circulation, particularly in limbs or extremities. (Aura & Kinnunen 2022, 194-195.)

Active antiseptic agent			
	Chlorhexidine Gluconate (CHG)	Iodophors (PI)	Alcohol
Mechanism of action	Disrupts cell membrane	Releases iodine which oxidises and substitutes cell material	Denatures cell wall protein
Preparation strength	0.5 %; 2 %	7-10 %	70% isopropyl or ethyl alcohol preferred but can be 30-85%
Quick kill	Moderate		Rapid
Persistent activity	High (up to 48hrs)	Moderate	None
Use on eyes	No (damage to cornea)	Dilute 1:1 10% solution with balanced salts to make 5%	No
Use on ears	No (damages middle ear)	Yes	Yes
Use on mouth	Use 0.12 % oral rinse	Yes	No
Use on genital area	No	Yes	No
Use on tissues	No	No	No
Contraindications	• Sensitivity or allergy • Neonates	• Sensitivity or allergy • Neonates • Inactivated in presence of blood Note: risk of iodine toxicity in repeat use in patients with thyroid disorders, pregnant/breastfeeding women but unlikely to be a problem for single preoperative skin preparation	• Sensitivity or allergy • Neonates • Inactivated in presence of blood

Figure 3: Properties of active agents in pre-operative skin preparations (Onetogether 2019)

3.4 Ankle surgery site disinfection

Preoperative skin antiseptic is an important aspect of orthopaedic procedures as the incidence of surgical site infections in feet and ankle surgery is higher than other parts of the body (Dingemans et al. 2018,1390-1391). Surgical site infections are one of the most common and serious complications following foot and ankle surgery that raises the risk of death, morbidity, hospital readmission, and expense. The percentage of foot and ankle surgeries that follow SSIs varies from 1.2% to 13.2%. (Mehraban et al. 2020, 1007.) The microbiota in this area of the body is one of the potential reasons for the increased infection rate in foot and ankle surgery (Letzelter, Hill & Hacquebord 2019, 602).

For ankle surgical site disinfection, skin antiseptic solutions (SAS) are widely used to cleanse the skin prior to surgery (Mehraban et al. 2020, 1007). In Finland, ethyl alcohol, known as ethanol, is commonly used as a disinfectant. Due to its effectiveness, the operating room generally uses this solution containing 60-80% ethanol named A12t dilutus. (Aura & Kinnunen 2022, 196). There are other methods and alternatives for the standard sponge application approach, such as immersion, the use of a bristled brush, and the use of cotton balls to disinfect the skin. (Mehraban et al. 2020, 1007).

During the ankle surgical site disinfection, nurses follow a strict set of guidelines to maintain the proper aseptic environment. Once the patient is positioned on the operating table and anaesthesia has been administered, the circulatory nurse starts the disinfection of the surgical site. (Karma, Kinnunen, Palovaara & Perttunen 2016, 109.) All the disinfectant supplies are reserved by the circulatory nurses in advance (Aura & Kinnunen 2022, 144). The things needed for ankle surgery site disinfection are factory disposable gloves, coloured antiseptic solution (60–80%), cotton balls for applying disinfection, hand disinfection, under pad and dustbin. Before starting to disinfect the surgical area, the circulatory nurse puts the disposable under pad underneath the leg of the patient so that the solution does not drip onto the sheets of operating table as shown in figure 4. (Aura & Kinnunen 2022, 196).

Figure 4: The under pad is laid underneath the patient's operative leg (Maharjan, Shrestha & Basnet 2024)

Firstly, the circulatory nurse disinfects her hands and then proceeds to open the factory clean washing package, placing it down on the table. It is important to disinfect the surface of the table before opening the washing package. Afterward, following aseptic technique, the coloured disinfectant (60-80% ethanol) is carefully poured over the cotton balls in the washing package. It is important to prevent the disinfectant bottle from touching the washing package or its creases and ensure that the disinfectant fully wets the cotton balls without spilling outside. Then, the circulatory nurse disinfects her hands and puts on factory clean gloves. It is important to squeeze out excess solution from the cotton balls to prevent wetting the areas that are not intended to be disinfected and starts disinfecting the area. (Aura & Kinnunen 2022, 196.)

The disinfection of ankle starts from toes. The circulatory nurse takes a pair of cotton balls and starts to disinfect the toes from big toe to small toe using both hands as shown in figure 5. It is important to remember the spaces between the toes. The disinfection of ankle does not follow the rule clean area to dirtier area because of the flow of disinfection liquid. The disinfection liquid flows from toes to ankle so the toes area disinfected first because the disinfection cannot flow to surgical site once it is disinfected. The cotton balls are changed as needed. (Aura & Kinnunen 2022, 197-198.)

Figure 5: Disinfection of the toes starting from big toe to small toe (Maharjan, Shrestha & Shrestha 2024)

After disinfecting the toes, the nurse takes a pair of cotton balls and starts disinfecting the leg from top of the bridge of the foot towards the knee stopping just below the knee as shown in figure 6 (Aura & Kinnunen 2022, 198). The disinfection area is made large enough with the first disinfection. The disinfected site should be sufficiently large to accommodate potential surgery extensions, drainage site creation, or new incisions (Queensland 2015, 4). According to surgical site disinfection guideline, it is avoided to be on top of disinfected area, so the disinfection is done from same side. Moreover, if the cotton balls touch other places than disinfected area, for example under pad, then they need to be changed immediately. The circulatory nurse should be careful not to touch the skin with protective gloves. (Aura & Kinnunen 2022, 197-198.)

Then, the sole of the foot is disinfected. The nurse straightens the sole with one hand using cotton balls and disinfects the sole from top to bottom with the other hand as shown in figure 7. The heels are disinfected at the same time with back-and-forth motion as heels can be dirty and may need extra care while disinfecting. (Aura & Kinnunen 2022, 198.)

The disinfecting procedure is performed at least twice, with each disinfection, the area is reduced. So, the circulatory nurse repeats the same procedure starting from toes then lower leg and sole of the foot but second time the area is made smaller. The circulatory nurse disinfects up to the middle of the lower leg as shown in figure 8. (Aura & Kinnunen 2022, 197-198.)

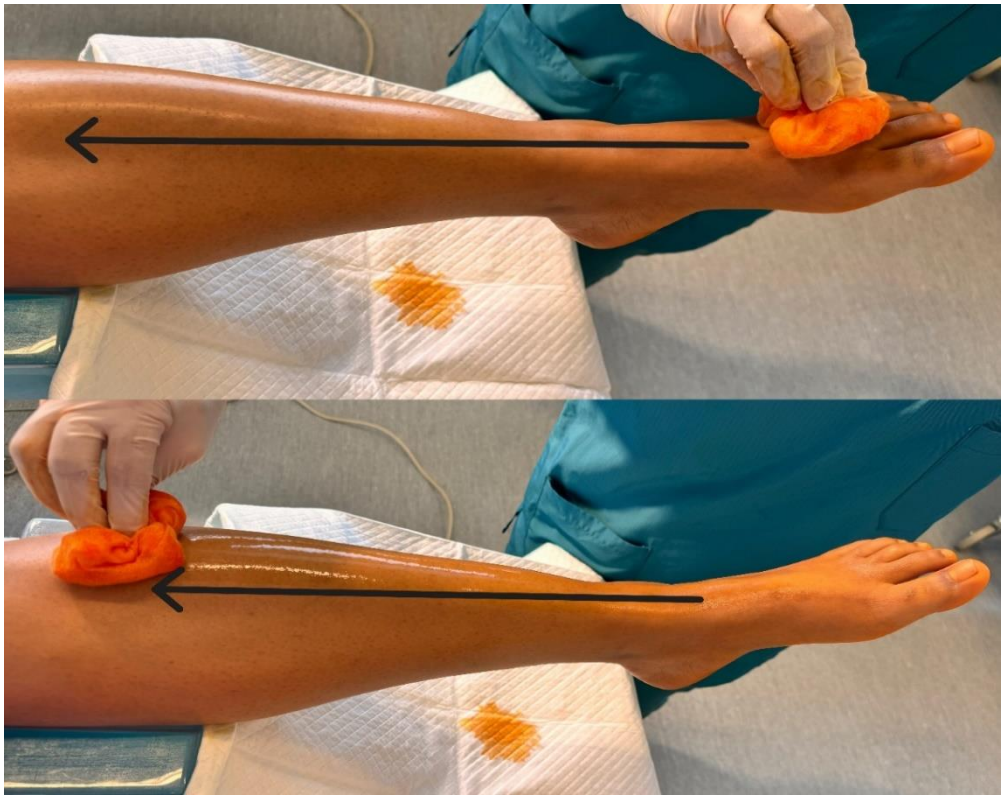

Figure 6: Disinfection of leg starting from bridge of the foot towards knee (Maharjan, Shrestha & Basnet 2024)

Figure 7: Disinfection of sole of the foot and heel (Maharjan, Shrestha & Basnet 2024)

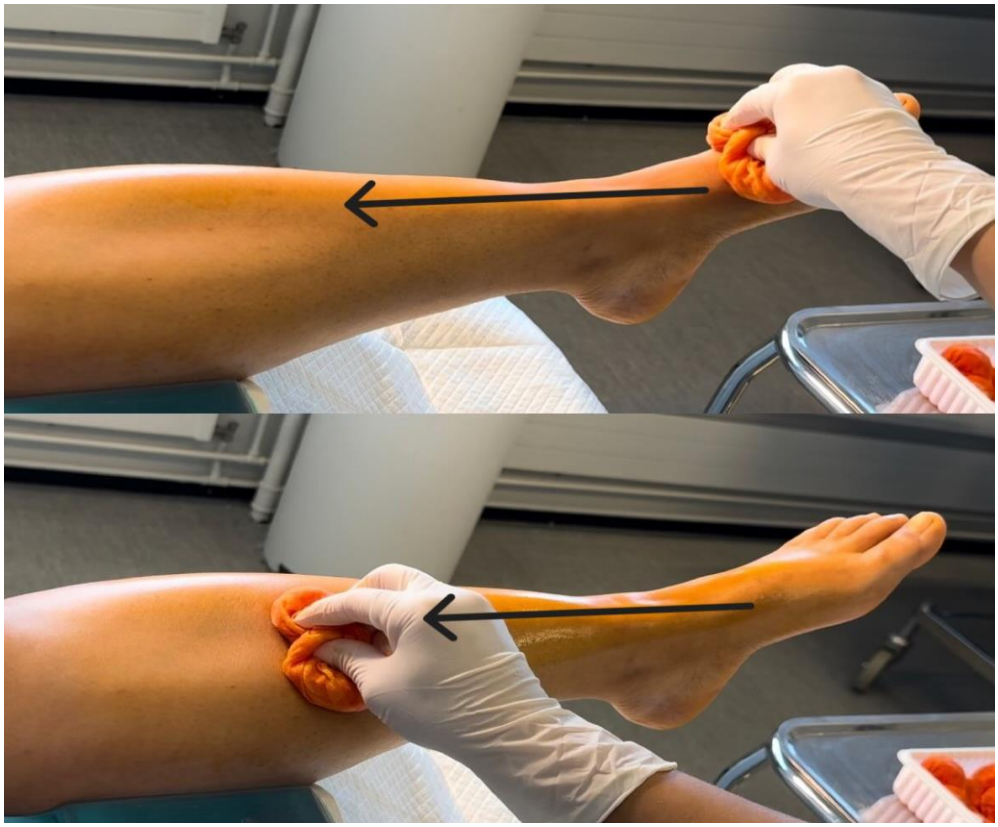

Figure 8: Disinfecting twice making the disinfection area smaller (Maharjan, Shrestha & Basnet 2024)

Once the surgical area has been disinfected twice, lastly the area of the surgical incision can be wiped as shown in figure 9. After this, the circulatory nurse will remove the disposable under pad and protective gloves in the trash can. Finally, the circulatory nurse disinfects her hands. (Aura & Kinnunen 2022, 197-198.)

Disinfection is done with one direction rule meaning the cotton balls are moved in a single direction without any back-and-forth motion, and they are subsequently discarded after reaching the edge (Álvarez, Guevara, Valderrama, Sefair, Ortes, Jimenez, Soria & Cuellar 2018, 52). After applying the disinfectant, the cleaned area is let to naturally dry. The use of swabs and sponges for drying is avoided as it could compromise the antiseptic agent's efficacy and increase the risk of contamination. (Queensland 2015, 4.)

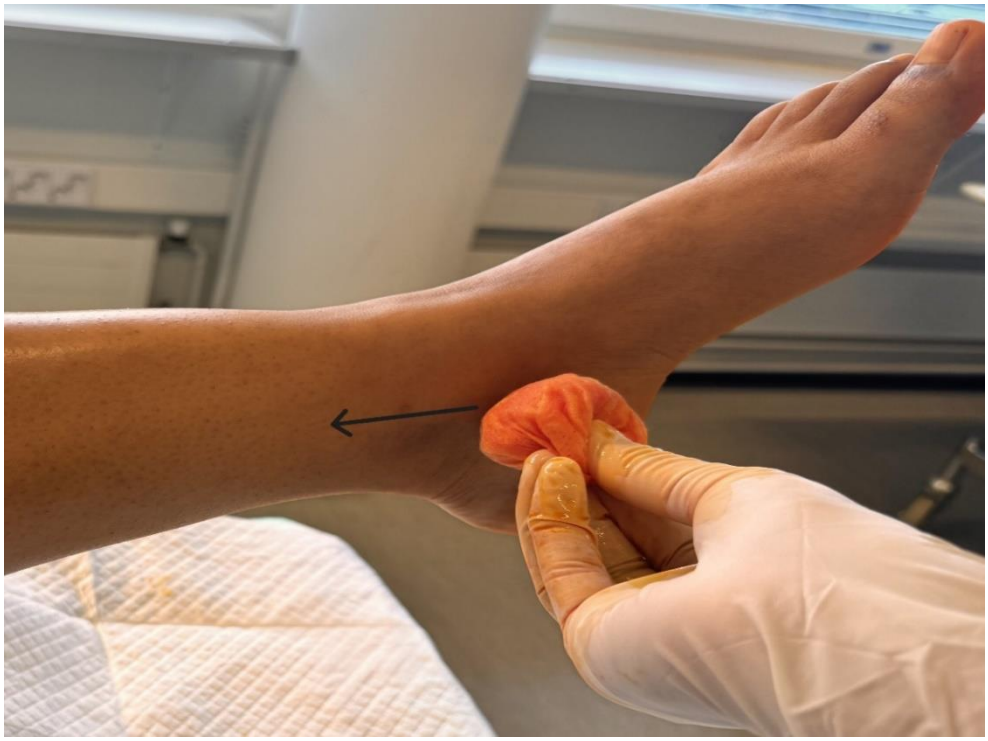

Figure 9: Operative area disinfection i.e., an ankle (Maharjan, Shrestha & Basnet 2024)

3.4.1 Nurses' responsibilities concerning ankle surgical site disinfection

Nurses play an important role in preoperative ankle surgery site disinfection as most of the disinfection procedures are carried out by nurses themselves to reduce the risk of surgical site infections and ensure the optimal possible outcomes for patients. The initial and important aspect before starting surgery procedures is to conduct a thorough preoperative assessment of the patient's overall health, assessing the ankle area for existing skin conditions, infections and allergies that might require special attention. The nursing preoperative assessment is comprehensive and useful to identify, define and communicate patients' risk factors and vulnerabilities. (Malley, Kenner, Kim & Blakeney 2015, 181.) Similarly, another important task is providing preoperative education to patients which depends upon the nurses' perceptions regarding the information to be delivered. It is one of the fundamental cares for patients that is accomplished by offering psychosocial support, health information, and the opportunity to acquire specific skills prior to surgery. It is also a way to identify a patient's needs and enhance therapeutic results. (Almutary & Almashi 2024, 1.)

Likewise, nurses have a responsibility to prevent the spread of microbes during disinfection procedures by utilizing proper hand hygiene, using personal protective equipment, and taking care of environmental cleaning and disinfection. Hand hygiene is maintained by washing hands with soap and water as well as with an alcohol-based handrub. (Carrico, Hudson,

Balcom & Glowicz 2018, 4-5.) Along with these, they are also responsible for making sure that the environment is clean and disinfected (Carrico et al. 2018, 4-5).

The operating room nurses have responsibility to plan the procedure beforehand, such as considerations related to the surgical position, the necessary instruments, as well as devices (Aura & Kinnunen 2022, 144). The operating nurses act as scrub and circulating nurses to provide a professional approach towards patient care. The scrub nurse, also known as the sterile nurse, supervises all items and supplies utilized within the surgical area. In addition, they are responsible for making sure that all equipment and instruments needed for procedures are functional, accessible, and sterile. (Kang, Gillespie & Massey 2014, 16.) Whereas, outside the sterile field a circulating nurse works as the intermediate between sterile and non-sterile, facilitating smooth flow of equipment, and information to the surgeons and scrub nurse. Likewise, they are responsible for accessing additional resources in the surgical suite, located outside the operating room. (Neyens, Bayramzadeh, Catchpole, Joseph, Taaffe, Jurewicz, Khoshkenar & San 2019, 2.) Likewise, the circulating nurse is responsible for monitoring the patient's position during the surgery to make sure that arms or legs don't accidentally fall off the operating table. (Wicker & Dalby 2016, 9-10).

According to Vogelsang, Swenne, Gustafsson & Brynhildsen (2019, 500), nurses hold a major responsibility to prevent surgical site infection by ensuring strict asepsis and hygiene during the patient's surgery. Therefore, it is essential for nurses to be competent and possess necessary knowledge and skills to perform their responsibilities precisely. Apart from technical skills, nurses also require non-technical skills such as coordination, teamwork, communication and providing holistic care to carry out the disinfection procedures effectively (Ucak & Cebeci 2020, 247).

4 Methodology

This chapter introduces functional thesis, the use of video in nursing education and co-operation between working life partners.

4.1 Functional thesis

This thesis is a functional thesis as the authors are creating an educational video. The educational video was sent to nursing students by the authors' tutor teacher to gather feedback. The survey questions were sent via Microsoft office questionnaire. The survey is anonymous as the authors did not collect any personal information from reviewers and all the collected data were deleted after the evaluation.

Functional thesis is development work and a type of thesis in university of applied sciences. Thesis is one-time work and is time limited. (Kostamo, Airaksinen & Vilkka 2022, 11 & 16.) Functional thesis comprises of theoretical part and practical part. Functional thesis helps to organize, advise, and lead practical work. (Saastamoinen, Vähä, Ypyä, Alahuhta & Päätalo 2018, 2.) Functional theses can be done as a case study or as developmental work. Functional theses done as developmental work such as making video or poster is beneficial for both authors and viewers. (Kostamo et al. 2022, 11.) Even though functional thesis is a practical activity, it requires theory and planning. The theory and planning take a lot of time since it is the basis of the work. (Saastamoinen et al. 2018, 2.) The purpose of functional thesis is to show that the authors can use previous information and discuss different solutions. Likewise, the objective of functional thesis is to present that the authors can manage to show professional competence for professional field. (Kostamo et al. 2022, 16.)

4.2 Video as educational tool in nursing education

Technologies can be used in teaching as they provide a wide range of knowledge on the subject (Cardoso, Moreli, Braga, Vasques, Santos & Carvalho 2012, 709). Video is a part of technology. If a video is created properly then it can become a reliable source of knowledge. Usually, to make a video there are three steps, which are pre-production, production, and post-production. (Barbosa, Gonzaga, Jardim, Mendes & Sawada 2023, 2.) In the pre-production phase, script is written focused on target population and scenes are decided. Video is filmed in the production phase according to the script and in the post-production phase, video is edited, and audio is added. (Cardoso et al. 2012, 710.) This audio-visual video gives the viewer time to intake the information because the viewer can pause, rewind and fast-forward (Brame 2016, 2).

Nursing education comprises of learning and demonstrating basic nursing skills (Burton 2022, 1). Additionally, nurses must have clinical skills and that is gained by learning during their studies (Cardoso et al. 2012, 709). New generation students nowadays use technology to enhance their knowledge (Burton 2022,2). Moreover, the use of technology in nursing education has grown as they make the learning process easier and fun (Cardoso et al. 2012, 709). Among technologies, educational videos (EV) have gained popularity in nursing practice (Barbosa et al. 2023, 2). EVs are used to boost teaching because they fill the classroom with motivation and enjoyment (Burton 2022, 2). EVs can help to reach the target audience despite their geographical location and help to update the ongoing technologies and practices in the field (Barbosa et al. 2023,2). EVs provides knowledge about the clinical situation that the nurse students have yet to experience (Cardosa et al. 2012, 712). As student nurses must go through a lot of different clinical environments for a short period of time during their studies, the ability to store the knowledge is a matter of concern (Burton 2022, 2). Therefore,

EVs help in relieving stress of student nurses and can be watched many times to improve knowledge and skills (Cardosa et al. 2012, 712).

4.3 Working life partner

This thesis was developed with the cooperation among authors and Laurea University of Applied Sciences (UAS). Laurea is operated in the Uusimaa region of Finland with six different campuses. Laurea provides bachelor's degree programs, master's degree programs and exchange studies. (Laurea 2024.) The aim of Laurea is to make students competent by providing them with knowledge and equipment required to develop their skills. Learning by development (LbD) is a project of Laurea UAS to allow students to participate in developmental works that is beneficial for them in their future careers. (Laurea 2023-2025, 2-3.) This thesis is a part of the authors' bachelor's degree.

The authors decided to make an educational video and the thesis plan was approved by thesis supervisors provided by Laurea. Laurea also provided the authors with an expert in the field. The expert and the authors had meeting via teams. The expert helped the authors in making the video for the thesis. Additionally, the authors made an agreement with perioperative expert following Laurea´s guidelines. As well a research permit was applied from Laurea UAS to make a video in Laurea premises and survey the English-speaking nursing students of Laurea UAS regarding their video. Laurea UAS provided the authors with essential materials to do the research needed to make the video. Moreover, the equipment that was used in the video was provided by Laurea. The participants for the survey are students of Laurea and the authors conducted a survey with 20 English-speaking nursing students of Laurea. The co-operation between the authors and working life partners was maintained during the thesis process.

5 Educational video: Process of making an ankle surgery site disinfection video

The idea of making an educational video first came to the author's mind during the thesis planning. All the authors had done their surgical placement, so they wanted to make an educational video regarding the operation theatre. While brainstorming, all the authors decided that disinfection of surgical site would be useful for student nurses who are going for their surgical placement. Therefore, the idea of making an EV of ankle surgery site disinfection was introduced to the thesis supervisors and was approved in May 2023.

To create an educational video, the authors initiated the process with a research phase that involved establishing a theoretical foundation for the chosen topic. Theoretical information and script for the product are sourced from reputable databases to ensure reliability. After gathering all the important information, the authors proceed to develop the script for the

video. The research is guided by keywords such as Ankle Surgical Site Disinfection, Educational Video, Surgical Site Disinfection, Surgical Site Infection, Asepsis, Nurses, Responsibility of Nurses, and Nursing Students. After the theoretical part was approved by the supervisors of the thesis, the authors started to work with the script. The script was carefully written bringing together the theoretical information into a story that effectively explains the important ideas about ankle surgery site disinfection. This writing process is crucial for turning theoretical knowledge into an interesting and educational video for the target audience, which is nursing students.

To create the script, the authors gathered information from trusted sources such as ProQuest, THL, Terveysportti, EBSCOhost, ProQuest eBook Central, LaureaFinna. The selected sources are in both Finnish and English language. The script comprehensively documents the entire filming process, detailing each step from beginning to the end. The authors outlined the list of required equipment and finalized script for the educational video in Appendix 2 and Appendix 3 simultaneously. Additionally, during the editing phase, the authors enhanced the audio quality by voiceovers as well as included subtitles in English for better understanding. The subtitles of the video can be found in Appendix 4.

Once the script was developed and the thesis plan was approved by the supervisors, the authors applied for the research permit on 13.3.2024. The research permit was granted on 25.3.2024 which is on Appendix 1. Then, the authors contacted the expert to plan the shooting. This involved discussing the shooting location, deciding on a schedule, and gathering the required equipment. The video was filmed in the Laurea premises with the equipment provided by Laurea on 10.4.2024. It took one day to shoot the video according to the script and the editing was completed the next day. Then, the video was sent to the expert for approval and the thesis supervisors for approval. After the approval from thesis supervisors, the authors sent an email to their tutor teacher with the link to the video, questionnaire, and invitation letter to forward it to 50 English speaking nursing students for survey. The invitation letter can be found in Appendix 5. The survey was open for 2 weeks (16.4.2024-30.4.2024) however, the desired number (20) of feedback was gathered within 1 week so the survey was closed early (22.4.2024). Once all the feedback was gathered, the authors started to evaluate them and write them in their thesis. It took 1 week for the authors to evaluate the feedback and submit the findings to the thesis supervisor.

6 Educational video evaluation

After finishing the filming of the video, the authors started the editing process. It was edited the next day and was forwarded to the expert to receive approval on the final product. On the same day, the authors received suggestions from the expert on audio quality since

narrator spoke quickly as well as to add the English subtitles to the video as it would make it easier for the viewers to follow the video. After making possible changes, the authors forwarded the final video to the expert. The expert approved the final video and praised the work of the authors including audio quality, subtitles, and content of the video. The final video was approved within a week. The educational video was uploaded onto one of the authors' YouTube channels. The link to the video is included in Appendix 7. Later, the video as well as questionnaires form with invitation letter was sent to authors' tutor teacher through Microsoft Outlook email. Then, the tutor teacher forwarded them to 50 English-speaking nursing students through Laurea's email. The questionnaires were made via Microsoft questionnaires form. Even though the questionnaire is answered using email, the authors were not able to see the email of the responder. Moreover, the questions in the questionnaire are related to video and do not collect any personal data. All the data collected during the survey was handled confidentially and was deleted after evaluation. The survey was opened for 2 weeks, however the desired number of students (20) was reached within 1 week, so the survey was closed early. The questionnaire form is included in Appendix 6.

The video link and questionnaire were sent to 2nd and 3rd year English-speaking nursing students of Laurea UAS. The survey was completed by 20 students. The result of the survey is shown in the bar chart for clear and easy understanding. There were 5 questions in total where 4 of them had options to choose from strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree and one question was an open-ended question. The results of 4 questions which had options are shown in bar chart and the result of an open-ended question is explained in a paragraph. The feedback was quite positive.

The first question of the survey asked about the quality of the video. Among the 20 respondents, 16 responded that they strongly agree, and 4 of them responded agree as shown in figure 10. There were no negative or neutral responses.

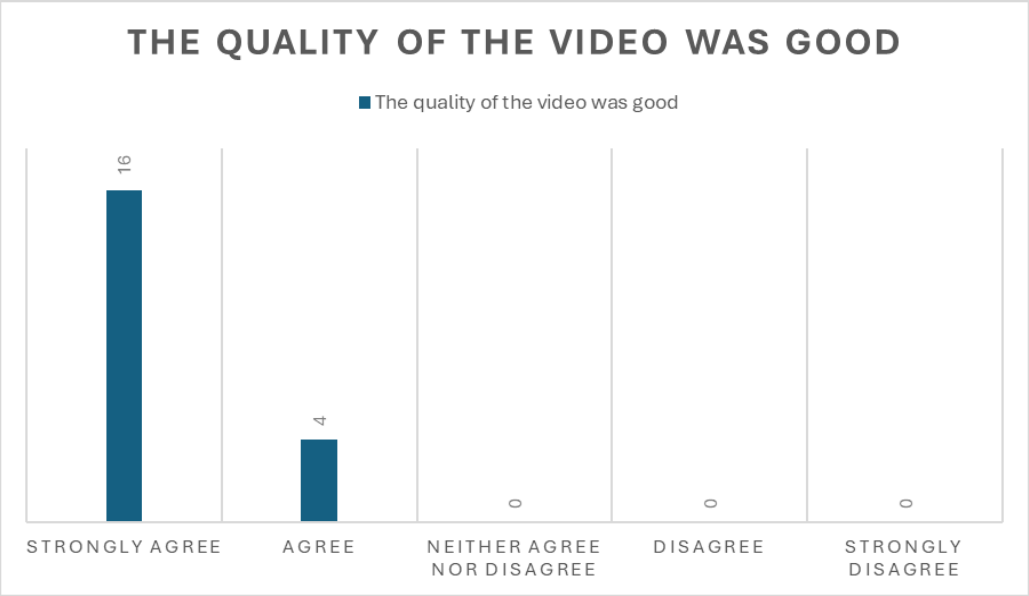

Figure 10: Quality of the video

The second question in the survey asked about the usefulness of the content of the video. 15 responded that they strongly agree that the content of the video is useful and 5 responded that they agree that the content of the video is useful as shown in Figure 11. The positive response in this video signifies the purpose of the thesis.

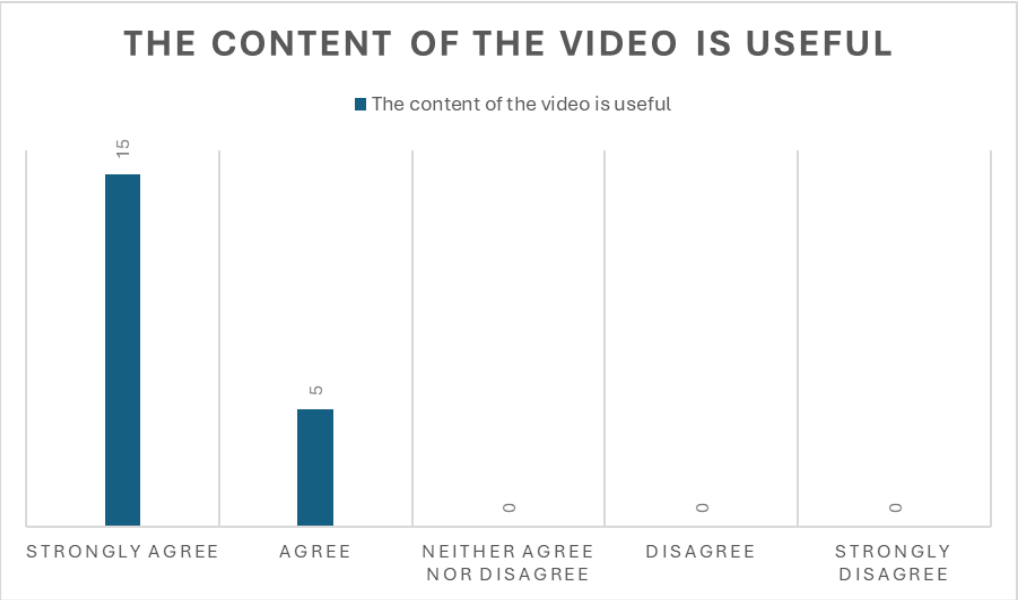

Figure 11: Content of the video

The third question in the survey asked how likely they are to recommend this video to others. 16 of the respondents strongly agreed that they would recommend the video to others and 3

of the respondents agreed that they would recommend the video to others while 1 of the respondents stayed neutral as shown in figure 12.

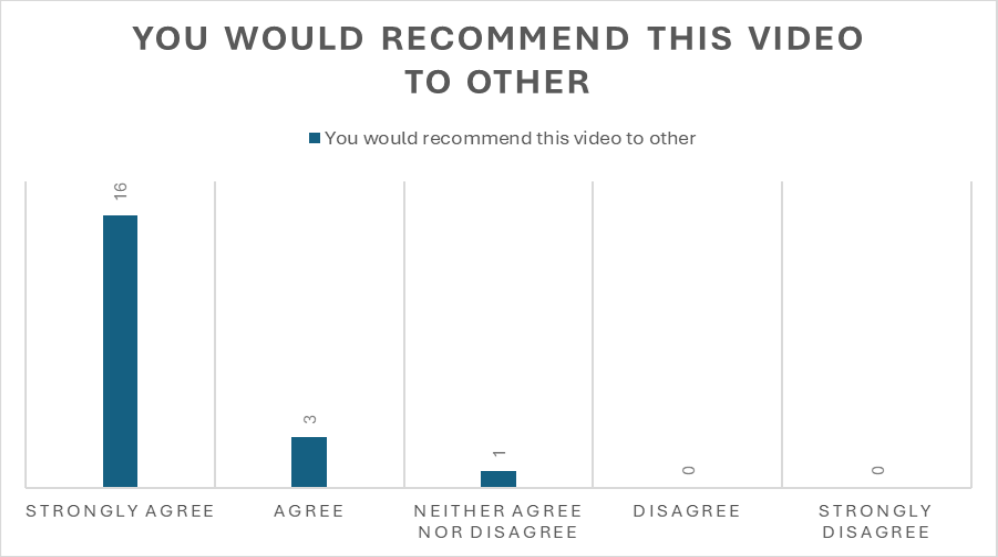

Figure 12: Recommending the video to other peers

The fourth question asked about the easiness of following the video. 14 of the respondents strongly agreed that it is easy to follow the video and 3 of the respondents agreed that it is easy to follow the video as shown in figure 13. This shows that the video was easy to understand and flowed efficiently.

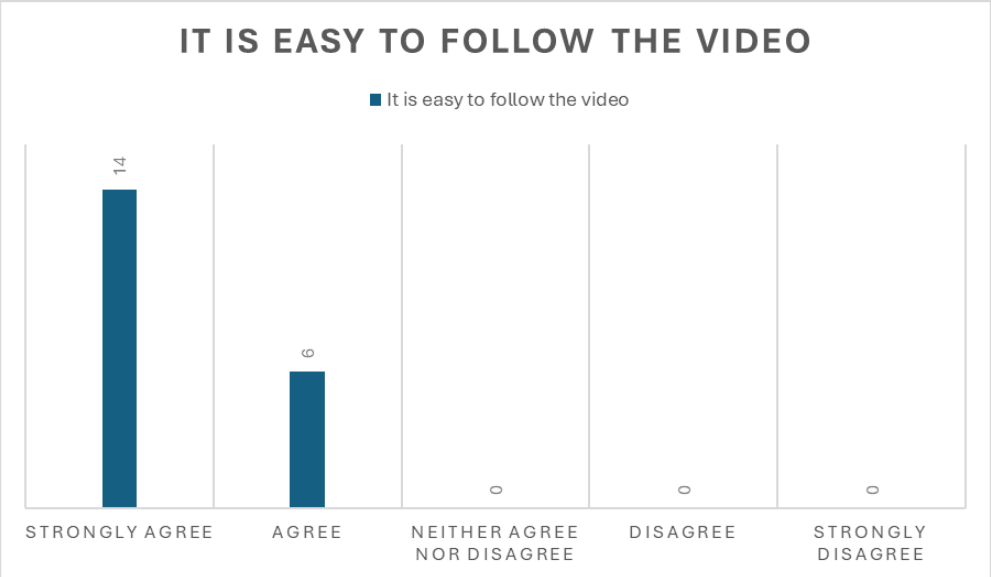

Figure 13: Ease to follow the video

Furthermore, all the respondents answered the open-ended question. So, there were 20 open feedback on the video. Almost all the open feedback was positive too. The feedback

acknowledged how great the quality and content of the video was. Along with that, there were also few suggestions for the improvement of the video such as two of them responded that it would have been great if there were Finnish subtitles in the video which would have helped them to grow the Finnish vocabulary. However, these suggestions could not be made as the authors had a limited time. Many of the feedback claimed that this video was great material for them in their studies as the process was explained properly. Additionally, one of the respondents pointed out the use of real patient. It was difficult for authors to figure out if the respondent meant it in positive way or negative but looking after other responses from the same respondent it seemed that the response meant that it was realistic and nice to use the real patient. Many of the respondents mentioned clear voice texture and good video quality. Moreover, there were some responses that said the video was well done and there was nothing to be improved.

7 Reliability

"Reliability" depicts the stability and consistency of research outcomes. In another words, reliability in the research means to the ability of a particular test to yield similar outcomes when applied at different circumstances. (Babu & Kohli 2023, 400.)

The authors of this thesis sought information to ensure that the measures used are trustworthy and valid. The theoretical foundation was built on research from well-known databases and extensively cited literature in nursing education. This thesis relies on existing information, including recent research findings, to enhance reliability and validity in the current context. Along with that, excluding publications before 2010 adds to the reliability of the work. As well as the guidance, support, and feedback from thesis supervisors were carefully followed. The thesis adhered to Laurea research guidelines, utilizing reliable databases like science direct, Ebsco host, Proquest central, WHO, PubMed, Terveysportti, and Sage through LaureaFinna. Furthermore, evidence-based practice was considered at every stage of the research process, as well as references were accurately cited per Laurea's thesis referencing guidelines.

8 Ethical considerations

Ethical considerations are the keystone of every research work. Throughout the entire research, ethical principles should be at the forefront of researchers' minds during every phase of the process. (Åstedt-kurki & Kaunonen 2018, 449). The Finnish National Board on Research Integrity (TENK) plays an important role in managing ethical considerations in research in Finland. It focuses on handling ethical issues related to research integrity and

supporting responsible research practices as well as aims to prevent violations of research integrity. Emphasizing ethical considerations is necessary to support the trustworthiness, reliability, and credibility of research conducted within the Finnish research community. (TENK 2023, 6). In Finland, research institutes, universities, and universities of applied sciences follow the guidelines to promote responsible ethical research conduct and prevent against research misconduct (Åstedt-kurki & Kaunonen 2018, 449).

According to Laurea guidelines, when conducting research involving interviews or gathering people's ideas, the researcher needs to obtain a research permit from the school. In accordance with the thesis plan, the research permit must be authorized by the administrative director of the organization. After the final video was developed, feedback was gathered from nursing students at Laurea UAS. Participants were assured that taking part in the survey and answering the questionnaire was entirely voluntary, anonymous, and confidential. When collecting feedback, the primary data source is a questionnaire completed by Laurea's nursing students. Authors have been responsible for data protection all the time through the process. All the information gathered during the survey was kept confidential and stored in Microsoft survey form. Once it was analysed, it was deleted.

9 Further development

Since the thesis was developed for nursing students, in future it would be good to collaborate with nurses to gain more information, conduct interviews, or have them in the educational video, targeting to present several perspectives on ankle surgery site disinfection. Furthermore, the video can be planned to be filmed in the real environment of an operating room, providing a practical setting for the content.

Likewise, having Finnish subtitles in the video would be beneficial for Finnish speaking nursing students and international students who wish to work in Finland as nurses in operation theatre after graduation.

Additionally, a survey among nursing students from different universities of applied sciences (UAS) can be planned to collect valuable feedback and understandings from a diverse student group, which will help in continuously improving the educational video.

10 Conclusion

Surgical site infection is one of the most common infections that affects surgical patients and can even lead to death. The best possible way to prevent surgical site infection is to perform

the preoperative surgical site disinfection properly and systematically. Among different surgeries, ankle surgeries are also often known to be complicated surgeries linked with higher post operative infection rates. The unique structure of foot makes it challenging to kill bacteria and microbes if disinfection is not done efficiently. Moreover, the use of multimedia is growing in the field of studies. While searching for the video regarding ankle surgery site disinfection according to Finnish guidelines, the authors could not find it. Considering these matters, this thesis has been done to create an educational video for nursing students to exhibit the conventional method and technique of ankle surgical site disinfection according to Finnish health care standards.

The authors have collaborated with Laurea to create this educational video and to send the final video to the nursing students for their feedback. The authors would like to bestow sincere gratitude to Laurea and all the teachers for their collaboration to make this project successful. The authors have received mostly positive feedback and comments from the nursing students about the video. All in all, the students responded that the video is a great study material for them and contains a lot of information. Therefore, the authors think that the purpose of the thesis has been fulfilled.

The journey of the thesis has taught the authors time management skills, the process to make a health-care related video and teamwork. The authors learned time management skills as they all were working while doing the thesis and it was compulsory for them to finish the work in the designated time. Similarly, the authors gained the knowledge of the process to make a video related to healthcare and difficulties of it. Despite all the hardships the authors had to face during their journey the authors are delighted that the aim and purpose of the thesis has been achieved and they got to learn new skills.

The thesis comprehends the detail overview of the literatures regarding preoperative ankle site disinfection which can be used as a learning material by nursing students and could also be used as a reference in the future for further thesis and research development. The educational video is easily accessible on the internet, and it can bring engaging and enhanced learning experience to the nursing students. Moreover, the thesis will strengthen knowledge and skills of nursing students regarding ankle surgery site disinfection procedures and contribute to bring a significant impact in the healthcare setting to promote safe health care environment by preventing ankle surgical site infections.

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Figures

Tables

Appendices

Appendix 1: Research permit

LAUREA AMMATTIKORKEAKOULU University of Applied Sciences

RESEARCH PERMIT APPLICATION

Date: 13.3.2024 Page 1/5

Research permit application should contain at least following elements.
If needed you may give additional information in attachments.

NAME: Anugya Maharjan, Tonisa Shrestha, Srijana Basnet

TITLE: Bachelor of Nursing

ADDRESS:

TEL:

E-MAIL:

DATE: 13.3.2024

[Research, thesis, etc.] Author(s)/investigator(s):	Anugya Maharjan, Tonisa Shrestha, Srijana Basnet
Degree programme/ college/university:	Degree programme in nursing/laurea university of applied sciences
Unit/department:	Nursing (SNV221KN)
[Research, thesis, etc.] Instructor(s):	Kirsi Tulus, Kati Saarinen
Ohjaajani on hyväksynyt tutkimuslupahakemukseni	Yes No
Title of the {research, thesis, etc.]:	Ankle surgery site disinfection: an educational video
Objectives/ research problem:	The aim of this thesis is to make an educational video of ankle surgery site disinfection for perioperative nursing students to use during their training at school and at their practical placement in the operating theatres. The purpose of this thesis is to educate the method and technique of ankle surgery site

	disinfection to nursing students and to promote preventing surgical site infections.
Concise definition of what information is needed, the format in which they are needed and how the information is delivered:	The survey is about the educational video. The survey will be conducted via Microsoft office quesstionnaire link. The quesstionnaire consists of 5 questions altogether. Questionnaires and video along with invitation letter will be sent to the authors' tutor teacher via Microsoft outlook and they will then forward that to 40–50 English-speaking nursing students. The survey questions are in Microsoft office questionnaire, the authors can not see the responders' email addresses. No contact information is needed or saved for the survey and confidentiality is maintained while evaluating the answers. All the data will be deleted once the survey is evaluated. The first 4 questions are rated on the scale strongly agree, agree, neither agree nor disagree, disagree or strongly disagree. The last question is an open-ended question. The questions are: 1. The quality of the video was good. 2. The content of the video is useful 3. You would recommend this video to other 4. It is easy to follow the video 5. What are the things you wished to be improved in this video?
Timetable (in two months accuracy):	The application for the research permit will be submitted right after the thesis plan is approved. After getting research permit, the authors will set a date for making video with the expert. This may take 1–2 weeks. After the video is made, it will be send for approval to the supervising teachers and the expert. This may take 1–2 weeks as well. Once the video is approved, the authors will send the survey, video and invitation letter to their tutor teacher to forward it to 40–50 English-speaking nursing students. The questionnaire link will be open for 2 weeks but if the target number of students (20) is reached before that time frame

	then the questionnaire will be closed. Once all the information is gathered, the authors will start to evaluate them and write them in their thesis within one month.	
Attachments (research plan, questionnaire, framework for theme interview, privacy statement etc.):	Research permit application form Thesis/Research plan Microsoft questionnaire forms link to the questionnaire Invitation letter Privacy statement	
Privacy notice If yes, fill in the information on the next page. If no, explain the grounds here.	Yes	No Grounds:
Permission to publish information about the granted research permit on Laurea's website (author(s) and title of the [research thesis, etc.])	Yes	No Grounds:
Filled by issuer of permit at Laurea	Research permit is granted Grounds:	Research permit is not granted
Name of the issuer of permit and the date:		

Research permit is granted on the condition that applicant complies with legislation when processing and saving personal data. All data is confidential and provided only for purposes of survey/research in question. The applicant is responsible for securing identity and anonymity of persons in data provided. After the survey/research is completed, the applicant is responsible for deleting the data in appropriate manner.

If personal data file is created during the research (Personal Data Act -523/1999- Section 10) then applicant must comply with the provisions of law when processing and protecting of personal information. If necessary, the application must be accompanied by Scientific Research Register Description.

The applicant is responsible for providing positive decision to a person who will provide information at Laurea. Practical implementation of survey is negotiated at this point.

Data protection notice (EU679/2016)

Processing personal data in research

This notice describes how your personal data is processed No personal data is collected during this survey.

The data controller of the research is Anugya Maharjan, Tonisa Shrestha and Srijana Basnet

For more information on the processing of personal data, please contact

Purpose and means of processing personal data

We have received on the basis of the research permit granted by
Laurea from Laurea's

in order to conduct our survey
We process personal data only for No personal data is collected during this survey. All the feedbacks will be confidential and deleted after the evaluation.
We do not collect any personal data such as gender, age, race, nationality etc.
We shall delete the personal data we have received

We are committed to following Laurea's data security and data protection guidelines. We process the data in secure information systems that are protected by usernames and passwords.

Your rights related to the processing of personal data

You can view or edit your personal data by contacting the person in charge of processing personal data. In certain cases, you may also limit or object the processing of personal data.

If the rights prevent the accomplishment of the research purpose or significantly hinders it, the rights may be derogated from in certain individual cases under the conditions laid down in the Data Protection Regulation and Data Protection Act. The need to derogate from the rights is evaluated on a case-by-case basis.

THE DATA PROTECTION OFFICER IS THE CONTACT PERSON IN MATTERS RELATED TO THE RESEARCH SUBJECT'S RIGHTS.

The data protection officer at Laurea is **Marjo Valjakka**, *marjo.valjakka@laurea.fi*

You have a right to make a complaint to the Office of Data Protection Ombudsman if you feel that the processing of your personal data has contravened existing data protection legislation.

Tämä dokumentti on allekirjoitettu sähköisesti Laurea Sign-järjestelmällä
This document has been electronically signed using Laurea Sign

Päiväys / Date: 13.03.2024 20:30:55 (UTC +0200)

Tonisa Shrestha

Organisaation varmentama (Laurea-käyttäjätunnus)
Certified by organization (Laurea user account)
Certified by organization

Päiväys / Date: 13.03.2024 20:31:01 (UTC +0200)

Srijana Basnet

Organisaation varmentama (Laurea-käyttäjätunnus)
Certified by organization (Laurea user account)
Certified by organization

Päiväys / Date: 13.03.2024 20:31:30 (UTC +0200)

Anugya Maharjan

Organisaation varmentama (Laurea-käyttäjätunnus)
Certified by organization (Laurea user account)
Certified by organization

Päiväys / Date: 25.03.2024 16:51:29 (UTC +0200)

Clarissa Bingham

Organisaation varmentama (Laurea-käyttäjätunnus)
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Certified by organization

Appendix 2: Equipment needed for the video

- Hand disinfectant
- Factory disposable gloves
- Operating table
- Surgical lighting
- Nurses scrub
- Patient surgical gown
- Masks
- Headcovers
- Coloured antiseptic solution (60-80% ethanol)
- Cotton balls for applying antiseptic solution
- Sheets to cover underneath the leg
- Clean table for supplies
- Footrest
- Trash bin

Appendix 3: Manuscript of the video

Introduction	Name of authors and working life partner Authors: Anugya Maharjan Tonisa Shrestha Srijana Basnet Working life partner: Laurea UAS logo	These will appear in the beginning of the video. Note: "Background music will be played throughout the video."
Disclaimer	"This video is for training purposes only. The video shows elective ankle surgery site disinfection according to Finnish guidelines. If you have any questions or concerns about steps outlined in this video, please consult with a qualified healthcare professional for guidance."	The text will appear with a blue background and at the same time narrator will read the text out loud.

Scene 1	"The principles of surgical site disinfection according to Finnish guideline: • The surgical site should be clean • The disinfection is done starting from clean area to dirtier area. • Remember to think about the flow of disinfection liquid. • The surgical site is disinfected at least twice. • The disinfection area is made smaller with each disinfection. • Be careful that glove or the forceps does not touch the skin • If the cotton balls touch other places than the disinfection area, they must be changed. • Avoid being on top of disinfected area. • Let the disinfected area dry before covering."	The text will appear with a blue background and narrator will read the text out loud.
Scene 2	"The disinfection of the surgical area is done after the administration of anaesthesia either general, regional, or local. The circulatory nurse in the operating room is responsible for surgical site disinfection."	This will appear as a text and at the same time narrator will read the text out loud.
Scene 3	The circulatory nurse is shown in this scene with her normal attire.	"The circulatory nurse in an operating room wears nursing scrub, head cover and mask. They use gloves as needed such as while disinfecting."
Scene 4	Before starting the disinfection, the circulatory (Tonisa Shrestha) nurse puts the patient into a suitable operating position i.e. patient's (Srijana Basnet) leg on the leg rest	The narrator will describe the scene. "The circulatory nurse puts the patient into suitable

	with under pad underneath their operative leg.	operating position i.e. the patient is laying on their back and the operative leg is supported by a leg rest making sure that toes, knee, and femur are in straight line. This position helps to prevent the patient's leg from sliding during the procedure. The under pad is laid underneath the patient's operative leg. This is to prevent antiseptic solution dropping onto the operating table."
Scene 5	In this scene: The circulating nurse (Tonisa Shrestha) shows the things needed for disinfection. Coloured antiseptic solution (60-80% ethanol) Factory disposable gloves Cotton balls for applying antiseptic solution Dustbin Hand disinfectant	The narrator will name the items as the name of the item appeared one by one.
Scene 6	In this scene, the circulatory nurse disinfects her hands and opens the sterile cotton balls package and places it on the table that is already disinfected.	The narrator will describe the scene as the circulatory nurse acts. Note: "It is important to disinfect the surface of the table before opening the washing package."

Scene 7	After this, the circulatory nurse disinfects her hands and carefully pours disinfectant solution to the cotton balls from top without any leakage.	The narrator will explain how it is done and why. “The nurse then pours the disinfection solution onto the cotton balls from the top without any leakage.”
Scene 8	In this scene, the circulatory nurse disinfects her hands and puts on the gloves. She takes a pair of cotton balls and starts the disinfection from the toes.	The narrator will describe the technique. Before starting squeeze the extra amount of disinfection.’ “The nurse disinfects the toes using both hands. The nurse takes cotton balls on both hands and disinfection starts from big toe to small toe. The toes are disinfected individually, with the circulatory nurse applying disinfectant in each toe and paying close attention to the spaces between them.”
Scene 9	In this scene, the circulatory nurse starts the disinfection from top of the bridge of the foot towards the knee stopping just below the knee.	The narrator in this scene explains what the circulatory nurse is doing. Remember to disinfect all parts i.e. not leaving any part dry. Be careful not to touch the skin with protective gloves. “It is avoided to be on top of disinfected area, so the disinfection is done from each sides covering all parts.”
Scene 10	Next, the circulatory nurse disinfects the soles of the foot. Hold the big toe with the other hand using cotton balls and start disinfecting	

	the sole from top to bottom covering the heels.	
Scene 11	The disinfection process is repeated twice in this scene.	Note: Disinfecting the surgical site is done at least twice "each time the disinfection area should be smaller."
Scene 12	Now, the circulatory nurse disinfects only the ankle area (operative area) again for the last time.	Note: "Care is taken to prevent contamination of already disinfected areas."
Scene 13	In this scene, once the disinfection is complete, let the area dry. Now, the circulatory nurse put disposable equipment in mixed waste, take off protective gloves. After that the circulatory nurse does the usual hand disinfection.	
Scene 14	"It is important to maintain aseptic principles during disinfection. If there are suspicions regarding inadequate disinfection or contamination of the area, repeat the disinfection process as needed."	The text will appear with a blue background and at the same time narrator will read the text out loud.
Scene 15 Closing	Name of the authors and their role Srijana Basnet: Patient Tonisa Shrestha: Circulating nurse Anugya Maharjan: Narrator Cameraman: Anugya Maharjan Editing: Tonisa Shrestha Script by: Anugya Maharjan and Tonisa Shrestha Special thanks to Tiina Pitkänen	The text will appear with a blue background.

Appendix 4: Voice over and subtitles of the video

This video is for training purposes only. This video shows elective ankle surgery site disinfection according to Finnish guidelines. If you have any questions or concerns about the steps outlined in this video, please consult with a qualified health care professional for guidance.

The principles of surgical site disinfection according to Finnish guideline:

- The surgical site should be clean
- The disinfection is done starting from clean area to dirtier area.
- Remember to think about the flow of disinfection liquid.
- The surgical site is disinfected at least twice.
- The disinfection area is made smaller with each disinfection.
- Be careful that glove or the forceps does not touch the skin
- If the cotton balls touch other places than the disinfection area, they must be changed.
- Avoid being on top of disinfected area.
- Let the disinfected area dry before covering.

The disinfection of the surgical area is done after the administration of anaesthesia either general, regional or local. The circulatory nurse in the operating room is responsible for surgical site disinfection.

The circulatory nurse in an operating room wears nursing scrub, head cover and mask. They use gloves as needed such as while disinfecting.

The circulatory nurse puts the patient into suitable operating position i.e. the patient is laying on their back and the operative leg is supported by a leg rest making sure that toes, knee, and femur are in straight line. This position helps to prevent the patient's leg from sliding during the procedure. The under pad is laid underneath the patient’s operative leg. This is to prevent antiseptic solution dropping onto the operating table.

The circulatory nurse gathers the materials needed to disinfect the surgical site. The things needed for disinfection of an ankle are coloured antiseptic solution (60-80% ethanol), factory disposable gloves, hand disinfectant, cotton balls for applying antiseptic solution, and dustbin.

Now, the nurse disinfects her hands before opening the cotton balls package.

After disinfecting her hands, the nurse carefully opens the cotton balls package without touching the cotton balls. It is important to disinfect the surface of the table before opening the cotton balls.

The nurse then pours the disinfection solution onto the cotton balls from the top without any leakage.

The nurse disinfects her hands and puts on factory disposable gloves. Then the nurse takes a pair of cotton balls touching only the back side of cotton balls. This is because, while disinfecting, only the cotton balls can touch the operating area. The nurse squeezes the extra amount of disinfectant and starts the disinfection process from toes. The nurse disinfects the toes using both hands. The nurse takes cotton balls on both hands and disinfection starts from

big toe to small toe. The toes are disinfected individually, with the circulatory nurse applying disinfectant in each toe and paying close attention to the spaces between them.

The disinfection area should be wide enough. So, the nurse starts disinfection from top of the bridge of the foot towards the knee stopping just below the knee. Always remember to disinfect all parts so that there are no dry spots. Disinfection is done with one direction rule meaning the cotton balls are moved only in one direction and not in back-and-forth motion. While disinfecting the calf area, remember that the cotton balls cannot touch the under pad. If the cotton balls touch the under pad, then the cotton balls must be changed immediately. It is avoided to be on top of disinfected area, so the disinfection is done from each sides covering all parts.

The nurse disinfects the sole of the foot. The nurse straightens the sole by holding the big toe with one hand using cotton balls and starts to disinfect the sole from top to bottom, covering the heels.

The disinfection is done at least twice so the nurse repeats the same procedure starting from toes again but this time making the disinfection area smaller.

Lastly, the operative area that is the ankle is disinfected one last time. Then the disinfected area is left to dry.

Once the disinfection is done, the circulatory nurse carefully removes the under pad without touching the disinfected area and puts all the disposable equipment in mixed waste, takes off protective gloves and does the usual hand disinfection.

It is important to maintain aseptic principles during disinfection. If there are suspicions regarding inadequate disinfection or contamination of the area, repeat the disinfection process as needed.

Appendix 5: Invitation letter for feedback

Laurea University of Applied Sciences **Invitation Letter**

15.4.2024

Dear participants,

We are nursing degree students Anugya Maharjan, Tonisa Shrestha, and Srijana Basnet from Laurea University of Applied Sciences. We are currently doing our bachelor's thesis research on the topic Ankle surgery site disinfection. In this thesis we made an educational video focusing on English-speaking nursing students.

We are sending you this email to invite you to kindly participate in our survey. The video is about 6 minutes long and the questionnaire consists of only 5 questions. The feedback will be used in our thesis and will be anonymous. We do not collect any personal information. All the collected information will be deleted at the end of the evaluation. Participation is voluntary. The link to a video and questionnaire is attached to this letter.

Thank you for your time and feedback. Your feedback is valuable for us. Herewith this email we have attached the link to a questionnaire and video. The video is a YouTube video link. Thank you for participating.

A research permit to do this survey was granted by Laurea UAS.

The link to the education video:
https://www.youtube.com/watch?v=lEEEoqQcucI

The link to the survey questionnaire:
https://forms.office.com/Pages/ResponsePage.aspx?id=1-m58GaNFkucHGsHxHligHA8FXl0Q39Dl58VTzMLnMVUMFpNSzNLNVEwRU83VUtHNDVMNTlZVlhOVC4u&fbclid=IwAR3qRUu0nl8pYSn83nch7apLtSNwvAA7PVWnpaqlQffI84nR4HUWuEhR2qA_aem_AcaOAVjCEPMwNZHo5nS5Cnwo6CapY-chanLtWRJoZ-TGcxeucusHdDlN8LSaPLjf368iebkEKXfg-UAnYLO--h-Y

Best regards,
Anugya Maharjan
Tonisa Shrestha
Srijana Basnet

Thesis supervisors,
Kirsi Tulus
Kati Saarinen

Appendix 6: Questionnaire

Ankle surgical site disinfection: an educational video

Please note that all the questions from 1 to 4 have five different options. Only one option can be choosen.

* Required

1. The quality of video was good

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly agree

2. The content of the video is useful

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

3. You would recommend this video to other

- ○ Strongly agree
- ○ Agree
- ○ Neither agree nor disagree
- ○ Disagree
- ○ Strongly disagree

4. It is easy to follow the video.

- ○ Strongly agree
- ○ Agree
- ○ Neither agree nor disagree
- ○ Disagree
- ○ Strongly disagree

5. What are the things you wish to be improved in the video? *

Enter your answer

Submit

Appendix 7: Link to the educational video

https://www.youtube.com/watch?v=lEEEoqQcucI&t