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INTRAVENOUS CANNULATION INSERTION AND REMOVAL

Educational video for nursing students of Centria University of Applied Sciences

Thesis

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ABSTRACT

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<p>This thesis aimed to produce a new and updated educational video about peripheral intravenous cannulation insertion and removal for Finnish as well as English-speaking nursing students of Centria University of Applied Sciences. Cannulation of the peripheral vein is one of the most important and common medical procedures performed by intravenous licensed health care professionals. Intravenous cannulation is a skill that nursing students need to learn. It is learned and mastered by practicing it several times. Before trying cannulation, nursing students need to know how to do it. Aseptic and technical skills are important while cannulating and the instructional video will help to acknowledge these skills.</p> <p>The purpose of the thesis was to produce an educational as well as instructional video based on up-to-date and evidence-based information on the procedure. The authors' aim was to make a video that can benefit those students who are practicing peripheral intravenous cannulation for the first time. The objective was to support the teacher and the nursing students by releasing the video which can be accessed whenever it is needed. The completed thesis provides theoretical knowledge about the principles of peripheral intravenous cannulation, such as reasons for cannulation, supplies and set up during the procedure, working steps and the procedure itself, potential difficulties that may arise during the procedure, the removal of cannula, and complications.</p> <p>The instructive video was created in co-operation with the health teacher and volunteers. The video is based on updated information from current research papers, articles, journals, and books. The video shows an adult patient being cannulated in a non-emergency situation. The video begins with the preparations of the procedure and ends with the removal of the intravenous cannula and securing of the cannulated place with dressings. The video will be handed to Centria University of Applied Sciences, where it will be used as educational material in the Faculty of Health Care.</p>		
Key words Cannulation, Fluid therapy, Intravenous, Intravenous medication, Nursing		

ABSTRACT

CONTENTS

1 INTRODUCTION.....	1
2 LICENSING PRACTICE OF PERIPHERAL CANNULATION FOR NURSES IN FINLAND	3
3 PERIPHERAL CANNULATION	4
3.1 Indications of peripheral cannulation	5
3.2 Supplies and setup.....	5
3.2.1 Tools required for peripheral cannulation.....	6
3.2.2 Suitable Cannula.....	6
3.2.3 Needle-free connector for infection prevention.....	7
3.2.4 Luer-access valve cap with 70% isopropyl alcohol.....	7
3.3 Work steps for peripheral venous cannulation	7
3.3.1 Patient preparation.....	8
3.3.2 Aseptic action during peripheral cannulation.....	8
3.3.3 Ergonomics during peripheral cannulation	8
3.3.4 Procedure.....	9
3.4 Monitoring of a peripherally cannulated patient.....	10
3.5 Removal of Peripheral Cannula	11
3.6 Complications related to peripheral venous cannulation.....	11
3.6.1 Cannulation failure.....	11
3.6.2 Local infection and sepsis.....	11
3.6.3 Thrombophlebitis.....	12
3.6.4 Arterial puncture	12
4 VIDEO AS TEACHING TOOL	14
5 PURPOSE AND OBJECTIVES OF THE DEVELOPMENT PROJECT	15
6 PROJECT IMPLEMENTATION.....	16
6.1 Functional thesis.....	16
6.2 Conception and Initiation.....	16
6.3 Definition and planning	17
6.4 Launching and planning.....	18
6.5 Performance and control.....	18
6.6 Development project close.....	19
6.7 Development project quality management	20
7 ETHICAL CONSIDERATIONS IN NURSING RESEARCH.....	20
8 REFLECTION ON THE DEVELOPING PROJECT	22
8.1 Methodological considerations and limitations	22
8.2 Discussion	22
8.3 Implications to the education of nursing	23
8.4 Process Management	24
REFERENCES.....	26
APPENDICES	

1 INTRODUCTION

The purpose of this thesis is to produce an instructional video for nursing students about intravenous cannulation and the process of completely sterile cannulation. Peripheral intravenous cannula or catheter is the most usual insensitive process accomplished across the range of health care sites with up to seventy percent of the patient's required intravenous cannulation during hospitalization. (Welyczko 2020, 12 [Ray-Barruel, Cooke, Mitchell, Chopra & Rickard, 2018]). Intravenous cannulation can be necessary for patients to determine blood sampling, monitor the administration of fluids, prescribe drugs, apply chemotherapy, and use blood products. (Welyczko 2020, 12 [McGowan 2014]). Nurses are highly responsible for looking after patients with peripheral intravenous cannulation. It is very important to understand that IV cannulation and insertion are very risky and may have the potential to damage the patient's health. Hence, all registered nurses and nursing students should be capable of, knowledgeable about, and committed to in all aspects of intravenous cannulation. (Welyczko 2020, 12 [Osti, Khadka, Wosti, Gurung & Zhao, 2019]).

The aim of this thesis is to enhance the ability of nursing students to carry out the process of intravenous cannulation easily and effectively. The purpose of using an instructional video in this thesis is to provide information and to illustrate intravenous cannulation to the nursing students of Centria University of Applied Sciences. The topic was researched by the authors and later was accepted by our nursing teacher; thus, we are making this project as a teaching video in English with Finnish subtitles. Previously, a similar thesis and instructional video has been done at UAS in the Finnish language. However, our university needs instructional videos that can be used in both languages. This video will be based on the recommendation made by Soite the Central Ostrobothnia Joint Municipal Authority for Social and Health Services and used to support the theoretical background of intravenous cannulation.

This thesis also casts light on the theoretical background of peripheral cannulation, the requirements for peripheral cannulation, the appropriate model, the work steps, procedures, complications, the monitoring of patients and the removal of the cannula. This thesis also aims to classify the use of needle-free connectors and alcohol swab caps that are new in practice in Finland. The theoretical part also deals with the use of video to support teaching and to make the implementation of video. This instructional video is completely based on the evidence-based theoretical framework. The composition of video and editing were done together with the volunteers from our university or vocational school. This video will be made

available to use as the support of theoretical studies for new nursing students who will be join Centria University of Applied Sciences.

2 LICENSING PRACTICE OF PERIPHERAL CANNULATION FOR NURSES IN FINLAND

According to the legislation, the doctor is responsible for prescribing of the medicine. Legalized health professionals, such as nurses, are responsible for the use of intravenous medicines following the doctor's instructions. Doctors and nurses are allowed to cannulate intravenously peripheral and administer medicines and infusion fluids intravenously. Before a nurse can have a drug permit, they need crucial training, orientation and competence. After verifying the competence, the doctor in charge of the functional unit gives the nurse written permission to carry out the medication and fluid treatments mentioned in the permit. The healthcare professional providing the medication should be confident in the ability to administer fluids and medications to the patient. The prerequisite for safe medication and fluid therapy is that the professional understands the special features of fluid and drug therapy, masters the necessary procedures, knows the equipment used, and monitors the patient's well-being. (Laukkanen & Ruokoniemi, 2021)

It is the employer's responsibility to ensure that each employee is in a position that matches their skills and they start working in the unit. Competence must also be ensured when more experienced employees shift to more demanding tasks. The duties of supervisors include supervising the implementation of medication in daily work. However, the patients take medication has a responsibility to do it on their own, and everyone should identify tasks in their work that they have not yet mastered. By gaining familiarization, having additional training and arranging tasks to suit everyone's skills, the implementation of safe pharmacotherapy can be ensured. (Laukkanen & Ruokoniemi, 2021)

3 PERIPHERAL CANNULATION

Peripheral intravenous cannulation is a common clinical technique. Its implication includes providing venous access in critical and emergency cases implementing IV hydration, correcting electrolyte imbalance, administering IV medication therapy, and supporting the diagnostics process such as in the scanning center or nuclear medicine. Christopher Wren inserted the first IV infusion device using a quill and a pig's bladder into a dog's vein in 1658. Since then, advanced technology and technicians have created peripheral cannulas. (Barton, Ventura & Vavrik 2017, 28-30.)

The quality ensures good practical skills and performance provided by registered nurses. Practical nursing skills are difficult tasks involving different types of technical skills, practical and theoretical knowledge, caring aim at the patients and the environment, as well as ethical and moral values. Although practical skills are the most important aspect of nursing education, many newly graduated registered nurses lack efficiency in practical knowledge. Peripheral vein cannulation is the most frequently performed skill of nurses working in the health sector. About seventy to eighty percent of hospitalized patients' medication is delivered through intravenous cannulation. The most difficult skills to master are considered the technical parts such as the insertion of a cannula into a vein. Mastering the specialized portion of peripheral vein cannulation is important for completing other components of the skills and operating those in a satisfactory way. (Ravik, Havnes & Bjork 2017, 1-2.)

There are various kinds of risks associated with the lack of skill proficiency of registered nurses. Poor vein cannulation can cause various risks, such as vein irritation. Phlebitis, which is an inflammation of a vein, often occurs in the legs and involves the formation of a thrombus characterized by pain, swelling and the change of skin colour. The infection caused by a catheter has a risk of procedure into a bloodstream infection and may expand inpatient days in the hospital. The lack of adequate skills may have a negative impact on nurses, such as dissatisfaction with their own performance, making mistakes, and accepting the time pressure. Because of this, many newly qualified nurses leave the profession. (Ravik, Havnes & Bjork 2017, 1-2.)

3.1 Indications of peripheral cannulation

Clinical judgment is required to justify the need for a cannula during placing after it is instructed by doctors. In general, the placement of peripheral cannulation should be considered, when intravenous therapy is expected to last for six days or more. Furthermore, not only the length of time, but also the type of intravenous therapy determines the requirement for peripheral cannulation. The inferior and superior vena cave can be assessed to give treatments and drugs that would otherwise injure peripheral veins. When compared to peripheral veins, increased blood flow in the central venous circulation allows for infusate haemodilution, lowering the risk of chemical phlebitis. Medication and solutions having an osmolality >600 mOsm/kg, pH <5 or >9 , or drugs and solutions that are recognized as chemical irritants that might induce vein damage, might encourage phlebitis and thrombosis, should be administered via central venous access, especially if haemodilution is insufficient. Other examples of common indications include IV administration of fluids, long-term medication, frequent blood transfusions or blood samples, resuscitation, nutritional support and prolonged or frequent hospitalization. (Lopez, Lorenc, Reading, Juang & Aguayo, 2021). A radiologic contrast agent is also administered intravenously during CT, MRI and nuclear imaging. Cannulation should be clearly documented in the patient's care plan. (Lincolnshire community health services, 2021.)

3.2 Supplies and setup

The practitioner must be fully prepared for the process by assembling the necessary equipment and ensuring that they have enough materials to accomplish the task. This will ensure that the procedure is not disrupted in any way. They must have a variety of cannula or needles in various gauge sizes to carry out each procedure, all of which must be assembled in a receiver, tray, or onto a clean trolley before being transported to the patient. The equipment must be sterile and intended for one-time usage. It is necessary to examine the packing to ensure that it has not been damaged or contaminated. All equipment and packaging should have their expiration dates double-checked. The required equipment must be assembled close to the patients and within the practitioner's field of vision when the practitioner is ready to execute venepuncture. (Phillips, Collins & Dougherty 2011, 134.)

3.2.1 Tools required for peripheral cannulation

Before the insertion of IV, all the types of equipment that are needed for the procedure should be made ready. The collecting tray should be cleaned with antibacterial wipes and the different types of equipment are collected by checking names along with expiry dates and placed in the tray by using the aseptic non-touch technique. Different types of equipment are IV catheters, disinfectants, nonsterile gloves, tourniquets, alcohol wipes, saline solutions for injection, needle-free bungs, 10ml syringes, sterile cannula dressings, and disposal containers. (Rachel 2015, 32-34.)

3.2.2 Suitable Cannula

Choosing the appropriate IV catheter size is the main part of the placement of a proper IV catheter. It also depends on the patient's visualization of veins and indication for the placement of an IV catheter. During an emergency, when there is a large amount of fluid that is necessary, it is good to insert a large-needle IV catheter to facilitate the rapid delivery of large quantities. In normal scenarios, the smallest size of the IV catheter is used depending on the situation. For example, the catheter size for less than 1 year of age; 22 or 24 gauge, greater or equal from 1 to 8 years of age; 20 or 22 gauge and for above 8 years of age; 20 gauge or larger (Gershel & Rauch 2018, 175-178)

TABLE 1. Cannula sizes and their uses (Adapted from Nutbeam & Daniels 2010, 45).

Colour	Size	Flow rate	Use
Blue	22G	2,2L/h	Pediatric or elderly patients with small, fragile veins
Pink	20G	3,7L/h	Iv maintenance fluids, drugs and blood products
Green	18G	5,4L/h	
White	17G	6,2L/h	Rapid infusions of fluids, drugs and blood products
Grey	16G	12L/h	
Brown	14G	18L/h	Unstable patients, emergency situations
Orange			

3.2.3 Needle-free connector for infection prevention

A needleless connector is a medical device that connects to a catheter or the end of catheters' extension via a septum and is secured with a Luer-lock slip to allow intermittent catheter access for infusion or aspiration while reducing the risk of occlusion, microbial, or water entrance and leakage from the catheter. Needleless connectors can have a variety of design features that determine how they should operate and be operated. With the pressure from the syringe, Luer-lock activates all needleless connectors. This pressure allows the syringe Luer to directly penetrate an already split septum, to open or depress the plunger or pierce from below with a blunt cannula. Before entering the blunt cannula, the fluid can flow directly through a smooth or corrugated channel, around a depressing plunger, around the housing, or through the eyelets. Fluid displacement at the catheter's end might be negative, positive, or neutral after access and flushing. Positive fluid displacement forces a small amount of fluid into the catheter end to prevent blood occlusion, while negative fluid displacement allows a small portion of blood to return to the catheter. After connection and disconnection, neutral displacement means there is no fluid movement back into the catheter. (Curran 2016, 234-240.)

3.2.4 Luer-access valve cap with 70% isopropyl alcohol

Luer-access valve cap with seventy percent isopropyl alcohol is a unique and standardised disinfection technique that continuously disinfects the valve's top to protect it from touch and airborne contamination. When the cap is twisted onto the valve, the sponge gets compressed to clean the valve's top and soaks in seventy percent isopropyl alcohol. In thirty seconds, the cap nearly accomplishes the complete kill of pathogens. It will remain in place until the next catheter access to protect the valve. There is no need for additional disinfection, and it makes nurses easier to perform. It has a shelf life of seven days if the cap is not opened. (Braun 2018)

3.3 Work steps for peripheral venous cannulation

The National Institute for Health and Care Excellence (2013) recommends that before the installation of a cannula, the health professionals performing this task should decide on the best site and right vein for controlling the risk of cannula failure and corresponding errors. The decision should always focus on the patient's preferences, their level of perceptiveness, vein accessibility and their medical as well as cannulation history. All the sites and veins associated and affected by the patient's clinical condition

should be avoided. For example, the professional should avoid areas where flexions occur, veins close to arteries, inflamed areas, small superficial veins and sclerosed veins. It is very important to choose the appropriate size and type of peripheral cannula. (Ford 2019, 838-839.)

3.3.1 Patient preparation

The procedure begins with the prescription of the doctor for IV fluids. If no cannula has been inserted, then the insertion process with the new cannula begins. At the beginning of the insertion process, nurses should introduce themselves to the patients and at the same time identify the patients with their names and personal identity number. Every step of the procedure should be explained properly to the patient. Avoiding the use of confusing phrases and emphasising the patient's cooperation will make the process easier. It is the nurse's responsibility to check the patient's contra-indications or allergies. As far as possible, it is recommended to perform the cannulation procedure in a treatment room with bright light for good visibility. (Gershel & Rauch 2018, 175-178.)

3.3.2 Aseptic action during peripheral cannulation

Standard infection control precautions must be used to achieve this quality standard. As a result, an updated practice framework for the aseptic technique assumes that asepsis is the common goal of all clinical procedures involving an infection risk. Hand hygiene is one of several evidence-based infection controls that can help patients with intravascular catheters stay safe from infections. Hand hygiene prior to catheter cannulation or maintenance protects the patients against infection. Both the health professionals as well as the patients need to have a clear understanding of the importance of hand hygiene, and the role it plays in transferring infections. Hands are, in many cases, a source of bacterial transmission. Hands are never sterile, no matter how thoroughly they are cleaned. Hands are cleaned with antibacterial soap, water, or alcohol-based hand disinfection for normal hand hygiene. Conventional soap and water should be used if hands are clearly filthy, contaminated with blood, or have been exposed to spore-producing microorganisms. (Moureau 2013, 14-16.)

3.3.3 Ergonomics during peripheral cannulation

For better ergonomics posture, the professional must ensure adequate light and a warm room to encourage vasodilation. The height and position of the bed or chair can be adjusted so that it would be comfortable and prevent unnecessary bending. Position the patient comfortably in bed and place the pillow or rolled towel under the extended arm of the patient. If the patient's skin is dirty, clean it with soap and water. (Shlamovitz 2021). Researchers found that the position of patient shifting from a seated position to a supine position leads to a bigger cross-sectional vein area, enhanced vein visibility, and palpability, all of which contribute to a higher success rate of peripheral intravenous cannulation. It was discovered that in the supine position, the targeted vein, in most cases, the cephalic, was larger than in the seated position and that this effect was maintained even after tourniquet application. In clinical settings, safe, easy, and quick approaches for achieving peripheral intravenous cannulation are critical. Positioning is quick and simple, and it requires no effort or skill on the patient's part. (Yamagami& Inoue 2019, 229-231.)

3.3.4 Procedure

The procedure begins with the preparation of saline flush. The drawing up needle is connected to the syringe using an aseptic non-touch technique i.e. without touching the head of the syringe or the bottom of the needle. Then the needle is inserted into the saline solution and the required solution is drawn up into the syringe. Afterwards, the air left in the syringe is slowly pushed out by pressing the plunger into the syringe, at the same time tapping the side of the syringe. Then, the sharp object should be safely disposed of in the disposal container. Also, the bung or extension set package is opened by using the aseptic non-touch technique without touching its ends. Additionally, the saline is flushed by attaching the syringe to each terminal port and slowly pressing the plunger and the syringe should be replaced in the original sterile packaging (Rachel 2015, 32-34.)

The position of the patients should be comfortable and well supported by a pillow below the hand. If possible, avoid putting an IV cannula into the patient's dominant hand. The tourniquet proximal is placed to the IV cannula insertion site. Then, the area is cleaned with an alcohol swab to disinfect and for better visualisation of the vein. When choosing the appropriate vein for the insertion of a cannula, the optimal vein should be chosen by palpation, not by just visual appearance. When the vein is localised, slightly release the tourniquet and ensure to pull out the cannula, fold open the side grips and ensure all the equipment is ready to use before fastening the tourniquet again (Rachel 2015, 32-34.)

Remember, the hands should be washed and disinfected properly before putting on the gloves. A non-dominant hand can be used to hold the skin stretched distal to the IV catheter insertion site. Then, clean the site with alcohol swipes and allow drying for 30 seconds. Then, the IV cannula can be held by the dominant hand at an angle of 15 to 25 degrees from the skin. Inform the patients about possible scratches and insert it confidently with the bevel up, slowly advance the needle through the skin into the vein and minimise the unnecessary movement of the needle. Once a primary flashback in the window at the back of the cannula is noted, lower the angle slightly before advancing the cannula further. Apply the cannula a few millimetres beyond the point of flashback retract in the needle, at the same time observe a secondary flashback in the chamber of the cannula then hold the needle stable and at the same time the index finger is used to push forward just the plastic catheter over the needle into the vein, until the hub is connected to the skin. Free the tourniquet whilst holding the proximal end of the cannula on the skin. Release the needle from the cannula and safely dispose of it in a disposable container. Connect the needle-free bung without touching the key parts. Similarly, flush the cannula with the saline to ensure it is placed accurately and to decrease clot formation, and protect the cannula with a sterile dressing and sterile tapes. Then, remove gloves, wash hands, and write the name as well as the date of insertion on the dressing then thank the patient and ensure they are comfortable with the cannula and have no adverse effect. (Rachel 2015, 32-34.) Finally, record the number of attempts (successful and unsuccessful) and sites of insertion in nurses' notes in the electronic health record. (Perry & Hall 2019, 520.)

3.4 Monitoring of a peripherally cannulated patient

The cannulation site should be checked every work shift. Nurses should be looking for infection marks that are redness, heat, pain, or secretion. If a cannulation site has one of these symptoms, then the cannula must be removed. If the cannula has moved from the vein, remove the cannula. If a cannula has been applied in an ambulance or in an emergency, the cannula must be changed within 24 hours. The cannula bandage needs to be changed if it is dirty or falls. (Heikkinen 2016)

Sometimes the cannula bandage is loose on one side, or it is dirty. In that case, the cannula bandage should be changed, and the cannulation site ought to be cleaned. First, wash possible blood from the area. This is done with sterile sodium chloride (NaCl). After cleaning the cannulation site, nurses can use skin disinfection on that area. Then, replace the old bandage with a new clean one. (Heikkinen 2016)

3.5 Removal of Peripheral Cannula

The cannula can be in one place for 3 days in an optimal situation. However, when it is time to remove the cannula, the nurse must prepare for that. Sterile wound patches and tape are needed. The first step is to remove the bandage without getting the cannula out of the vein. Then take the cannula out from the vein while applying mild pressure with a sterile wound patch. Lastly, apply pressure to the wound for a few minutes and tape the wound patch to the skin. (Heikkinen 2016)

3.6 Complications related to peripheral venous cannulation

Peripheral vein cannulation is a commonly performed procedure within hospital practices. Many times, the patients are treated without any complications, although patients have the potential risk of experiencing trauma to their veins each time of these procedures. Peripheral vein complications started from slightly bruising to inflammation and in extreme cases death as well. The complication may arise at various stages of the procedures: initial stages attempting suitable sites for inserting devices, or later, during the installation procedure, or during care of the sites or devices. The complication of these processes may be influenced by various factors: ageing process, gender, vein selection, equipment selection, disease process, treatment boundary and skill of nurses. (Phillips et al. 2011, 175-185).

3.6.1 Cannulation failure

Cannulation is a complex procedure, and it can fail. Sometimes finding a suitable vein or getting the needle to the vein is difficult. Veins can be so frail that inserting the needle in the improper area will puncture it after this, the same place of vein is not suitable to try again. One nurse should not over-try cannulation. If one nurse cannot get the cannula in two tries, then the nurse should be changed to try further cannulation. (Nyholm 2019)

3.6.2 Local infection and sepsis

Cannulation is not risk-free. There are various aspects that nurses must consider before cannulation. Aseptic is most important thing to consider while cannulating. Without a good aseptic, there is a high risk of local infections, for older or sick patients this can even be fatal. That is why this is the most important thing to consider (Heikkinen 2016)

Infections spread through the puncture opening or through the basal part of the cannula. Through the puncture opening, microbes spread around the cannula into the subcutaneous tissue and advance along the outer surface of the catheter into the blood vessel. Infection may be a local infection of the penetration site, subcutaneous tissue or tunnel and catheter, or general infection. (Heikkinen 2016)

Even after good skin disinfecting, the surface of the skin contains staphylococcus and other bacteria. There is a possibility that bacteria enter the bloodstream from the cannula. Symptoms of cannula-related infections are usually milder than normal general infections. Staphylococcus aureus infections that spread from the hospital are usually caused by intravenous cannula. (Heikkinen 2016)

3.6.3 Thrombophlebitis

Thrombophlebitis is a disease in the superficial veins that causes thrombosis to occur. This differs from deep vein thrombosis because in thrombophlebitis there is inflammation in the venous wall that, usually occurs on one of the legs. Symptoms such as pain, redness, burning and swelling in a small area are normal in thrombophlebitis. If there is a risk, that cannula is the cause of thrombophlebitis, the first treatment is to remove the cannula. Thrombophlebitis caused by cannula is not typically treated with systemic anticoagulants. Treatment consists of applying anticoagulant gel and oral non-steroidal anti-inflammatory drugs (NSAID) medicine. (Mustonen 2020)

3.6.4 Arterial puncture

If the cannula is inserted too deep, there is a risk that the cannula will puncture the artery. The cephalic vein is usually used for intravenous access because it is large and easy to see veins on radial bone. The radial artery is quite close to the cephalic vein which has a small risk of being punctured. If there is bright, pulsating blood flow, the cannula might be in an artery. If this happens, the cannula must be removed immediately and pressure should be applied in the puncture area for at least three to five

minutes. Veins do not pulsate, and therefore palpation of the vein is required before cannulating. Studies show that the possibility of accidental arterial puncture is 0.5-1%. (Lirk, Keller, Colvin, Colvin, Rieder, Maurer & Moriggl 2004, 741-742).

4 VIDEO AS TEACHING TOOL

Video, being one of the most versatile technologies, provides many alternatives and possibilities for creating a successful teaching and learning environment. Video has recently been widely integrated into many hybrid and fully online learning settings, including the primary delivery mechanism in massive open online courses such as Future Learn and Coursera. According to the research, video is an important aspect of teaching and learning outcomes. (Gedera & Zalipour 2018, 362 [Boyle, 1997; Mayer, 2009]) and video is an excellent teaching and learning tool in a variety of disciplines (Gedera & Zalipour 2018, 362 [Allen & Smith, 2012; Hsin & Cigas, 2013; Rackaway, 2012]). However, simply presenting materials in video format will not automatically lead to in-depth learning. (Gedera & Zalipour 2018, 362 [Karppinen, 2005]). For video to be an effective tool in educational environments, pedagogical design, and production of videos with key aspects are crucial and tertiary instructors must include styles and options to include elements that promote active learning. The video appears to be a promising, relevant, and widely used instructional technique that could improve the quality of clinical skills teaching in today's environment. (Gedera & Zalipour 2018, 362.)

As teaching material, the video has many aspects that can be considered the alternative to print material. The video better captures the viewer's interest and is also able to engage viewers. The viewer focuses on watching the video, as they can see practical examples and see what works and what does not. The human brain learns by combining old knowledge with new information. The viewer may know the theory of the subject, but by seeing the practical performance in the video, they can combine the information with what they see. Learning can therefore be considered as storing, processing, and applying data. The video helps the viewer identify the key points to be taught, and thus the viewer remembers the most important things better. Video can be used to introduce a new thing or help to distinguish something from a familiar otherwise it would be difficult to illustrate. Video enables to assimilate model learning and complex learning materials divided into small pieces. Video narration allows for theories and learning explanations, making learners' own conclusions, and recalling knowledge. However, just watching the instructional video does not automatically lead to in-depth learning. (Gibbons & Farley 2019, 263-273.)

5 PURPOSE AND OBJECTIVES OF THE DEVELOPMENT PROJECT

The main purpose of this thesis is to make instructional video for the nursing students studying at Centria University of Applied Science. This study aim that the video will support the practice of cannulation and students learn the important and valuable information needed during cannulation. This video will support all the Finnish as well as international students. It will be available in both English and Finnish languages. This thesis uses all the evidence-based sources and materials that are used in Finnish hospitals. This project, as it is important for all new nursing students at Centria, is completely dedicated to new students and uses only theoretically accurate materials. This video comprises the newest guidelines available in various evidence-based resources.

The nursing studies at Centria University of Applied Sciences consist of nursing-science-based professional studies, languages, IT, welfare entrepreneurship, and other basic studies. All the professional studies are related to the development of skills and knowledge in various fields of nursing and medical specialties. The nursing studies include seventy-five credits of supervised practical training, which are carried out according to the objective's categories in every field of nursing. These practices are done in the approved practical placements, either in different units of social and health care of Finland or abroad. Online courses, independent studies and face-to-face teaching method are used for theoretical studies. In Centria, students' skills are supported by developing their capacity for independent research, enhancing self-assessment, communication skills, and sharing feedback. (Centria University of Applied Sciences 2020.)

6 PROJECT IMPLEMENTATION

Project implementation means carrying out the targeted goals planned and expected to achieve project objectives and give the best possible results and output. The success of the project depends on various internal and external factors. Some examples are well-organised teamwork, effective monitoring of projects, risks, quality, changes, and expenditures. The management system should be more flexible to modern needs and changing situations because of the modernized technology and growing advanced research. Yet, managers should always desire to give the best quality results and output. According to the lead partner principle, the whole responsibility for monitoring the project will be with the lead partner. However, in this case, both the authors are responsible for monitoring the work. (ETC Regulation (EU) No 1299/2013, § 23.4)

6.1 Functional thesis

A functional thesis's guide is to teach, direct, organise and justify practical operations. The clients and the target group determined how the work will be accomplished. A functional thesis consists of a functional section and thesis report that includes process communication and process research communication in any form. A functional thesis as a method has shown to be particularly useful for students, who find themselves worthwhile working on a project basis and developing the product that serves practice from beginning to end. (Saastamoinen, Tuomo, Alahuhta & Puutalo, 2018.)

6.2 Conception and Initiation

When it is decided that a new project or an upgrade to an existing project is necessary, the initiation process begins. The initial phase entails carrying out all the tasks required to start formally planning the project, which is the second step or phase. This phase usually begins with the project management assignment and hiring of the project team and ends when the project team has all the necessary information to begin constructing the detailed plan and budgets. Identifying the project sponsor and drafting the scope and charter documents, which, once signed, formally approve the project, are all tasks that must be completed during the conception and initiation phase. During this phase, basic timeline of the project is created, the project requirement is adequately justified and specified, and concrete project objectives are created. (Sipes 2016, 37-54.)

The idea for this thesis started back in the fall of 2019 when the authors realised that the teaching video for intravenous cannulation is available only in the Finnish language at Centria University of Applied Sciences. The authors also discussed the need for a good instructional video on peripheral venous cannulation during nursing lessons. As the plan for making a good educational video with English and Finnish subtitles for teaching purposes, it was accepted by the thesis supervisor. The initial phase began with the appointment of the project team. This project was basically related to the thesis plan, and the authors of this thesis were appointed as the managers for the project. After getting the signed project contract from Jennie Elfving, the Director of Education at Centria, the project was initiated.

6.3 Definition and planning

The second, or planning, phase of a project followed the design/initiation phase of the project management. One of the most important phases of the project was definition and planning. The failure in specifying the tasks or activities during this phase results in the project delay. The five Ws and H: who, what, where, why, when, and how of a project were all included in the comprehensive and detailed project plan. The project management planning process is like a road map that provides project managers with the required details to support the project team; then only thrives it and encourages the team in navigating the project highway, making it a success. Many of the tasks or elements of the project were interconnected. They could be adjusted using the change management methodology and tools that were designed during the planning phase. Communication is a key factor throughout the whole project work. A good project plan with poor communication, or a bad project plan with good communication, is ineffective and can result in project failure. (Spies 2014, 58-91.)

The functional thesis proceeded with the preparation of the plan. Writing a thesis plan was an important and time-consuming step. In the initial phase, the authors defined the purpose of the thesis, and continued improving it as the thesis progressed. They made the schedule and work plan as realistic and detailed as possible to accomplish the job on time. The supervising teachers approved the plan, after which the project proceeded with the production of the instructional video. At the same time, the theoretical basis was also refined. A project group was built for the thesis. The tasks of the members were defined, an agreement was made between the project managers and the project schedule was planned. The authors frequently communicated with each other through social media, phone calls and sometimes face-to-face meetings to share ideas and solve the issues. Regarding the budget, there were no significant expenses

as the project did not require hiring experts and technicians. The skills of the authors were enough to complete the whole project and the required equipment was available from the Nursing Laboratory, Centria University of Applied Sciences. The supervisor of the thesis organised the filming location on campus so that no additional expenses were needed.

6.4 Launching and planning

The authors searched for information online, in the library, through articles, literature, different journals, and youtube to make the video evidence-based. The authors reviewed the guidelines for different hospitals in different parts of the country through websites. They collected information from various books available in the library of Centria University of Applied Sciences and from Theseus.fi to make the script accomplished.

The script for the instructional video continued to expand as product development progressed. The script is a framework for a film, in this case, an instructional video. There are no precise instructions and rules for the manuscript. The script can be specific or general. Knowing the target audience will help in creating the script. When the target groups are known, it is easy to script the video that interests the viewers. The script was designed so that the events proceed in the most possible logical order. A clear and logically progressive script is essential for learning. (Saastamoinen et al. 2018.)

As nursing students, the authors were aware of the needs of the target group when designing the instructional video. The script was based on theoretical data the authors collected on peripheral cannulation. From the collected information, the authors planned to make the most informative and important short video that illustrate the whole university and upcoming nursing students with all information available. The authors were knowledgeable of cannulation which includes good asepsis, careful preparation, good working conditions, calming and knowledgeable patient guidance, and smooth technical performance. The authors contacted the thesis supervisor, the nursing teacher, and set the date and time for shooting the video in the Nursing Laboratory of Centria University of Applied Sciences. For shooting the video, a volunteer videographer Mirko Nevasaari helped to shoot the video.

6.5 Performance and control

When recording a video, there are numerous factors to be considered. One must be aware of factors that influence video quality, such as the room's lighting and colour combination. The audibility of the sound in the room, as well as the positioning of the cameras, must be considered. A well-written script aids in the filming phase allowing to know what will be done. To achieve the intended result, the shooting should be done with as many shots as possible. (Saastamoinen et al. 2018.)

A total of five hours was spent filming the instructional video and the video was filmed on two separate days. The first shoot of the video was filmed in the Nursing Laboratory of Centria University of Applied Sciences. Two students from the group modelled the role of a nurse and a patient. Mirko Nevasaari who had a good sense of videography agreed to film the video voluntarily. The nursing teacher/thesis supervisor monitored the whole video procedure. Two cameras were used for the shooting, capturing the situation from two perspectives that provided more versatile options for video editing. Some of the scenes were also retaken to make the video until the outcome could be satisfactory. The supervising teacher evaluated the video and provided feedback to shoot again for the best outcome. For this reason, another shoot was scheduled at Soite, Central Ostrobothnia Joint Municipal Authority for Social and Health Services. This time, a volunteer modelled the role of the patient, substituting the previous one.

After filming the project, the video was edited. Editing a video means shortening the duration as appropriate. When editing, the recorded materials are cut and pasted together, and the order of the shots can also be changed. In this way, the image materials can be shaped in many ways to suit the purpose. With the help of modern programs, it is possible to edit the materials in many ways. (Saastamoinen et al. 2018). The video was shot in a 1080 progressive scan fully high-definition video at sixty frames per second using smartphones with a video size of almost six gigabytes. There were two different shooting angles.

6.6 Development project close

The project of the closing phase signifies that the project has been completed and is already ready for the handover process and transfer to the original organisation or party, whoever originally demanded the project. The final delivery of the project should be checked to ensure that it satisfies the organisation's needs and expectations. Moreover, it should include the definition of any additional tasks that must be completed, determinations whether the project, its procedures, or approaches require any additional change, the definition of the customer satisfaction in relation to the output as well as the quality of the

product and benefits of the product developers. This chapter covers the final steps required to conclude the project formally and legally. The final evaluation and assessment, formal acceptance, and project modifications during the project are the final three topics included in the project close but any or all these tools may be used by project managers. (Sipes 2016, 133-139.)

Finally, the supervising teacher assessed the edited video and provided feedback on the final product. Changes to the video were made based on the suggestions by the supervisor teacher. To improve visualisation, some of the contents were changed, and pictures and narration were added. The length of the video was finalised into the appropriate size so that it can captivate the viewers satisfaction. The sound was already recorded in English thus, Finnish subtitles were added later. The video was edited with the movavi editor pro, as it is economical and editing is easy. Editing was complicated because there were so many parts that needed to be edited. The video had multiple colour issues that needed to be fixed.

6.7 Development project quality management

The focus of total quality management is to correct quality issues throughout the organisation however, quality, on the other hand, is never an end goal. Total quality management procedure operates continuously and simultaneously in every aspect of the project's operations. The goal is to bring the market products of increasing quality, not necessarily products of the very same quality as the previous year or year before. The cycle is designed in accordance with project management practices. To achieve the objectives of any project, the first part is to plan and then execute. After that, double-checks must be done and managers can correct what did not work as expected before putting their plan into action. Customer focus, process thinking, and variation reduction are also essential aspects of total quality management. The plan-do-check-act cycle can be used to find, validate, and apply project management practices. (Kerzner 2014, 310-313.)

6.8 Ethical considerations in nursing research

Ethics is the moral sense of right and wrong. Ethics in clinical research define what should and should not be done in a study. It assures that research is of high quality and that human subjects' rights are protected. Different ethical ideologies exist, and it is necessary to find the right balance between them. Although many countries have distinct guidelines and research ethics authorities, the essential aspects

of ethics are universal. Before performing a study, researchers should closely comply with the requirements and receive approval. A good ethical analysis should find the right balance between safety, scientific requirements, and ethical acceptability. During the research, virtue and integrity must be maintained as well as the existing knowledge should be built upon in research. In order to do that, a thorough literature review is required prior to the investigation. To ensure the value of conducting research a knowledge gap should be recognized before performing it. The data should be well-organised and easily accessible. Data should be managed in a secure manner to preserve people's privacy and ensure that no personally identifiable information is made public. Also, safety should take precedence over all other concerns in the study. Prior to collecting data, the risk should be evaluated. A risk-benefit analysis should be performed on a regular basis to guarantee that the risk of harm is kept to a minimum and that the possible benefits are never overestimated. Moreover, plagiarism can be avoided with proper referencing. Confidentiality and autonomy should be safeguarded by data storage security. (Tang & Chan 2010, 141-148.)

7 REFLECTION ON THE DEVELOPING PROJECT

Completing a thesis is a long process. When the thesis is completed, the authors must be able to evaluate the results of their own work. It has been important to consider why the work was done, for what purpose and how it was done. It is important to consider whether the target goals considered at the beginning of the thesis are answered.

7.1 Methodological considerations and limitations

A functional thesis was chosen as the method of implementing the thesis because the authors wanted to make a concrete output that could be utilised as study material. The authors made a step-by-step description of the aseptic illegality of the cannula. Theoretical information on the topic of the thesis was sought from many different sources, which also expanded the knowledge of the authors of the thesis. Shooting the video turned out to be challenging. The instructional video was filmed in Kokkola at the Nursing Laboratory of Centria University of Applied Sciences.

The script of the instructional video was made thoroughly based on theoretical knowledge. The result of the thesis was up-to-date and evidence-based data on peripheral vein cannulation and the production of learning materials. These elements were combined in the thesis in the resulting video. The thesis used a wide range of sources based on the data examined. This made the thesis reliable and accomplished. The thesis has been successful and met the goals set. The topic was successfully delineated, and relevant sources were found for implementation. The content of the thesis was comprehensive and progressed logically. Meticulously defined project and well-written script helped the implementation of the video appropriate. The authors brought their own expertise to the workplace and through it obtained comprehensive information to make the project a success.

7.2 Discussion

The project produced an up-to-date instructional video based on the latest evidence, from which the students at Centria University of Applied Sciences will surely benefit. The authors are pleased with the

outcome of the video. When the theoretical knowledge is strong, it is easier to start cannulation in practice. The video became a necessity for the educational institution, as the old videos used as educational material had shortcomings and outdated information. The instructional video is a good way of learning and teaching.

The authors believe that the result is reliable and that the rightful procedures have been applied. The process of the project taught the authors a lot, from understanding the cannulation to making an instructional video. Along with the established principles of peripheral venous cannulation, the new perspectives brought about by new research enriched the information. A variety of sources both online and books were consulted. This ensured that the information provided by the work was accurate. International sources were sought and used extensively. Information that was relevant to the thesis and data were withdrawn from them.

Asepsis plays a very important role in the prevention of peripheral venous complications of cannulation. In terms of operational development, the implementation of asepsis peripheral venous cannulation should be further investigated. Another idea for further research would be to study peripheral venous problems, the most common mistakes in cannulation in practical work. Based on the theoretical basis, it can be assumed that the biggest errors would occur in asepsis, but there may also be shortcomings in the use and care of the cannula.

Completing the thesis was challenging due to the prevailing pandemic situation, and the constraints associated with it. All this delayed the making of the instructional video by almost a year and therefore also the graduation. The authors also experienced other challenges from time to time in finding evidence-based nursing research articles and access to some databases and articles.

7.3 Implications on the education of nursing

The purpose of the thesis was to make an instructional video on peripheral venous cannulation. The goal was to promote the competence of nursing and nursing students in peripheral venous cannulation. There were many similar projects done in the past, but the main aim was to make the cannulation video in spoken English with Finnish subtitles. The authors anticipate benefiting all nursing students from Centria University of Applied Sciences from a single project. An instructional video is an effective tool to support learning and clinical skills, in this case, cannulation skills. Peripheral venous cannulation skills are

required in many nursing work environments, so it is an important skill to master and develop self to work efficiently and effectively. It is also an important part of professional competence that is highlighted aseptic work for infection control and patient safety. Every nurse should understand how cannulation is performed as a procedure and what treatment and monitoring of a cannulated patient are included. Peripheral venous cannulation is a common procedure for a hospital patient and may be performed by a legal practitioner nurse.

The students are also allowed to practice under the supervision of a nurse hence, it is important for students to be able to develop their professional skills already during their studies. Cannulation skills progress over the years with the more practice. However, nurses should have up-to-date knowledge of peripheral venous cannulation. The nurse should have a clear understanding of the situations in which the cannula will be placed on the patients and what factors influence the choice of cannula size. Cannula sizes affect fluid flow in different ways, so it is good to identify the gauge units as well as the colour codes. Good patient guidance creates trust in the patient that promotes patient satisfaction. Cannulation opens the connection directly to the patient into the bloodstream, so adherence to asepsis is essential. Aseptic work should be kept in mind throughout the whole performance of the procedure. With the instructional video, the importance of asepsis was observable when the nurse performed cannulation.

7.4 Process Management

The completion of the thesis was really a satisfying and educational experience for both of the authors. The authors have gained and learned a lot about how to structure the resources correctly as well as the requirements of both written work and video making segments to make the project successful. In the beginning, the task appeared to be quite difficult. Both the authors were confused at the start of the thesis on how to divide the task equally and what materials needed to be researched, so that the project could succeed with the quality and evidence-based instructional video. As the research began with a similar project found in Theseus and the guidance from the thesis supervisor, it motivated the authors to make a similar project ready by spring 2022. The authors decided on the strategies and created the plan with a tentative table of contents, divided the task equally, collected the resources, and started writing. It was started from the theoretical part that the authors considered to be the core of the project. The authors were connected regularly through social media to discuss the use of materials they planned and solve the issues that arose during the written process. The coordination was an important part of this whole project from start to finish. The table of contents has changed from the original, but the authors still felt good about this strategy because their thesis became stronger and more effective with the changes that

they made. The process was time consuming but the authors are satisfied to deliver a good and effective video project, which is beneficial for future nursing students.

Shooting and editing the video as well as making and mixing the audio was really a great experience and a decent part of the project. Shooting in the multiple devices simultaneously and editing were all new but the authors were successful to fulfil their requirements. Although, it was really hard to keep the video short. However, the authors found watching the video more meaningful when the length remains moderate and thus the viewer's interest is maintained. Although the video-making process was a very small part in comparison with the writing part, it is always invigorating to get to do something rather than writing. The whole process of making the video was completely new to the authors, so it probably inspired both of the authors that they got a great opportunity to practice new things in between, however, cannulation was a relatively familiar topic. The authors booked the appointment with supervisor Hanna Peltoniemi for successful and safe cannulation and also to volunteer the whole filming process of the project. The video was successfully shot within five hours at the Nursing Laboratory of Centria University of Applied Sciences. Though, the authors had to reshoot the video couple of times from the beginning in order to get a pleasing result. All the materials that are needed for cannulation were provided by the university. Because of some technical issues, some scenes were retaken. The authors did not have previous experience with editing programs, they had to learn things by experimenting themselves. These re-cuts, merges, and editing took a few hours of extra time. The recording was successful and the authors were able to combine it easily with the video itself. After all, both the authors are very pleased with the outcomes, and they hope this video can help many nursing students in the future.

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In this video we investigate what is intravenous cannulation and how to perform it, how to use it and how to spot the most common complications. We also go through how to remove an intravenous cannula.

Remember to mark the date of cannulation on the sticker provided in the dressing package
common indications for intravenous cannulation.

Peripheral venous cannulation is performed for multiple reasons: in preparation for surgery and other procedures, as well as intravenous fluid therapy, intravenous medication, and blood transfusions.

Intravenous fluid therapy is performed in cases of dehydration, hypovolemia, or electrolyte imbalances when peroral hydration is not sufficient. It can also be used for intravenous drug therapies when peroral administration is not sufficient.

Preparation before the procedure

First, disinfect the treatment table, or other surfaces used.

Before performing the procedure, open the packages and place the necessary equipment on the treatment table, or within arm's reach, where they are easily accessible.

By preparing all the equipment beforehand, we can avoid unnecessary delays during the procedure and ensure patient safety.

Equipment needed:

Tourniquet

Cloves

The intravenous cannula

Cannula fixation dressing

Prefilled saline syringe

Needle-free syringe connector

Antiseptic cap.

Clean cage

Antiseptic swab.

APPENDIX 2/2

It is recommended to open all the packages before the cannulation and prepare all the necessary equipment. 5sec

It is also good to prepare the syringe connector with the prefilled syringe. 3sec

Selecting the area for cannulation

The recommended location for the cannula is in the back of the palm or the forearm of the non-dominant upper limb. Injection sites, areas of inflammation, or broken skin are to be avoided.

In emergencies, cannulation should be performed as soon as possible. In acute first aid situations, the cannula is to be inserted into the largest and most central vein possible.

Primarily, the cannula should be inserted into the vein of the upper limb, beginning from the veins in the back of the palm, and last, the veins in the elbow bend.

peripheral venous cannulation should be performed with as few attempts as possible.

You can provoke the veins to be more visible by lightly tapping the skin on top of the vein

Find the straightest vein possible. If possible, the patient can close and open their fist several times to enhance the visibility of the veins.

The cannulation

After locating the vein, disinfect the location with a single stroke with the antiseptic swab.

Before cannulation, allow the disinfectant to dry.

Stretch the skin, locking the vein in place. Penetrate the skin with the needle and insert the cannula into the vein.

As blood appears in the chamber of the cannula, continue to insert the cannula for a couple of millimetres, then pull the needle out while pushing the cannula in.

Before removing the needle from the cannula, apply pressure on the cannulated vein. This prevents more blood from entering the cannula and allows you to remove the needle. After removing the needle, twist on the one-way valve and flush the cannula with the prefilled saline syringe using pulsating flushing. It is important to not to lose grip from the cannula. If the cannula is not immediately used put on the antiseptic cap. Remember to mark the date on the sticker provided in the dressing package.

Apply the tapes from the cannula fixation dressing package over both wings of the cannula. After applying the tapes, you can let go of the cannula. Apply the dressing over the cannulation area.

Possible complications.

Infection can be prevented using good aseptic procedures. If the needle pierces and punctures the vein, bleeding will occur at the injection site. The cannula may also deliver the infusion into the tissue. If this happens remove the cannula and insert a new cannula to a different location.

If a vein is pierced, apply a tourniquet over the site of injection

While using the cannula, if any redness, or pain appears, remove the cannula, and watch for any signs of infection.

Removing the cannula.

Remove the dressing fixating the cannula. After removing the dressing, remove the cannula in one swift motion. Apply pressure over the cannulated area for a minimum of 5minutes.