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**DEMONSTRATION OF ADMINISTRATING INJECTIONS
REFERENCE FOR CENTRIA UNIVERSITY OF APPLIED SCIENCE'S NURS-
ING STUDENTS**

Intramuscular, Subcutaneous, Intradermal

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ABSTRACT

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Name of thesis DEMONSTRATION OF ADMINISTRATING INJECTIONS: Reference for Centria University of Applied Science's Nursing Students.		
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<p>The purpose of this thesis is to enlighten the skills on preparing the injections and identify the different ways of delivering it following the guideline in proper technique. The instructional video is prepared in order to promote the skills in injections and own this thesis as a reference. By making the video available, which can be viewed anytime necessary, the goal was to support the teacher and the nursing students. The comprehensive thesis contains conceptual knowledge about injections, comprising the need for injections, the equipment and setup needed for the procedure, sites for injections, complications that may arise and patient guidance.</p> <p>This is a thesis based on demonstration of administration of injections: Intramuscular, Subcutaneous, and Intradermal for the beginners nursing student of Centria University of Health Science. This video is applicable for English speaking nursing student, but Finnish students can also take it as a reference. It is very important to know about the different routes of administration of medications to patients like oral, injections, peripheral, rectal routes etc. The drugs administrating non-orally but injecting through different routes are defined as Parenteral drug administration. Nursing students should get familiar with the proper technique of administrating drugs, its indications, proper sites and possible complications before giving medication to patients. Proper site selection and effective administration techniques play a vital role in medicine absorption which are described in this thesis. It is unpleasant and painful for the patient, if the health care professional lacks adequate training, increases the chance to get infection if not done in aseptic techniques.</p> <p>The educational video was created in coordination with the Centria UAS' nursing teacher which is totally based on evidence-based articles, journals, papers and books. The video begins with the introduction of equipment needed for each injection, proper site selection, hand hygiene and injecting technique. Patient guidance and complications of injections are also mentioned in the video. The video will be handed over to nursing faculty of Centria University of Applied Science for further use as an educational purpose.</p>		
Key words Injections, Intramuscular, Subcutaneous, Intradermal, Medication, Nursing, Patient Guidance, Needle safety.		

CONCEPT DEFINITIONS

IM

Intramuscular

SC

Subcutaneous

IV

Intravenous

ID

Intradermal

HIV

Human immunodeficiency virus

HBV

Hepatitis B virus

HCV

Hepatitis C virus

ABSTRACT
CONCEPT DEFINITIONS
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1 INTRODUCTION

This thesis aims to create and publish videos about the injection process where intramuscular, subcutaneous, and intradermal injections is the major highlights. The information and process are based on the Finnish guidelines so that the students, new health workers and educational institutions can utilize it as a source of learning. The purpose of thesis is to enlighten the skills on preparing the injections and identify the different ways of delivering it following the guideline in proper technique. The instructional video is prepared for the students of Centria University of Applied Science nursing students, in order to promote the skills in injections and own this thesis as a reference.

Injections are widely used in healthcare settings, injected medications are frequently utilized for sickness prevention, diagnosis, and treatment. Due to which it is very important to have adequate knowledge regarding injections. Unsafe injection techniques have been linked to a wide range of operations and locations, putting patients and healthcare professionals at risk for infectious and non-infectious adverse effects. This harm can be avoided. Safe injection techniques are a component of standard precautions and are intended to uphold the most fundamental patient and provider safety standards. According to the World Health Organization, a safe injection does not endanger the patient, expose the injector to needless risks, or produce waste that is hazardous to the neighborhood. (CDC, 2012)

After getting approval from the nursing teacher, the authors have selected the topic to provide enough information about types of injection, various sizes of needles, equipment needed, methods to deliver injections safely and complications of injections. The theoretical part also includes preparation of skin and syringe before administration of injection, incidents and accidents and patient guidance. The videos are prepared in English language following the features that are needed for informative educational video. After watching the videos and reading this content the main objective of thesis is that the reader will get enough information about the subject and will help them throughout their nursing practices or work.

During the present context, where online classes and self- study are promoted, such instructional video plays a vital role in getting the information. The authors had the opportunity to go through the research and videos that were created by the previous students which then encouraged in developing this thesis. Therefore, the authors believe that this study and watching the video will be beneficial to the students. This instructional video is entirely based on the theoretical framework that uses evidence. The process

of creating and editing videos was carried out in collaboration with volunteers from our university or technical school. The copyright of the videos will be given to the school so the students coming in future will also be able to have access to the video.

2 INJECTION COMPETENCE OF A NURSING STUDENT

In this chapter the author describes what are the competences of a nursing student when fully trained to give injections to real patients. The nursing student must have the basic knowledge about the injections, safety, correct technique, indication and complications before performing into the real people, the author has included those part in this chapter.

2.1 Safe Pharmacotherapy

When the body itself cannot protect itself and needs supplements like drugs as mediation then it is known as pharmacotherapy. To receive the optimum level of health, it is especially important that the pharmacotherapy is safe. Various measures are developed to promote safe pharmacotherapy (Alcohol and drug foundation 2022).

There are 10 rights that must be addressed while giving medication to patients to prevent risks or further complications. Patients name and identity number should be checked which comes under the Right Patient. Special attention should be given while preparing the drug and its dosage. The route of medication plays a vital role in its functioning so medication route should be clear and as per the guidelines. There is the right time for every medicine which means that the interval between the medication and its reaction time should be kept in mind. Documenting the medication helps secure from confusion and avoids mistake of giving twice. Patients have the right to know about what kind of medication they are receiving, and all the information related to it and nurses should respect their decision if they refuse to take it. Proper assessment of patient should be done, including the patient's drug reaction, contraindication, allergies and need for the medication and evaluation of patient after receiving the drug. (Medilog Bio Health 2021.)

Safe medication can be promoted though 3' checks where the first check should be done while taking the medicine making sure that the right amount of medicine to right patient. The second check involves a dose as per doctor's prescription, medicine expiry date and composition. Third check: check the medication's availability and the label before putting it away in storage. (Medilog Bio Health 2021.)

2.2 Briefly about Injections

The drugs administrating non-orally but injecting through different routes are defined as Parenteral drug administration. Intramuscular, intravenous, subcutaneous, and intradermal are the common routes for parenteral drugs administration. Parenteral drug administration has both positive and negative feedbacks, drugs absorbed faster than orally it is more effective, it can be used as an emergency. Whereas there are drawbacks about it which could be very costly way of administrating drugs. It is unpleasant and painful for the patient, only trained staff can administer, easy to get infection if not done in aseptic techniques and sometime needs extra equipment such as infusion devices with trained staff to use it. (Boyd 2013.)

The chemical characteristics of a certain medicine determine the methods in which it is administered. If some medicines are consumed orally, the body's digestive enzymes may break it down and render it useless. Consequently, it needs to be injected. Like this, some medications can only be taken orally and cannot be injected. Many protein medications are administered subcutaneously because if they were taken orally, they would break down in the digestive system. The best technique to distribute a dose quickly and precisely throughout the body in a controlled manner is through intravenous administration. (Le 2022.) Due to situations like vomiting or being unconscious, for example, some people are unable to take tablets. In such a condition, the only therapeutic option would be an injection because taking a medication would be impossible. Some drugs, when injected, may have other advantages besides speed. In contrast to a tablet that simply provides overall pain relief and may have undesirable side effects, such as fatigue, an injection of a painkiller will more effectively target the affected location. In addition to how extended an injection's pain relief lasts, a tablet pain reliever may also require daily use for a person to feel its effects. (TIPIT 2019.)

The direct route for the drugs to the blood stream in emergency cases are through venous route. The drugs administration is rapid and lifesaving, Drugs such as cytotoxic which are toxic to the gut epithelium and proteins when taken orally can be given through venous route. The problems of drugs encountering in the stomach and intestine can be relieved efficiently through intramuscular and subcutaneous route of administration. All drugs are not efficiently released through intramuscular or subcutaneous, such as some drugs like insulin are not fully absorbed through IM sites. (Florence & Attwood 2015.)

2.3 Intramuscular

An intramuscular injection is a method of injecting medicines into the muscles. This allows for rapid absorption of the medicine into the bloodstream. When alternate distribution methods are not an option, intramuscular injections are performed. That are: oral. Intravenous and subcutaneous. (Healthline 2019.) The injection given within muscles is stated as intramuscular injections. The injection is commonly used to deliver vaccines and medication. Intramuscular injections are recommended as a substitute way to deliver the medication. Some intravenous injections are not suitable for some veins, oral medication when swallowed may get destroyed in digestive system, in those cases intramuscular injection is given. Absorption is faster than subcutaneous injections in intramuscular injection. (Weatherspoon 2019.)

The drug is absorbed quickly into the bloodstream by injecting through intramuscular technique by delivering the medication deep in the muscles. Usually, doctor prescribe for this injection and the health care professional delivers it. Some drugs that treat multiple sclerosis or rheumatoid arthritis, are self-administered intramuscularly. In some cases, veins are irritable or not suitable for the drugs and oral drugs may be destroyed by digestive system, then IM injections can be administered in replace. Subcutaneous injections have lower absorption than intramuscular injection because of larger blood supplies in the muscles tissue. Whereas it can hold larger volume of medication in comparison to Subcutaneous injections. The injection is given to part of muscles in body because of its high blood supply quality. (Cafasso 2022.)

2.3.1 Different sites for Intramuscular

Firstly, before any process it is important to adhere to the aseptic way for preparing the injection. There are different sites allocated for intramuscular injection. Gluteus muscles, Deltoid muscles, Vastus lateralis muscles. Gluteus muscles injection sites are given in two places ventrogluteal muscles on the hip and Dorso gluteal muscles on the buttocks (Gutierrez & Munakomi, 2022). There is a major issue in this site because of many sciatic nerves and gluteal arteries passing through it. With the low absorption rate the site can hold only 4 ml in adults and 1–2 ml in children. Whereas in deltoid muscle or in arm muscles, small dosages of drugs such as vaccinee of max 0,5–1 ml can be administered. (Boyd 2013.)

Some drugs are injected into the muscles (adipose tissue beneath the skin) so that it is deposited to release of drugs in the circulation for certain period which are also called depot injection. The common medication used for it are antipsychotic drugs for example flupentixol in oil which is usually administered every 3 month or once a month. It is also important to understand that sc. Injections are not supposed to administer in IM. Layer because drugs like insulin injected in muscles gets absorbed rapidly and causes glucose instability or even hypoglycemia but for patient with hyperglycemia that are admitted in hospital can be administered fast acting insulin through iv routes. (Boyd 2013, 67.)

The muscles located posteriorly to the pelvic girdle at the proximal end of femur are called anatomically gluteal region which moves the lower limb at the hip joint. These gluteal regions are divided into two groups, Superficial abductors and extenders which have a larger muscle that extends the femur, which includes gluteus maximus, gluteus Medius, gluteus minimus and tensor fascia lata. And the other region is deep lateral rotators with small muscles for laterally rotating the femur which includes quadratus femoris, piriformis, gemellus superior, gemellus inferior and obturator internus (SA Health, 2022). The branches of the internal iliac artery (the superior and inferior gluteal arteries) are the main route for arterial supply to these muscles. (Jones 2022.)

The gluteal regions for ventrogluteal injection are located on the Gluteus Medius on the top outer edge of the gluteus muscles and Dorso-gluteal injection is located on the gluteus maximus (on the buttock's region) on the outer upper quadrant of the gluteus. It is also considered as the least painful injection site and the safest among intramuscular injections. The site is away from the major blood vessels and nerves which make it the safest and most common site of injection for nurses and doctors. (Broccardo 2020.) Injection in dorso gluteal or buttock site is no longer chosen by current research because the medicine is not always absorbed. The larger nerves and veins pass through those regions so there is a high chance of medicine getting injected in nerves because they are very close to the injection site. Therefore, ventrogluteal sites are preferred and said to be safe site with better absorption. (SA Health 2022a.)



PICTURE 1. Picture showing the Ventrogluteal site.

Deltoid Muscle is the other possible site to administer intramuscular Injections. The sites are mostly favorable to inject vaccines. Due to its small muscle mass limits it's not usual or difficult for self-injection. The volume to be injected in the area is not more than 1 milliliter. To figure out the actual place for the injection it's important to find and feel the bone located on the top of the arm which is called acromion process (SA Health 2022a). From the bone the injection site is 2-3 finger width below with the marked upside-down triangle, the actual point of injection will be the center of the triangle. The site is not suitable to inject if the person is very thin or the muscle is very less. (Cafasso 2022.)



PICTURE 2. Picture showing the Deltoid Site.

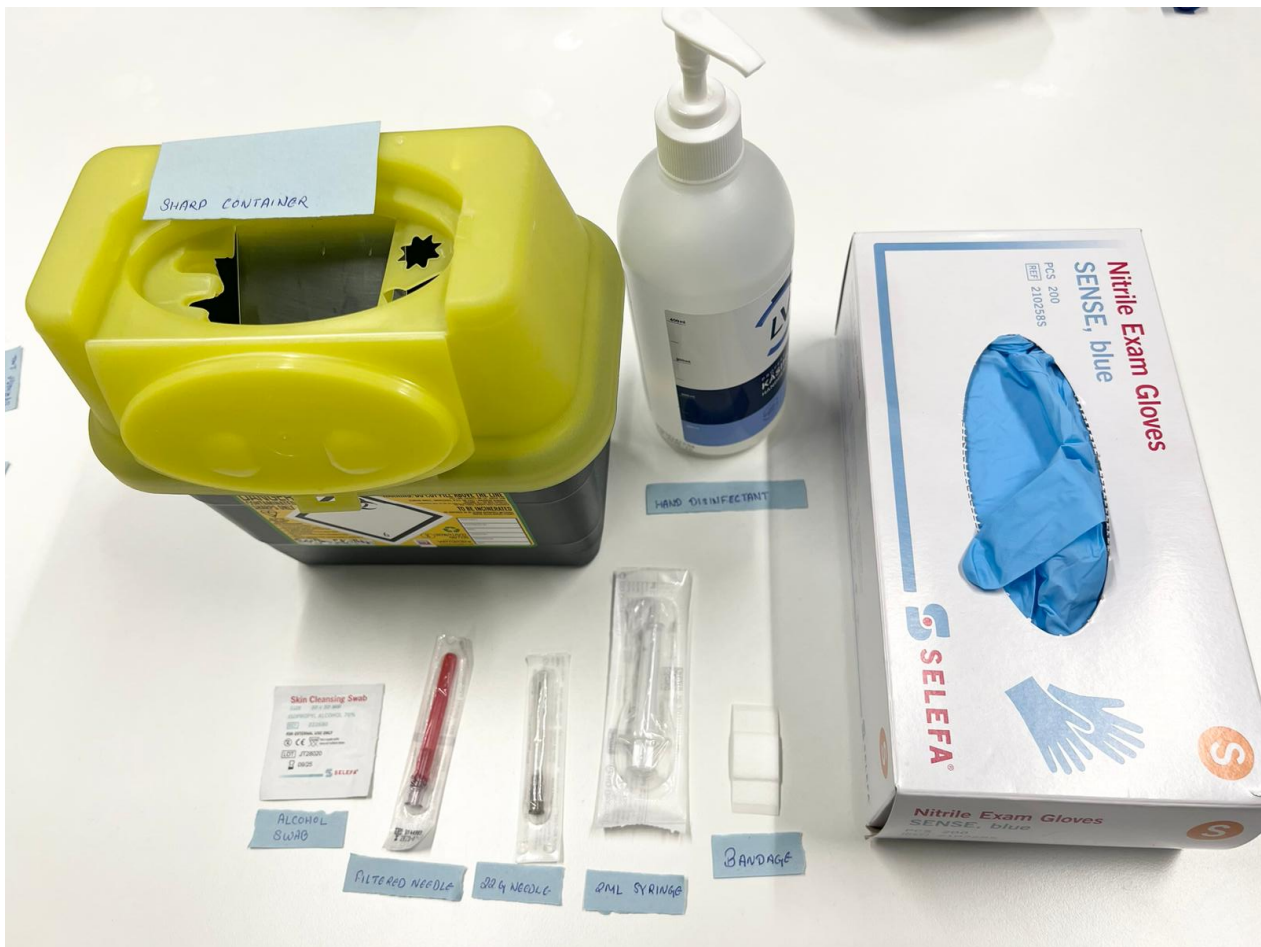
Vastus Lateralis Muscle are also the possible site for injecting intramuscular injection if any other site is not possible or if needed for self-injection. These sites are most favorable for neonates and infants. The site has a possible to inject up to 1 ml in neonates, 3ml for children and up to 5ml in adults also the chosen site for anaphylaxis management. To locate the correct marks to inject in thigh muscles, it is important to lay the patient down or in case of infant being held by their parents. The muscles below the greater trochanter and above the lateral femoral or knee joint are palpated. And for the correct place divide the muscles into three parts and the correct part is in the middle of the muscles lateral to the middle of the thigh. (Schneider 2022.)



PICTURE 3. Picture showing the Vastus Lateralis Site.

2.3.2 Equipment needed

Usually, the injection is administered by a healthcare professional but in some cases a person can inject him/herself with proper training and guidance. Many factors should be considered while injecting, such as needle size and injection site, including age, size of person, volume and type of medication receiving. Specific guidelines are provided by doctors or pharmacists for appropriate needles and syringes to administer. The needle appropriate for penetrating should be long enough to reach the muscles. The needles used are usually 1–1,5inches for adults and smaller for a child, which is said to be between 23-25gauge. (Gutierrez & Munakomi, 2022.) Before injecting it is important to collect all the required equipment. A filtered needle is needed to withdraw the medication from ampules so that there is not any contamination such as tiny glasses particles from ampules. Needle and medication, alcohol pads, hand disinfectant, swabs, disposal needle container, bandages and non-sterile gloves are required beforehand. (Cafasso 2022.)



PICTURE 4. Picture of Equipment needed for IM injection on tray.

In case of vaccine preparation, the equipment prepared should be sterile and disposable. Some vaccine comes with separate ampoules and syringes which must be prepared according to the instruction in the package. It is not recommended to use filter needle while preparing the vaccine due to its dense type which prevents the active ingredient of vaccine from getting into the syringe. A safety needle is used to prevent needle stick accidents with the fixed safety guard which covers the needle. A disposable 2 ml syringe is most convenient when injecting into the muscles. (THL 2021.)

TABLE 1. Equipment needed for Intramuscular injections

SN	Equipment	Uses
1	A filtered needle	To withdraw the medication from ampoules so that there is not any contamination such as tiny glasses particles from ampoules.
2	23-25G needles	To inject the medication. The size of the needle varies according to the age of the person.

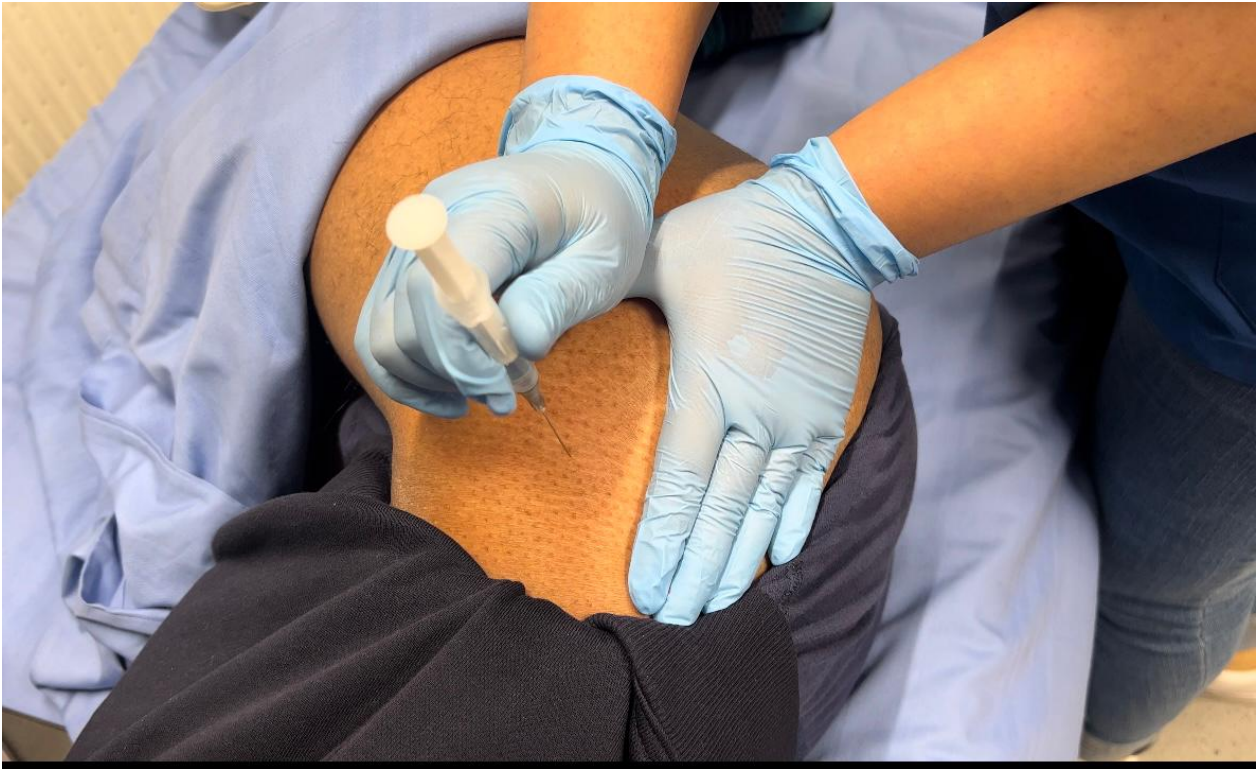
3	Syringe	To insert medication. 2ml syringe is convenient for IM
4	Alcohol swab	To disinfect the injection site
5	A sharp container	To dispose the needles after use
6	Bandage	To apply in injection site in case of bleeding.
7	Nonsterile gloves	To prevent cross infection.

2.3.3 Injecting the medication

During injecting the intramuscular injection, it is important to follow the different techniques and proper positions and sites in context to their age and size, so to make sure the medication is injected in the intramuscular regions. It is recommended that when giving vaccine to small children thigh area is the best place to administer whereas for others upper arm or deltoid muscles area is considered. When giving injection on limbs two different vaccines can be given in same limb with the distance of at least 5cm in exceptional cases. (THL 2022.)

The recommendation for intramuscular injection area according to age group are for age under 1 year receives on thigh or Vastus Lateralis Muscle, for the age group between 1-6years receives on front upper thigh muscles or deltoid muscles and the age over 7 receives on the deltoid or upper arm muscles. While vaccinating thigh muscle is more common in use for infants than gluteal muscles due to its least risk of damaging the sciatic nerve. The femoral artery and vein are situated far from the injection site on the inner side of the thigh. Which also contains large muscle mass and less fatty tissue compared to buttock. Intramuscular injection should not be injected into the rashes areas whereas it can be administered through a tattoo. (THL 2022.)

While injecting the intramuscular injection, it is important to mark the correct place of injection. If an injection is on the deltoid muscle, first you need to lift and squeeze the upper arm muscles, insert the needle with the angle of 60–90 degree through the skin quickly deep inside the muscles. (SA Health 2022b.) Hold the syringe in place throughout the process with one hand, aspirate it to check the needle is not in the vein by no blood coming in needle while aspiration. Inject the medication slowly into the muscles so there is less pain. Finally, pull the needle out and press the site for a few seconds with a clean swab and plaster on it. (THL 2022.)



PICTURE 5. Picture of Z Technique of injection

While injecting the medication through ventrogluteal sites certain technique should be reconsidered which includes ventrogluteal injection technique and the Z technique. The easiest way to find the correct place for ventrogluteal region is by using PINS acronym where P refers to Palm on greater trochanter of the femur, I refer to Index finger pointing to anterior superior iliac spine, N refers to No thumb to bum and S refers to spread your index and middle finger so there will form a triangle and the site is in the middle of the triangle soft when palpated. (SA Health 2022c.) Ventrogluteal injections are given in the gluteal muscles and are well suited for giving drug injections. The ventrogluteal region is found to be a better injection site than the upper outer quarter of buttock or Dorso-gluteal muscles. The sites are also preferred for its large amount of medication injection compared to deltoid muscles. (SA Health 2022b.) The Z technique of injecting is the better way to allow the medication to be in the muscles area and useful for injecting larger amount of drug in an adult. It is not usual to use this technique while giving vaccine but could apply with no obstacle if an injector has mastered in Z technique. (THL 2020)

The correct way of Z technique injection is by injecting the needle in 90 degrees in one hand quickly deep in the muscles whereas one hand should be pulled downward on the skin and fatty tissue. Aspirate the syringe by holding the needle throughout the process and if no blood is seen then inject the medication slowly. (SA Health 2022b.) The needle is placed for 10 seconds after injecting. When removing the

needle, it is important to release the hand which was holding the skin and tissue at the same time. Put bandage in case of bleeding. The place should not be massaged after injection which could cause leakage of medication. (Pietrangelo 2018.)

2.3.4 Complication of Intramuscular Injection

It is common to get a local reaction after the intramuscular injection such as warmth, redness, swelling, pain, itching and rashes on the site. The symptoms are usually mild which could last for 2 days or may disappear within a few hours or days. Also, general symptoms may occur such as fever and feeling sick, enlarged lymph nodes and increase in or inflammation levels in the blood. Sometimes tissue irritation may cause by a needle or vaccine, for example if a booster substance in vaccine which contain an aluminum salt which is intended for muscles may irritate the tissue if it is transferred to the subcutaneous tissue. Therefore, good injecting technique and correct selection of equipment could reduce these reactions. (THL 2019.)

Sometimes the discomfort after the injection may experience severe, symptoms may be extreme or unbearable. It is usually the health career gives an information about the symptoms which may occur after the injections specially in vaccines. But sometime there might be severe pain in the injection site, drainage at the site, prolonged bleeding, numbness, redness, or warmth or swelling in the site and even may occur a sign of an allergic reaction with difficulty breathing or facial swelling. Therefore, it is important to call a healthcare professional. (Cafasso 2022.) While performing Z-technique injections, commonly considered safe procedure, mild side effects occur as with others. But if there are signs of infection or formation of abscess, damage to tissues, nerves, blood vessels, also hemorrhage in people with bleeding disorders. These symptoms should be notified to the physician. (Gutierrez & Munakomi, 2022).

2.4 Subcutaneous

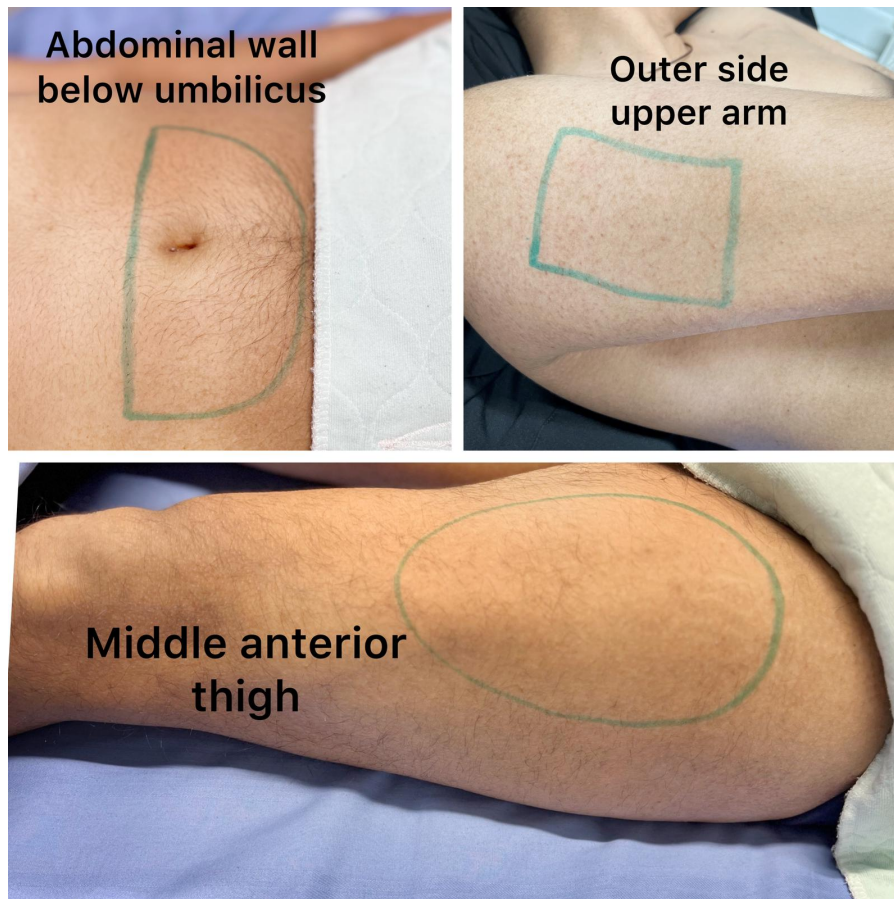
Subcutaneous injections are given into the subcutaneous tissue (fatty layer just below the skin surface). In this tissue, medications are absorbed slowly and steadily, and blood vessels and nerves are few. The middle outer side of the upper arm, the middle anterior aspect of the thigh, or the anterior abdominal wall right below the umbilicus are the most extensively used locations for subcutaneous injections. Drugs are absorbed slowly and consistently with this method. For medications like insulin and enoxaparin sodium, fertility drugs and blood thinners up to 2 mL can be administered. (Boyd 2013.)

Drug absorption can be affected by factors affecting blood flow to the skin, such as exercise and variations in surrounding temperature. In patients with diseases that cause reduced blood flow, such as vascular shock, the subcutaneous route may be unreliable. Abscesses are a risk with subcutaneous injections, as is the possibility of lipohypertrophy, which is defined as an accumulation of fat beneath the skin in patients who require regular injections. When several injections are given to the same area of skin repeatedly, lip hypertrophy develops. It can be unpleasant and unattractive, and it can interfere with medicine absorption, but it can be avoided by switching injection sites (Down and Kirkland 2012).

The medication may be injected into muscle if the skin is pressed upwards to raise the adipose tissue away from the underlying muscle. Traditionally, a 45° angle was utilized to infuse insulin into a skin fold, however a 90° angle is recommended for the new shorter insulin needles. (Boyd 2013.)

2.4.1 Different sites for Subcutaneous

The areas suitable for injecting the subcutaneous injections follow Upper arms. At least 3 inches (7.5 centimeters) below your shoulder and 3 inches (7.5 centimeters) above your elbow, on the side or back. (MedlinePlus 2021.) Outer side of upper thighs. Belly area below your ribs and above your hip bones, at least 2 inches (5 centimeters) away from your belly button. The injection site should be free from dirt and there should not be infection, skin lesions, scars, birthmarks, bony prominences, and large underlying muscles, blood vessels or nerves. From one injection to the next, switch injection location by at least 1 inch which will maintain skin healthy and improve how well the body assimilates the medication. (Stephens 2018.)



PICTURE 6. Picture showing the Subcutaneous Injection sites

2.4.2 Equipment needed

A syringe with a needle attached is required. These tiny, thin needles are short. A 25G needle is typically used for subcutaneous injections. Needles are measured in gauges (needle diameter). The injection fluid's viscosity determines the size of the needle. Such syringes are used once and should never be reused. If the syringe is contaminated or the cap is misplaced, then use the new syringe. Syringes with the appropriate dosage medication already inside can be found or might need to dispense the prescribed amount of medication directly into syringe from the container. In either case, make careful to read the medication label to ensure the right drug at the right dosage. Make sure the medicine is not out-of-date by looking at the label's date as well. In addition to the syringe, the following things are needed: 2 alcohol swab or earner gauze pads, a sharps container, non-sterile gloves, bandage, and a tray to carry the drugs. (Stephens 2018.)



PICTURE 7. Picture of Equipment needed for SC injection on tray

TABLE 2. Equipment needed for Subcutaneous injection.

SN	Equipment	Uses
1	Syringe	To insert medication
2	25G needles	To inject in the site
3	Alcohol swab	To disinfect the injection site
4	A sharp container	To dispose the needles after use
5	A tray	To carry all the equipment.
6	Nonsterile gloves	To prevent cross infection.
7	Bandage	To apply in injection site in case of bleeding.

2.4.3 Injecting the Medication

Injecting the medication requires a set of actions to be taken. Foremost it is important to explain the procedure to the patient, make sure the patient understands everything about it and maintain privacy. Allergies of the patient should be previously identified. After following the safe pharmacotherapy, maintain the patient's position with the site selected exposed. Examination of the area for any indications of oedema, infection, or skin lesions, pick a different location if any of these apply. Then the health care

provider should put on gloves if doing so is considered required after risk assessment. If skin cleansing is considered necessary, swab for 30 seconds with isopropyl alcohol and then allow it to dry for 30 seconds (Stephens 2018). Pinch 2.5 centimeters (an inch) of skin and fatty tissue (not muscle) between fingers using the hand not holding the syringe. Then shortly, quickly, and at a 90-degree angle, put the needle into the pinched skin (45-degree angle if there is not much fatty tissue). UKHSA (2016) advises giving subcutaneous vaccines with the skin pressed together and the needle at a 45-degree angle to the skin (UKHSA 2016). Slowly depress the plunger or injection button after inserting the needle all the way to inject the medication. The needle is frequently checked to see if it is in a blood vessel by drawing back on the syringe after insertion. Because it is unlikely to happen, this is not advised for subcutaneous injections. (Stephens 2018.)

To avoid the drug from going backwards, wait 10 seconds before removing the needle. Avoid massaging the area because doing so can hasten the absorption of insulin and cause bruising after the administration of heparin. Pull the needle out after letting go of the skin. To prevent from sharps hazard; sharps container should now hold the needle. To stop any bleeding, firmly apply clean gauze to the area and maintain pressure for a few seconds. Upon completion, wash your hands. But while inject insulin there is no need to clean the site with alcohol swab. (Ogston-Tuck 2014.)

Note the administration on the prescription chart. Likewise, keep a record of the administrative site to prevent reusing it. Hence, lip hypertrophy is prevented. As the patient receives the prescribed medication, keep a close look out for any side effects and issues with the injection site. (Stephens 2018.)

2.4.4 Complications of Subcutaneous injections

People are taking insulins and blood clotting injections by themselves through the instruction of the health care personnel or by watching videos which can lead to various complications. Some of the complications of subcutaneous injections are pain, infections to the skin, scarring or bruising and needle breakage in the muscles. The feeling that a person is getting injection is itself a pain due to which a person can feel pain initially. Since the SC injection is injected into the muscle layers so the person getting it for the first time might have much pain than the people who are using daily or frequently. With the frequent use can arise sacring or bluish discoloration of the skin. If a person injects himself and does not use the proper sterile technique, then the chance of skin infection increases. Improper or lack of skills in handling injections can lead to breakage in the muscles, resulting in fatality. (Allcarehhsbeko 2016).

Sharing or reusing needles can result in the transmission of illnesses from one person to another. The way a drug is absorbed can alter if it is injected into a blood vessel. In rare instances, injecting a blood artery can result in severe problems. It is highly unlikely to strike a blood artery in subcutaneous fat, though. If there is blood, it results from very minor bleeding following the injection. (Villines,2018)

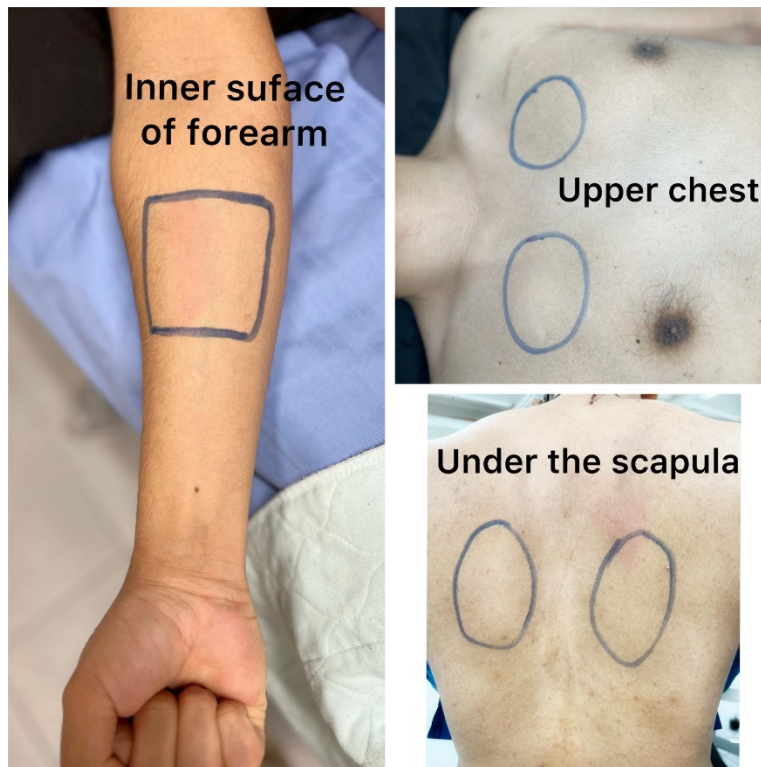
2.5 Intradermal

Intradermal injections (ID) are injected on the layer of skin called dermis which is just below epidermis layer. Among the routes of injections, it takes the longest time for absorption as there are less amount of blood vessel and does not have any muscle tissues. It is mostly used as a methos to test for sensitivity reaction because of easy visualization of reaction. (Wisconsin technical college system 2022)

These injections are used for localized medications rather than systemic medications, such as allergy tests, tuberculin/ Mantoux test or local anesthetics. A 25 g needle is usually used to puncture the epidermis. 0.05 mL or less is used (Miller 2022). Personal ethics refers to the ethics that a person identifies with respect to people and situations that they deal with in everyday life. The angle is 10–15 degrees. The substance should be injected until a papule form on the skin's surface. (Boyd 2013)

2.5.1 Different sites of Intradermal

The inside surface of the forearm and the upper chest, under the scapula, are the most prevalent places. Choose an injection location absent of blemishes, rashes, moles, or scars, since they might affect the visual assessment of the test findings (Nurseinfo 2021). The dermis layer does not consist of blood vessels, therefore there is no need to aspirate while injecting. Also, avoid disruptions while preparing medicine and always recheck the prescription. If there is concern about medication or procedures within the patient, doublecheck with the doctor's order. (BCcampus 2018)



PICTURE 8. Picture showing the Intradermal Injection sites

2.5.2 Equipment needed

The equipment needed for any clinical procedures should be prepared beforehand for safety and to eliminate distractions between the procedures. So, that should be arranged before the procedure (Nurseinfo 2021). The equipment needed is like other injections which includes a tray with tuberculin syringe 1 ml, two small needles e.g.: Terumo 25 G needle, nonsterile gloves, sharp container. (Ralli & Savolainen 2021)



PICTURE 9. Picture of Equipment needed for ID injection on tray

TABLE 3. Equipment needed for Intradermal injection.

SN	Equipment	Uses
1	1ml syringe	To insert medication
2	2 small 25G needles	To inject in the site
3	A sharp container	To dispose the needles after use
4	Nonsterile gloves	To prevent cross infection.

2.5.3 Injecting the Medication

These injections are given for diagnostic tests such as allergy tests, ruling out tuberculosis. After gathering all the equipment needed, introduce yourself, explain the procedure to the patient, and make sure the patient understands everything; also, ask the patient if they have any queries. To avoid infections or contamination wash hands and disinfect before the procedure. Identify and choose the site for the injection which is free of hair, scars, moles, or any rashes. Remember to confirm again the medicine and patient before drug administration (Nurseinfo 2021). Use the non-dominant hand to stretch out the skin and put the thumb finger below the injection site and gently stretch the skin. With the use of dominant

hand hold the needle in 10-to-15-degree angle. Penetrate the skin with the syringe and push the plunger of the syringe so medicine goes and forms a blister on the skin. (Lee,2021) While penetrating the skin do not try to aspirate as skin does not have large blood vessels. If the blister is not formed choose another site and repeat the procedure from the star. But once it is successful gently pull out the needle. (Medline plus 2021) But remember to advise patients not to rub or scratch around the site as the injection solution ca spread to other tissues. Discard the needle on the sharp container and properly dispose of other equipment. Wash your hand again after the procedure and document properly. Watch for any allergic reactions that may arise. (Nurseinfo 2021)



PICTURE 10. Picture showing the correct way of injecting ID injection.

2.5.4 Complications of Intradermal Injection

The complications patients may face after the intradermal route of drug administration are pain, swelling and irritation in the site. There might also be infections on the site of injection. Also, other complications that can be seen are medication error and needle stick injuries. (Medilog Bio Health. 2021)

2.6 Preparation of injection site (Skin and syringe)

Before administration of any injections, skin should be prepared with the following technique: To prevent infection, the nurse, or the patient if they are administering themselves should wash hands thoroughly between fingers, backs, and palms. (Nurseinfo 2021) For the injections, safety needles should be used to lower the possibility of needle-stick injuries. Dry your hands with clean paper and use non-sterile gloves. Wipe with alcohol pad to clean the injection location on skin. Start wiping at the injection site and move in a circular motion away from it. Let the skin dry naturally or use the clean gauge pad. (MedlinePlus 2021)

To properly prepare syringe, following instructions should be done: In writing hand, hold the syringe with the needle end facing up like a pencil. Remove the needle's cover. To get air bubbles to rise to the top, tap the syringe with finger after that push the plunger up slowly until the line representing the correct dose and the plunger's dark line are parallel. (Stephens 2018.) In some ways, we should assemble all the equipment needed in a tray. After that, check the doctor's prescription and follow the safe pharmacology checks needed so the right medicine is administered. (Lee,2021)

While preparing for the injections, the care provider should know precisely about the lengths and diameter of the injections and which kind of needles are suitable for the different injection administration methods. Below is a brief description about the sizes of needles which are suitable for various kinds of injections. (THL 2021)

TABLE 4. Recommended needle size for injections (THL 2021).

Injection administration method	Diameter of needles	Length of needles
Intradermal	26G	10mm
Subcutaneous	23-25G	16-30mm
Intramuscular	20-25G	25-40mm

2.7 Incidents and accidents

Most medical treatments include injections. Hence, as it is the most used treatment procedure it is very crucial that health care professionals adhere to safety requirements which can prevent accidents. Although following safety methods, there may come many accidents or unwanted incidents, some of the accidents that can occur while injecting are discussed below. (WHO, 2016)

Injuries caused by the needles while doing medical procedures are known as needle stick injuries or sharp injuries (NHS, 2021). Sharp injuries include injuries caused by scalpels, blades, lancets, used broken glass. While these injuries can happen during or after the procedure or injection administration as well as before, during and after disposal. For example, trying to recap the needle that was used to inject the patient, trying to be quick while disposing the needles, improper and lack of knowledge about waste disposals. Following needle stick injuries several disease transmissions can occur like HIV, HCV, HBV infections (WHO 2016).

If a medical health professional or any person ever encounters needle stick injury first it is especially important to let the wound bleed under the running water using soap to rinse the wound. It is important to know not to suck or scrub the wound as it only increases the risk of getting the infected blood to the bloodstream. (WHO, 2016) So, it is advised to dry and cover the wound with dressing. To reduce the risk of infection, seek medical help immediately so they can rule out the blood tests of the person with a needle stick injury and the other person's blood. Sample blood for Hepatitis B, C and HIV should be tested immediately. (NHS, 2021).

According to Soite, the injured area should be cleaned immediately by running water for 5-10 minutes then it should be allowed to bleed, and presence of any foreign materials should be taken removed. If there is blood at the injection site or incision site, an alcohol bath (at least 70% alcohol) is placed for 2-5 minutes but in case of mucus membrane exposure, alcohol swabs should not be put. (Soite 2019). It is always reported to the immediate supervisor, for example the nurse in charge or the doctors on duty. The accidents must be reported according to the instructions of the workplace, adverse effect notification, for example HaiPro/ HAVA. The information necessary for the investigation of the accident is given. In terms of own legal protection, filing a report is important so that infection can later be shown to be work related and are entitled to compensation according to the Accident Insurance Act. (Antilla 2019.)

2.7.1 Mishandling of Sharps

Wastes products from health sectors can be hazardous and toxic. When waste from the hospitals or health sectors is not separated properly, it harms health care professionals and waste handlers and the community. (WHO 2016) The sharp objects used may have remains of medicines, body fluids or microbes from the person it has been used. To prevent injury, containers to dispose of the waste should be separated. The use of sharp object disposal bins should be specially designed to prevent needle stick injuries. These containers for sharp waste can be found in varied sizes so that it can be taken along while doing the injection procedures. (CDC 2019).

After injection, putting back into the cover should be prohibited, as it can increase the risk of accidents. When working with sharp instruments, safe disposal procedures for sharp instruments and contaminated waste must be introduced and sharp waste containers must be placed in facilities where instruments are handled. The edge waste container must not be filled beyond the filling limit. (EPHSP 2016).

2.7.2 Reuse of Injection Equipment

Worldwide, there is use of unsterile injections and needles by drug users for their daily administration. Studies have shown as per WHO that there is huge amount of injection administered through shared needles which leads to bloodborne infections such as HIV, HCV and HBV which is transmitted through the reuse of needles among these group. Also, the spread of pathogens, viruses, bacteria, and other infections can result from reuse of syringes to use ampoules/ vials for different patients. (WHO 2016). Professionals while preparing the injections should strictly avoid the reuse of needle either from one patient to another or from one vial to another. Use of filter needles in case of glass ampoules and blunt fill needles to fill the syringe from any other vials. (CDC 2010). Needles used to draw the medicines should be strictly discarded and replace it with clean sterile needle as per the injection the healthcare professional is administering so there is less risk of infections and reactions to skin through the needles. Incorrect aseptic practices used when administering intravenous medications have contributed to several infections linked to healthcare also increases microbial infection risks. Prefilled syringes are also used to save time and shown to be more effective in practice for injections. (Suvikas-Peltonen et al. 2017)

2.8 Patient Guidance

An essential competence for a health care professional is the ability to explain procedures to patients in a way that would encourage their participation, assuming the patient understands the treatment. (Major & Holmes). All the patients admitted to hospital may not have comprehensive knowledge about health care. It is nurses who must assess the patient's level of knowledge and provide instructions in simple and common terms and phrases as possible. Also, not all patients have the same learning and understanding ability. Some patients may have better learning ability through visual aids rather than hearing (Arkansas State University, 2018). So, for example, while doing injections it is sometimes better to show the actual instruments before procedure and method to patient so they can be prepared. The patient can be then reassured that the nurses treating them are qualified with skills and can trust them as communicating with patients allows them to play huge roles in their own recovery. (Dugdale 2021.)

Many infectious diseases can be transmitted through unsafe injection practices and could be a serious threat to the health. It is a healthcare responsibility to educate or give proper guidance to the patients for safe injection practices. It is important not to reuse the needle or syringe each other through patient or while withdrawing medication from vial. After withdrawing the vial, the needle should be changed and it's not an aseptic practice to reuse the syringe by just changing the needle which may lead to transmit diseases such as hepatitis C virus, hepatitis B virus and HIV. (CDC 2010.)

Some common injections that are prescribed to the patient that need to be administered regularly or within a period, that includes SC injection like insulin or anticoagulant medication or an IM injection such can some long-acting depot medication should be given proper and safety guidance. It is important to guide the patient to follow the correct instruction given for the medication either from the medicine leaflet, pharmacist or from a doctor. And as a health care professional, it is important to guide the patient in the safe use of sharps, preparation, and storage of the medicine for unwanted infections. It is essential to maintain good hand hygiene before any injecting procedure by washing hands with soap and water, drying and sanitizing. Preparing all the supplies like alcohol wipe, swab, medicine, gloves and more important the sharp container in a clean or sterile place. Get in a good and proper position to be administered and begin to inject the medicine according to the instruction. After it is done, we need to tidy up all the supplies to their proper place, especially the sharps so that it will not inject others and make it complicated further. And it is also important to give information of the following mild symptoms in the injecting area and when to call for help for further complication in a written form. (France 2021.)

When hearing or even thinking about sharps things it is common to get scared or some might have a phobia. People might get faint thinking of it, heart runs fast, blood pressure gets imbalance and stomach cramps. The reason might bring shame or embarrassment to the patient so they might skip the treatment path, so it is important to guide patient to get relief of fear and encourage to get injected for the treatment. It is a wise decision to get injected as early as possible so there is not an entire day to get stressed or worry about it. It is important to get relaxed or do some breathing exercises or meditation for mindfulness before injection. Also try applied tension technique to increase the blood pressure. Family or friend support is good to build up confidence. The most crucial thing to be noted is to know the benefit of getting the medication and adhere to treatment. And last, while injecting avoid looking the needle by talking to someone or getting busy on the phone which might divert the attention. If the phobia is extraordinarily strong and is exceedingly difficult to bond with it, then it is good to talk to the doctor. (France 2021.)

2.9 The Features of an informative educational video

There are two significant factors that had played a significant role for the increased use of videos as educational tools. The spread of videos via YouTube had resulted to videos being watched online as a daily activity for most of the people. Beside watching videos being a part of the daily activity for many people, the improvement of internet connections should not be undermined while reflecting over factors that have affect in the increased use of educational videos. (Kay, 2012). People who suffer from dyslexia will experience the highest benefit from educational videos. (Aluehallintovirasto). Based on the previous sentence and what we had experienced during corona pandemic and studies becoming even more digital, we believed most of the students will be watching educational videos than read books to get the needed information in the fastest feasible way. It is important that the ability to read books does not get extinguished thus videos can be used as a powerful addition beside articles and books as study materials. Maskati with colleagues had researched the benefits in using technology while instructing students with dyslexia. According to Maskati et. al, multimedia improves the memory, recollection as well as help students in comprehending and processing the information that had given while increasing their engagement (Maskati et. al, 2021,293).

The use of educational videos in higher education have become an important part of learning. Videos can be used as effective educational tools if the educator considers the following factors: managing cognitive load, the maximization of student engagement with the video and ways to promote active

learning from the video. (Brame, 2016.) Brame (2016) refers to several previous studies that had demonstrated that videos can be used as a highly effective educational tool (e.g., Allen and Smith, 2012; Kay, 2012; Lloyd and Robertson, 2012; Rackaway, 2012; Hsin and Cigas, 2013; Stockwell et al., 2015). Followingly, we had shortly presented these previously mentioned factors in their own sub-headings.

2.9.1 Less is more also in educational videos (The length of the video)

The most crucial factor to take into consideration while making an educational video was to keep it short. This could maximize the student's attention. (Brame, 2016.) Brame (2016) refers to the previous study made by Guo and colleagues. Their study demonstrated that the student's median engagement time for videos shorter than 6 minutes was almost 100 %, which means students watched the whole video when it lasted for less than 6 minutes. When the videos got longer, students engagement dropped. Adding the videos length more than 6-9 minutes is wasted effort. (Brame, 2016). When we were making the educational video, we were taking this factor into consideration and trying to make the video under 9 minutes to maximize student's engagement.

2.9.2 Consideration of cognitive load

The cognitive load is one of the most principal factors we need to consider about when creating educational videos as educational materials. Due to human beings having an extremely limited working memory, the information receivers need to be selective about what information they can take notice in. The information should be processed by working memory to become encrypted in long-term memory. Due to the working memory having a limited capacity, only the most crucial information should be given. (Brame, 2016.) While we were making an educational video it was important to only give the crucial information without too many trivial details. We were taking this into consideration while planning the educational video.

2.9.3 Active Learning

Active learning is defined as the process where students' are engaged in the learning by thinking and discussing rather than passively just sitting in a classroom and listening. (Freeman et al., 2014). Zhang et al. have done research on the usefulness of diverse kinds of educational videos. The researchers concluded that compared to traditional classroom learning e-learning has a few major advantages e.g., the

students can control the learning process by repeating and pausing the information when needed. The outcome from the research was also that included interactivity is remarkably better for the learning as well as students' satisfaction. (Zhang et al., 2006.) As a target by our video was to engage students' in the process of active learning by thinking and reflecting.

2.9.4 Ways to make an educational video as beneficial as possible

According to Brame (2016) to get the most possible benefit from educational videos, the educator must consider the cognitive load, elements that will affect in engagement and those elements that enhance active learning. With the following recommendations the reflection of these elements can be covered:

- The video should be short and target towards learning goals
- Audio and visual elements can be used to explain; however, one should consider how these elements can be used in the proper matter and not in redundant way
- Signalling can be used for highlighting the important parts
- Conversational, enthusiastic style can be used for improving engagement
- Active learning can be achieved using guiding questions, interactive elements, or associated assignments.

2.9.5 Accessibility

Educational videos can improve the learning experience, which means they will improve accessibility for those who suffer from learning- and reading problems (Aluehallintovirasto). The educational video we made was available for use with theoretical studies at Centria University of Applied Sciences. The main target group is nursing students, but we could see other students also finding benefits from the use of our video. The video was done by collaborating of Centria University of Applied Sciences. The copyright of this video was taken by Centria UAS. The video is available in English language with the Finnish subtitles so it will be benefit for Finnish students also.

3 PRUPOSE AND OBJECTIVES

The main goal of this thesis is to provide instructional videos for Centria University of Applied Science's nursing students. The purpose of this study is to help students acquire the crucial information they need to know about injections and to assist injection practice. All the international students will benefit from watching this video. Injections into the intramuscular, subcutaneous, and intradermal tissues are demonstrated in the video. All the evidence-based resources and materials that are applied both internationally and in Finnish hospitals are used in this thesis. This initiative is solely dedicated to new students and includes only theoretically accurate materials, as is crucial for all Centria's new nursing students. The most recent recommendations from multiple evidence-based resources are included in this video. This study is reliable for self-study as well as for classroom teaching environment.

The nursing courses at Centria are very hand-on, therefore the video we have created could be helpful for the beginning nursing students. From the first year on, students get to grow fully into the many nursing specialties. For theory classes, online and in-person instruction is used. The delivery of theory courses can be done through contact teaching, online learning, or independent study. Likewise, the school may use this film as a reference tool. (Centria UAS 2022).

4 METHODOLOGY

4.1 Project based

According to Cambridge Dictionary 2021, the project is defined as a planned piece of work or activity that is completed over a period and is meant to achieve a specific goal. One of the most crucial characteristics of a project is that it is time-bound. The beginning and end of the project are clearly defined. Practice-based research is original research carried out with the goal of gaining the latest information, in part through practice and that effort's results (Candy 2006). The aim of a functional thesis is to guide, set and make sense of the procedure. A functional thesis consists of the functional part as well as the documentary of the process and the assessment of the procedure. (Saastamoinen, Vähä, Ypyä, Alahuhta & Päätaalo 2018.) It is important to divide the project into divergent phases. The distinct phases consist of initiation and preparation, planning, execution, and termination. Diving the project into distinct phases is the key to a successful project and will increase its management. (Mäntyneva 2016, 17, 61.) The reason we decided to do a functional thesis was to provide nursing students with genuinely helpful study material. It seems like many nursing students', especially those without or with less working experience, feel nervous encountering patients while injecting them. Our aim is to show the nursing students' the correct ways of injecting patients' to make the students' feel less nervous about it. As a group we also started by making the plan and collecting the theoretical parts. In the following chapters we have reported the functional parts of our thesis.

4.2 The initiation and planning of the project

The initiation phase of each project starts when the estimation of the need for a new project or an upgrade has been done. The initiation phase consists of different activities necessary to start the official planning process. During this phase, the preliminary timeline is set for the project. (Sipes 2018, 38–39.) The idea behind initiating this project started from Centria UAS. The teacher had provided a few topics for the project, and we felt this project was remarkably interesting to initiate. The project was clearly started to make an informative and educative video for the topic. We were recalling our past students' years and felt that we were very insecure and nervous handling the needle and injecting which be lack of experience or education. We thought a video where the whole injecting process is demonstrated might help future nursing professionals. After the initiation of the project is done, one should make a detailed plan.

In the planning phase one should define the scope and aims of the project. In this phase, it is important to estimate different alternatives for the project to reach the targets set. (Mäntyneva, 2016, 19.) During the initial phase we had multiple times a group member meeting for starting the theoretical background from various sources and beginning with initial resource search. Planning the video making process and script writing started with our supervising teacher's consultation. We took in consideration about the video in Finnish health care standard point of view so that it will be beneficial for the students doing their practices and could be possible for their work perspective point of view in the Finnish health care sector. While making an educational video it is important to consider many things. We have reported previously in this thesis about the features of good educational video about the cognitive load as well as the length of the video and student engagement. The planning process for our thesis included planning the video, writing a script, retrieving materials, the location and permission of filming, making the video and the editing process. We started planning the video making process by taking all the previously mentioned factors into consideration.

4.3 The Execution

Besides the previously mentioned factors, while making a video one should also consider some other factors as well. It is important to consider elements that will affect the quality of the video, such as lighting, the surrounding, audio and the position of the camera. (Saastamoinen et. al. 2018). We filmed the video at Centria UAS campus in Kokkola at the end of November 2022. We had prepared well for the filming, but the implementation was still quite difficult. At some points while filming it was hard to find the proper angle and we could not affect the lightning due to the filming day being one of the darkest times of the year and we could not get the natural light in our video. During the execution of our video making process, we decided that one member will be filming, and the two others will be acting. The person who was filming was responsible for reading the script so that it would be easy for actors to follow. We decided to use an artificial voice over in our educational video. The main reason for deciding to use voice over was that we felt that the video audience would be getting the information more clearly if we used a voice over instead of speaking while filming. We also felt that we would be able to concentrate better on showing the injecting procedure properly if we did not need to worry at the same time about speaking loud and clear enough for the video audience. Therefore, reading the scripts was not a part of the video, which made it easier for actors to act naturally.

4.4 The Termination of the Project

The termination of the project should come when the output has been done. During the termination process, it is usually custom to report the project where the output is documented, and its success is estimated. (Mäntyneva, 2016, 19.) The whole video making process went as we expected. Everyone took an equal initiative to make this happen. After the filming process was done, the editing parts were equally challenging. Everyone took part in the editing process of the video including adding the text as well as the pictures to the video with voice over simultaneously. After filming and editing we revisited our theoretical part as well as added the description of the video-making process. The outcome of this led to the termination of our project in the form of a completed thesis.

5 IMPLEMENTATION OF THE PROJECT

This thesis is created as a reference for nurses and nursing students, targeted specially for beginner nursing students. First, we proceeded with the theory part as a pathway to our video. We researched various sources, articles, and journals with the latest information as references. To strengthen the theory part, our thesis counsellor guided and provided feedback as much as possible and made changes as needed.

Hereafter, we were allowed to plan for the video which started with preparation of the script for the video. For the script, we prepared it considering what we were going to say and show in our video and calculated the approximate time for the video. Along with the script we planned about what we were going to include in our video. We also planned to edit videos, adding voiceover, subtitles, and music.

We then booked time for our video shoot. On the day we took the pictures needed for our theory part and video clips. As we were three members it was accessible for us to record the video and to play the nurse and patient roles at the same time. We filmed with our own smartphone, and it took us almost 4 hours to film and finalize the videos. We went thoroughly through all pictures and videos to crosscheck if we had all the content, equipment and technique was correct. We then edited the recordings with Inshot and Capcut applications, which were easy to use and free. Voice over (artificial voice) through the application was used for clear pronunciation. The total length of the video after editing was 7 minutes 41 seconds.

Moreover, to finalize the video, the supervising teacher was consulted for feedback. Also, questionnaires about the video were prepared for feedback from other nursing teachers to decide if the video was good for educational purpose showing correct injection technique.

5.1 Feedback of the video from the teachers with the questioners

The video was created after finalization of theoretical part in Centria's simulation room. All the authors were given the various roles to play and work division was equally distributed. It took 3 days to complete editing of the video which then was submitted to supervising teacher and likewise to other faculty teachers for feedback before it goes for final submission.

In this section the authors have mentioned the feedback that was acknowledged from the teachers and how the authors resolved it. The video was about 5 minutes long initially due to which in some part it was moving faster so to resolve this the length of the video was increased and the pace of video was normalized and made sure that all the images and video were faced in same sideways. Authors had skipped the video acknowledging about making table ready but, as per the feedback received preparation of table was added later. Patient guidance was elaborated more precisely, focused on checking the doctor's prescription. Since the video was prepared in English language and subtitle was also in English so instead that subtitle was converted to Finnish language due to which the Finnish speaking students will also be benefitted.

Despite being very careful while preparing the video, authors had missed some parts or had done the procedure incorrectly which made the authors reshoot the video again in the same room after receiving the feedback from the teacher. Some errors that were corrected are Needle was kept straight to the sharp container waste as authors had previously taken the needle away from the syringe using hand. There happened to be a stain of red markers while giving IM injections in health care personnel's hand which resembled like blood stain, so authors had to retake the shoot for it. In ID injections authors had used the alcohol swab before injecting which was incorrect technique (feedback from teachers) so it was corrected in later video. The background music level was a bit loud which disturbed the voice over but then later it decreased.

6 ETHICAL ISSUES AND REALIABILITY VALIDITY (OR TRUSTWORTHINESS)

Research demands ethically reliable subjects that follow the principles of research ethics. Especially in the research related to health care one needs to pay extra attention to ethical issues. Assurance of the thesis's reliability is important as it provides guidance to others. There are various measures to examine the thesis's reliability and that can vary within the country. Likewise, to maintain the thesis's reliability and avoid ethical issues, the author of this thesis has maintained its validity through the following listed measures.

The video was recorded and presented after the supervising teacher's approval. Prior appointment was taken with the supervisors concerned for this thesis. Confidentiality was maintained throughout the thesis process. As per the need, explanation of thesis can be given to everyone. Since the video was captured by the authors and the actors were author themselves so consent was taken from all prior to the recording of the video. Research misconducting such as fabrication, falsification, plagiarism, and misappropriation was strictly avoided. Personal data of people involved was managed carefully.

We were a three membered group consisting of two female and one male member. As there was gender difference, the issue of uncomfortableness on showing some body parts was present. We first tried to manage a mannequin for our video. But considering the project and the knowledge of the students we thought it was better to demonstrate the injections in real humans. Therefore, after discussion with members and consent we decided to play the roles by ourselves.

While looking for the reference for the video we saw there were different techniques and regulations as per different nations. It was first a topic of discussion for us thinking which guidelines to follow. But then we saw the reference videos from various Finnish sites and previous project-based thesis videos reference. Eventually, we decided to take the reference from THL videos to shoot as it was based on Finland.

We have followed the guidelines from Centria University of Applied Sciences and Finnish Advisory Board on Research Integrity (TENK). The validity of thesis was maintained through face validity and content validity by extensive literature review, consulting with the expertise in the related field and nursing teachers and discussion with the colleagues.

7 REFLECTION AND CONCLUSION OF THE PROJECT

Development of a thesis is a lengthy process which requires immense study and research from the author. One simply cannot finish or develop a thesis. When underdoing the thesis, the author is responsible and answerable to it. Authors must master the thesis and realize its main objectives and goals. In this chapter we will evaluate our thesis process and assess the result.

Our choice of making a functional thesis was based on our teacher's suggestion about the topic and the authors' joint decision on making a thesis that consists of both theory part and a concrete output. The theory part was gathered from many different sources. In the theory part we wanted to highlight the Finnish healthcare guidelines due to the reason that the students who will be reading our thesis and using the video as an educational tool will be de facto doing their nursing practices in Finland. Our research on this subject has demonstrated that the use of videos as an educational tool is an effective way to engage students in the learning process. The authors have tried to take into consideration the factors that have been established in chapter 2.8.4 when making the educational video. The video-making process itself was more challenging than anticipated. We experienced some difficulties with the technical parts of video-making, such as finding the proper angle and managing lighting in the most optimal way. One limitation one might consider with our educational video is that the video is only made in English, which can result in reluctancy on using the video by the Finnish nursing students. However, we feel that while studying at bachelor's level it is accepted that not all study materials are provided in one's mother tongue thus, we did not find it necessary to make (translate) the video into Finnish as well.

The authors feel that the thesis making process has been very educational but challenging. We have gotten the chance to implement theory with what we have learned during our nursing practices and career. We are incredibly happy to be providing nursing students with essential information on injecting techniques in an aseptic way with a Finnish guideline. The authors feel this thesis has met the goals that had been set for it. We feel that the thesis along with the educational video will be useful for the nursing students at Centria.

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APPENDIX 1/1

Script for the video

Hi, we are nursing students from Centria. In this video we are going to demonstrate how to inject an IM, SC, and ID injection through different routes. Throughout the video we will be giving instruction and patient guidance. First, we will show the equipment needed and preparation for all injections (In a table, setup for all three injections tray with the label on it) and show the aseptic way of preparing the medication. (40 seconds)

Equipment's needed for all injections are:

Intramuscular injection

A filtered needle
23-25G needles
Syringe
Alcohol swab
A sharp container
Bandage
Nonsterile gloves

Subcutaneous injection

Syringe
25G needles
Alcohol swab
A sharp container
A tray
Nonsterile gloves
Bandage

APPENDIX 1/2

Intradermal injection

1ml tuberculin syringe
2 small 25G needles
A sharp container
Nonsterile gloves

Intramuscular injections

First, we will start with intramuscular injection which is a method of injecting medicines into the muscles which allows for rapid absorption of the medicine into the bloodstream.

For the preparation of the injection hand washing and disinfecting are the crucial points for aseptic technique after that we put on non-sterile gloves to prevent cross infection. After that from the intramuscular try, we take a syringe to insert medication, as 2ml syringe is convenient for IM also a filter needle to withdraw the medicine. Then we take needle size of 23-25G.

Before injecting medicine, it is important to guide and support the patient throughout the procedure. And prepare the site beforehand after the patient's consent. (1 min)

Foremost it is important to explain the procedure to the patient and make sure the patient understands everything about it and maintain privacy. Allergies of the patient should be previously identified. As we have already prepared the equipment, we proceed to injection Always remember to wash hands and disinfect before any procedure. After the equipment is kept ready, the injection site should be selected, and skin preparation should be done. (30 sec)

For ventro-gluteal site which is the most popular site to inject intramuscular injection we use PINS acronym technique to find the site. P refers to Palm on greater trochanter of the femur, I refer to Index finger pointing to anterior superior iliac spine, N refers to No thumb to bum and S refers to spread your index and middle finger so there will form a triangle and the site is in the middle of the triangle soft when palpated. Then swipe once with alcohol swab on the site. Stretch the muscle and pinch the site with thumb and index finger and inject in 90 degree and aspirate. While aspirating, if there is not any presence of blood then inject medication and put plaster after withdrawing other injection out. (1.5 min)

APPENDIX 1/3

First, we will start with the Deltoid muscles site. Place two fingers below the acromion process and mark upside down triangle. The midpoint of the triangle will be the site. Then swipe once with alcohol swab on the site and pinch the muscle with the non-dominant hand where you take the prepared injection in the dominant hand and inject in 90-degree angle straight to the muscles. Aspirate the syringe to check so that it is in the muscle and not in any veins or nerves. While aspirating, if there is not any blood presence then inject the medication and put plaster to it or else start the whole procedure again if blood is seen while aspirating. (1.5 min)

For vastus lateralis site, the muscle below the greater trochanter and above lateral femoral or knee joint is palpated. Divide the muscles into three parts, the correct part is the middle of the muscle lateral to the middle of thigh. Swipe with alcohol swap on site. Using z track technique, Stretch the muscle and pinch the site with thumb and index finger and inject in 90 degree and aspirate. While aspirating, if there is not any presence of blood then inject medication and put plaster after withdrawing other injection out. (1 min)

Complications: It is common to get a local reaction after the intramuscular injection such as warmth, redness, swelling, pain, itching and rashes on the site. The symptoms are usually mild which could last for 2 days or may disappear within a few hours or days. (30 sec)

APPENDIX 1/4

Subcutaneous injections:

Subcutaneous injections are given into the subcutaneous tissue which is a fatty layer just below the skin surface. In this tissue, medications are absorbed slowly and steadily. (30 sec)

The middle outer side of the upper arm, the middle anterior aspect of the thigh, or the anterior abdominal wall right below the umbilicus are the most extensively used locations for subcutaneous injections

first disinfect your hand and put on non-sterile gloves.

Use an alcohol pad to clean the injection location on skin in a circular motion away from center of site. Let the skin dry naturally. (15 sec)

Following skin preparation, now hold the prepared syringe with the needle end facing up like a pencil, in the dominant hand and remove the needle cover with another hand. Pinch skin and fatty tissue (not muscle) between fingers using the non-dominant hand. Then shortly, quickly, and at a 90-degree angle, put the needle into the pinched skin. Slowly inject the medication. The needle is frequently checked to see if it is in a blood vessel by aspirating on the syringe after insertion. To avoid the drug from going backwards, wait 10 seconds before removing the needle. Note that no need to clean the site with alcohol swab while injecting insulin.

Do not massage the area because doing so can hasten the absorption of insulin and cause bruising after the administration of heparin. Pull the needle out after letting go of the skin. To prevent from sharps hazard; sharps container should now hold the needle. To stop any bleeding, firmly apply clean gauze to the area and maintain pressure for a few seconds. Upon completion, wash your hands. (1.5 mins)

Complication of subcutaneous injection:

Some of the complications of subcutaneous injections are pain, infections to the skin, scarring or bruising and needle breakage in the muscles. (15 sec)

Intradermal injections

Lastly, going to intradermal injections it is injected on the layer of skin called dermis which is just below epidermis layer, and it takes the longest time for absorption as there are less amount of blood vessel in skin. It is mostly used as a methos to test for sensitivity reaction because of easy visualization of reaction ruling out tuberculosis. (30 sec)

Injection preparation

First, assemble all the equipment needed in a tray and fill the syringe with no more than 0.5 ml. Use the same method for preparation of medicine as shown in intramuscular video. Recheck the doctor's prescription and prepare the injection. (20 sec)

Injection administering procedure

Introduce yourself, explain the procedure to the patient, and make sure the patient understands everything; also, ask the patient if they have any queries before administering injection. Wash hands and disinfect before the procedure. The site for the injection should be free of hair, scars, moles, or any rashes. Use the non-dominant hand to stretch out the skin and put the thumb finger below the injection site and gently stretch the skin. With the use of dominant hand hold the needle in 10-to-15-degree angle and penetrate the skin with the syringe and push the plunger of the syringe so medicine goes and form a blister on the skin. While penetrating the skin do not try to aspirate as skin does not have large blood vessels. But once it is successful, gently pull out the needle. Remember to guide patients not to rub or scratch around the site as the injection solution can spread to other tissues. Discard the needle on the sharp container and properly dispose of other equipment. Wash your hand again after the procedure and document properly. If the blister is not formed choose another site and repeat the procedure from the start. (1 min 40 sec)

Complications of intradermal injection

Pain, swelling and irritation in the site are some of the complications of intradermal injections. There might also be infections on the site of injection. (20 sec)

APPENDIX 1/6

Patient guidance

While administering injections, every healthcare professional should know that not all patients have the same learning and understanding ability. Some patients may have better learning ability through visual aids rather than hearing. Communicating with patients allows them to play huge roles in their own recovery and understanding of the procedure. It is also common to get scared or some might have a phobia with injections, so guide patients to get relief of fear and encourage them to get injected for the treatment. Many infectious diseases can be transmitted through unsafe injection practices and could be a serious threat to the health. It is a healthcare responsibility to educate or give proper guidance to the patients for safe injection practices. (1 min)

Total time of video = Approximately 7-8 min

APPENDIX 2/1

Questionnaires for reviewing video. (Please tick Yes/No and Reason if there was some missing)

1. Do you think the length of the video was appropriate?
(Yes / No – if no reason)

2. Was the equipment needed shown clear as per order?
(Yes / No – if no reason)

3. Do you think the injecting technique was able to follow for nursing beginners?
(Yes / No – if no reason)

4. Was the patient guidance given in the video appropriate and enough?
(Yes / No – if no reason)

5. Is complication of injection after each technique useful?
(Yes / No – if no reason)

6. Do you think overall this educational video was productive and educative?
(Yes / No – if no reason)

7. Were there any more things that could be added or was the information given enough?
(Yes / No – if no what could have been added or done better?)