



FONYA MARELICE AMINDE

KAMGANG FOZING

NOUAKO WEBEDJO SANDRINE KLORANCE

SUCTIONING OF THE UPPER AND LOWER RESPIRATORY TRACT

CLINICAL GUIDEBOOK FOR NURSING STUDENTS

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ABSTRACT

Fonya Marelice, Kamgang Fozing, Nouako Webedjo:
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Experience has shown that respiratory tract suctioning is an important factor in caring for patients with respiratory obstruction, especially while in intensive care units, ear nose and throat unit, surgical unit, and care homes. Nurses while attending to duties often face issues of respiratory difficulties from their patients due to accumulation of mucus in the airways. It is incumbent for nurse to manage the patients' respiratory problems while they are being treated.

The purpose of this project thesis therefore is to produce an easy to understand, evidence-based guidebook for nursing students on how to perform suctioning in the upper and lower respiratory tract. With respect to the objective, the goal is to provide nursing students with instructions by use of a guidebook to boost their knowledge and improve their skills on the implementation of airways suctioning. This project thesis report, therefore, led to the production of an easy-to-understand guidebook for nursing students on how to perform upper and lower respiratory tract suctioning. During project process, authors gained lots of theoretical and teamwork skills which will be beneficial in later part of authors working life.

The product is an e- PDF file which contain theoretical knowledge of suctioning and pictures demonstrating each procedure of upper and lower airways suctioning. The Authors decided to make three different guidebooks to keep it short and simple, hence facilitating reading. The authors received feedbacks and improvement were made before the guidebooks were accepted.

Authors used the waterfall model of project management in which each step of the thesis project was carefully analysed and completed before going to the next stage. The Waterfall project management model, which the authors utilized, the initial stage, the planning stage, the execution stage, and the concluding and evaluation stage.

Information and data in this thesis were achieved from evidenced based websites, Finnish database, and textbooks written by Finnish authors. intext references and list of references follows the Satakunta Universities of Applied Sciences instructions. This project and guidebook was evaluated by the supervising teacher and other tutors in the nursing department, because of time constrain authors could not produce questioners for the target group.

keywords: The respiratory system, airways suctioning, guidebook as an educational material

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1 INTRODUCTION

Airway suction is a collective act used to open patient airway. This includes suctioning, secretion removal, and airway patency maintenance. This is especially important for patients on ventilators, endotracheal tube (ET) intubation, tracheostomy, or other airway attachments. For the prevention of airway infections, atelectasis, and maintenance of airway patency, airway secretions clearance is a normal and very essential process. Anatomy of the airways can be broken down into two distinct sections: the anatomy of the upper airway, which is normally made up of the nasopharynx, nasal passage, oropharynx, laryngopharynx, and larynx; and the anatomy of the lower airway, which is made up of the alveoli, bronchioles, bronchi, and trachea. Both sections are necessary for normal breathing. (Sinha et al., 2022.)

The flow of air into and out of the lungs constitutes breathing (ventilation), which is the subject of this thesis. The respiratory system, which includes the upper and lower respiratory tracts, transports carbon dioxide out of the body and allows oxygen to reach body tissues for internal respiration. This process is very important to life such that if the respiratory tract is obstructed, the gaseous exchange becomes impaired and that could be fatal to the person. Within the upper and lower respiratory tracts, there are secretions such as mucus. These secretions are naturally cleared from the respiratory tract by the person through coughing and sneezing reflexes, or even swallowing. Some patients, due to their health conditions are unable to remove the excess secretion from their respiratory tract naturally. In such cases, suctioning is carried out by the nurse or respiratory therapists. Author focused on two basic areas where suction is needed, the upper and lower airway suctioning. Depending on the observation of the nurse in attendance, one of these airways may be suctioned when the patient is unable to effectively clear this airway of excess secretions by themselves. This may happen because the patient is

unconscious or minimally responsive or has other health conditions which thus lead to possible respiratory tract obstruction and ineffective airflow. This results in a decrease in the exchange of gases such as carbon dioxide and oxygen. Thus, the optimal functioning of the body's cells is negatively affected. (Pasrija & Hall 2022.)

The purpose of this project thesis therefore was to come up with an easy to understand, evidence-based guidebook for nursing students on how to perform suctioning in the upper and lower respiratory tract. With respect to the objective, the goal is to provide nursing students with instructions by use of a guidebook to boost their knowledge and improve their skills on the implementation of airways suctioning.

2 THE THEORETICAL BASE OF THE PROJECT

The theoretical base of this project is centered on the principles expounded in the following key concepts, the respiratory system, airway suctioning and guidebook as an essential educational material. These key concepts are explained in the section that follows.

2.1 The respiratory system

The subsequent page (figure 1) is a photo of respiratory system anatomy. It assists in the exchange of gases, including oxygen and carbon dioxide, takes place within the human body's network of respiratory organs and tissues. This system is divided into the upper respiratory tract which is made up of the pharynx, nasal cavity, and the larynx and the lower respiratory tract which comprises of the trachea, bronchi, bronchioles, and the lungs. (Terveysportti sanakirjat, 2021.)

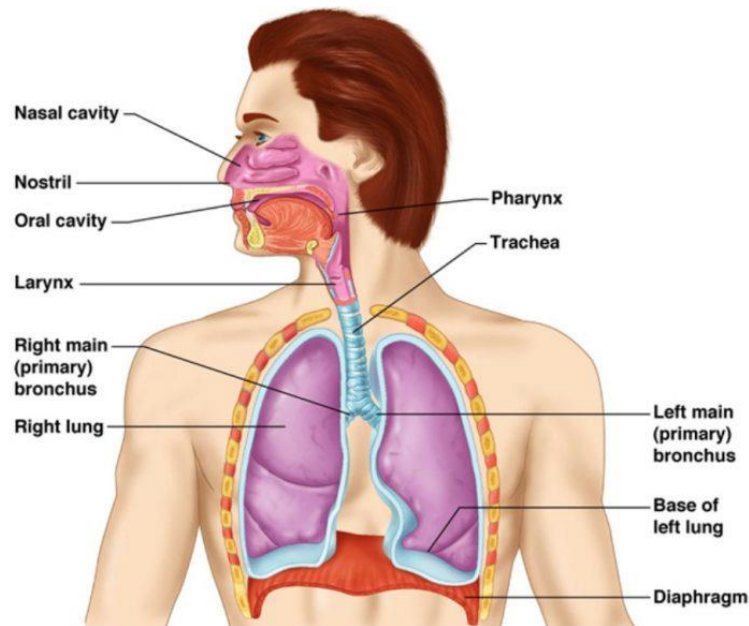


Figure1. Indicates the parts of Human Respiratory System by Nagpal in 2018

The respiratory system's principal role is to enable and facilitate gas exchange. The system absorbs oxygen through breathing and exhales carbon dioxide, a harmful byproduct of the metabolic process of cellular respiration (America Lungs Association, 2022).

Breathing entails two phases, inhalation, and exhalation. The process starts with inhalation and involves taking in air from the surrounding through either the nose or mouth into the lungs through the various respiratory tracts. The nose is the physical structure that is adapted for the intake of air though we can also take in air through the mouth. The air is sucked from the atmosphere through the nostrils into the respiratory tracks. These airways must be free of obstructions for the lungs to function at their best. The air inhaled passes through the airways into the alveoli which are surrounded by blood capillaries where oxygen disseminates into the bloodstream. Once oxygen is absorbed, it is transported by the blood to the heart, which then fills up oxygenated blood to the cells of numerous tissues and organs throughout the body. Cells use oxygen to break down food to release energy. During this metabolic process, carbon dioxide is liberated and transported back to the lungs via the bloodstream and heart before being expelled into the atmosphere. The respiratory system also has functions to clean the air that is

absorbed into the body system. Inside the nostrils are tiny hair follicles that help to filter the air from debris, dust, and even pathogens during inhalation. Cells in the trachea and bronchioles secrete mucus to keep the passage moist and keep bacteria and viruses out of the lungs. The larynx is found in front of the neck and is responsible for producing sound for language communication and facilitates respiration (Cedar, 2018, 47-50.) Specific to the respiratory system are some diseases like asthma, a condition in which the airways become narrow and secrete excess mucus that obstructs the airways. Pneumonia, tuberculosis, and lung cancer are other respiratory tract diseases. (Ratini, 2021.)

Summarily, the respiratory tract consists of the nostrils for air intake from the surrounding, the nasal cavity with cilia and mucus that filter the air, stopping dust and dirt from going into the track. The pharynx is the passage between the nasal cavity that serves as a passage for both air and food particles. The larynx is usually called the sound box since it harbors the vocal cords and is important for the generation of sound. The epiglottis stops food particles from entering the respiratory system or trachea. The trachea is a cartilaginous tube located in the thorax that branches into the bronchus, which terminates in the alveoli. Lungs, which are sac-like structures that assist respiration and the exchange of gases, are the principal organ of the respiratory system. (Ratini, 2021.)

2.2 Airways suctioning

In numerous care settings, such as subacute care, acute care, home care, and long-term care, airway suctioning is conducted routinely. Suctioning is done when a patient is not capable of adequately removing secretions from the respiratory tract. This can result from extreme secretion production or inefficient clearance, causing secretions to accumulate in the upper and lower respiratory tracts. This can lead to airway blockage and decreased airflow efficiency. This hinders the exchange of gases such as carbon dioxide and oxygen, which is essential for efficient cellular activity. If this procedure is not

performed, excess secretion may engender obstruction of the patient's respiratory tract, leading to ineffective gaseous exchange. (Pasrija & Hall 2021.)

In hospital conditions, an open or closed suction system can be used, but closed suction should always be used for suctioning the upper airways. Airway suction is done in order from the lower airways to the upper airways. Once the suction catheter has been advanced to the deepest point, its port is closed, and the catheter is slowly pulled back in a rotating motion until it is out of the patient. Suction sessions should be limited to 2-3 times, each suction session should last 10-15 seconds to prevent mucosal damage and hypoxia. The patient is allowed to rest between suction sessions. Hypoxia of a patient on a ventilator is prevented by administering 100% oxygen 30 seconds before and 60 seconds after suction when using an open method. When using closed suction, the patient does not need to be removed from the ventilator, so no additional oxygenation is needed. (Kurvinen & Petonen, 2016.) Airway suctioning is usually carried out using sterile procedures and specialized equipment. This equipment includes the suction hose, suction catheter, the Y connector, 0.9 % sodium chloride, disposable cups, apron and bowl, sterile gloves, eye goggles, cuff pressure gauge as well as mouth care equipment (Rautava-Nurmi et al...2020, 342).

With the understanding that suctioning is an artificial process, there are bound to be some complications in some patients. It is therefore important for nursing students to be familiar or acquainted with these complications. Some of these complications, which is not exhaustive include hypoxemia which is oxygen deficiency causing a very strong drive to correct the deficiency. There are also complications like mucosal trauma, increased intracranial pressure and bradycardia which are a slow heart rate. Complications of suctioning may equally include infection, pain and discomfort and anxiety. (Sinha et al., 2022.)

2.2.1 Upper respiratory tract suctioning

The respiratory system is separated anatomically into the upper and lower respiratory tracts. The upper respiratory system comprises of the nose, throat, and larynx, whereas the lower respiratory tract consists of organs within the thorax, including the bronchi, bronchioles, alveolar duct, trachea and the alveoli. The function of these tracts is to serve as air passages. Through the alveolar duct, the upper respiratory tract admits air from the surrounding atmosphere into the alveoli, which permits gas exchange. It also evacuates the toxic waste product of cellular respiration, Carbon dioxide (CO²), from the lungs into the surrounding atmosphere. (Patwa, & Shah, 2015.)

Within the lower and upper respiratory tracts, there are secretions such as mucus and saliva. These secretions are usually expelled from the tract naturally by means of reflexes such as coughing, sneezing, or swallowing. In the event whereby these reflexes are not possible, excess secretions may accumulate and cause obstruction of the airway and the flow of air through these tracts. Some patients are unable to cough out or sneeze or even swallow these secretions due to their health conditions. This may happen because the patient is unconscious or minimally responsive or is in a health situation that leads to possible respiratory tract obstruction causing infective airflow leading to impaired gas exchange. (Government of Australia, 2019.) Suctioning is a collective measure used by trained and experienced health workers to clear patients' respiratory tract of excess un-expelled secretions. Though suctioning is a normal process, it is critical to the prevention of respiratory infection and the preservation of airway potency. According to Sinha et al.,(2022) suctioning should never be considered as a routine procedure but instead planned to depend on the need of the patient also it should be carried out by trained, experienced, and prepared health workers in an aseptic condition.

The following equipments is necessary to carry out this process; a suction device in good working condition either attached to the wall or mobile (displaceable unit), a sterile suction catheter, Y-connector, and a disposable mug, sterilized water or saline solution, a soft absorbent paper, disposable napkins, factory clean protective gloves, plastic apron, and a waste container (Rautava-Nurmi et al., 2020, p. 337).

Firstly, before starting the process, assemble all the required equipment near the patient's bed, disinfect the hands and identify the patient through the two-way identifier, introduce yourself and let the patient know what you are about to do, how it will be done, and why it is being done. You may consider some pain medication for the patient if you judge it necessary. Raise the head of the bed to an angle of 45° and protect the patient's body appropriately including the eyes with disposable napkins and soft absorbent paper. (Rautava-Nurmi et al., 2020, p. 338-339.)

Secondly, start the suction machine and check its functionality. Regulate suction strength to the appropriate level depending on the patient, put on the plastic apron, and don all the protective equipment for the eyes, nose, and mouth. Disinfect the hand again and remove the protective paper of the suction catheter; on the other hand, take the catheter far from the part that goes into the patient's pharynx. It is important not to touch the part of the catheter that goes into the respiratory tract. Suction a little amount of sterile fluid from the disposable mug to ensure that the suctioning device is operating properly and that the suction power is set at 10 – 20 kPa for adult patients.

Pass the suction catheter into the patient's mouth through the neck down towards the pharynx while keeping the Y-connector open. When the suction catheter is correctly placed, close the Y-connector with the thumb to provide suction and with a firm, yet gentle grip, quickly suction for about 10 seconds. This time interval is important as doing it much longer may cause complications such as hypoxia or even mucosal damage. While suctioning goes on pull the suction catheter evenly and calmly out of the pharynx. Observe the patient's

breathing condition. If necessary, the suction is repeated after a rest period of about 20 to 30 seconds. Once the suctioning of the pharynx is completed, do suction of the mouth as well. Suctioning may start from the mouth before you suction the pharyngeal region if you observe that there are lots of secretions in the mouth. (Rautava-Nurmi et al., 2020, p. 338-339.)

Lastly, rinse the suction catheter after the suction procedure is completed as well as the suction hose and the Y-connector by suctioning the saline solution or sterilized water from the mug, remove the catheter and roll it around the second protective glove, take off the glove such that the used catheter remains inside the glove. Place the glove in the waste container. Turn off the suction device and protect the hose as well as the Y-connector with clean gloves. Place the remaining saline solution into the waste container and disinfect your hands so as to take care of the patient's comfort. Ensure that the suction device has a suction catheter as well as other necessary equipment in readiness for the next suction session. Record the procedure carried out, the response of the patient, observations made as well as type and quantity of secretion including its colour and odour if possible. Consider administering to the patient supplementary oxygen and pain medication if necessary. (Rautava-Nurmi et al., 2020, 338 – 339.)

Summarily, the purpose of suctioning the mucus from the upper respiratory tract is to secure the patient's gas exchange. It is never done as a routine procedure and should be done by experienced health workers in an aseptic condition. While recommending suctioning for a patient beside emergency cases, the health condition of the patient should be taken into consideration since patients in poor health, children, as well as elderly, are burdened by suctioning. The patient should always be informed of what is being done, why, and how. (Rautava-Nurmi et al...2020, 336.)

2.2.2 Lower Airways suctioning

Tracheostomy and Endotracheal (ET) tubes are used to keep the airway patent and enable breathing mechanically. ET or tracheostomy tube suctioning is carried out to keep the patency of the artificial airway, promote gas exchange, reduce airway resistance, and minimize infection risk by eliminating secretions from the trachea and major bronchi. Tracheal secretion samples can also be collected through suctioning for laboratory research. Because efficient coughing and spontaneous secretion evacuation are hindered by ET and tracheostomy tubes, pulmonary secretions must occasionally be suctioned out. Suctioning is usually performed sterilely in acute care settings to prevent hospital-acquired pneumonia. (Chulay & Seckel, 2015.)

2.2.3 Tracheostomy tube suctioning and Endotracheal tube suctioning

In a tracheostomy, the doctor creates an opening in the patient's trachea through the skin of the neck from the second or third cartilaginous space in the trachea, (Figure 2) illustrates placement of tracheostomy tube, When the patient is unable to receive sufficient oxygen through the airways, because of injury or illness. A tracheostomy is typically performed concurrently with the operation on a patient who is sedated and intubated. Because it is a more comfortable method of securing the airway than intubation, a tracheal tube is frequently used to temporarily secure the airway of intensive care patients undergoing prolonged (lasting more than 1-2 weeks) ventilator treatment. Tracheostomy cannulas come in different sizes and can be cuffed or uncuffed. The purpose of the cuff is to prevent the patient from aspirating and to ensure a tight airway. A cuff that is too full can cause serious mucosal damage within hours, and a cuff that is too loose allows secretions to drain into the lungs, which causes aspiration risk. (Rautava-Nurmi et al., (2020, p. 341.) Whereas uncuffed tracheostomy are used in patients who do not require a ventilator for adequate breathing, they lack the cuff to protect the airways, so the individual should be able to breathe normally to control lung secretions without the need

for consistent suctioning. If necessary, speaking valves can be use with cuffless tracheostomy (Oregon Health & Science University, 2019, p.4.)

General anesthesia is administered unless the situation is life-threatening, if this occurs, a local anesthetic is administered to help patient feel less pain during the procedure. Other medications are administered to relax and calm patient as as well if there is time (MedlinePlus, 2021). Among the indications for tracheostomy are: A foreign object, Infections such as abscesses of the floor of the mouth, Trauma, burns congenital developmental disorders, respiratory center paralysis, brain injuries, poisoning, emphysema, chronic obstructive pulmonary disease, and bronchiectasis are examples of respiratory conditions. Trauma, multiple rib fractures, stabbing protracted intubation and ventilation treatment. Tracheostomy is only performed in severe cases of sleep apnea when other treatments have failed. Suctioning mucus, changing bandages, maintaining the tracheostomy, and replacing the tracheostomy cannula are daily procedures. The treatment aims to stabilize the patient's breathing and provide independent care and monitoring of the tracheostomy. (Waenerberg, 2021.)

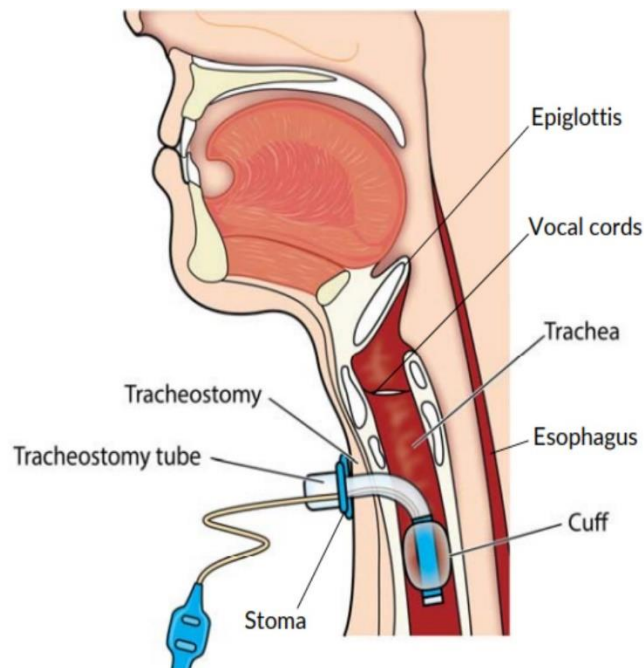


Figure 2. Placement of Tracheostomy tube by OHSU in 2018

Suctioning of the tracheostomy tube is therefore an important lifesaving procedure that needs a timely and precise methodology carried out within an aseptic working condition suctioning the trachea first then pharynx, to mouth, lastly the nose. When it is done correctly and on time it reduces the chances of suctioning complications (which are cited in this write-up below), tracheostomy tube suctioning should be done by well-prepared and experienced health care professionals. Tracheostomy tube suctioning according to Rautava-Nurmi et al., (2020, p.341) should be carried out only when there is a visible accumulation of secretion in the respiratory tract or when the patient is unable to expel the mucus. When the mucus bubbles in the cannula, the breathing sound is raspy, the patient has difficulty breathing or the color of the skin deteriorates. It is also indicated when the tracheostomy tube is changed, or its cuff is deflated.

Suctioning may not be done on a routine or scheduled basis. Its performance should be justified by evident obstructions of the patients' respiratory tract.

To carry out this process, the health personnel require some equipment. These may include the following: a suction device, suction tube, the smallest possible suction catheter the diameter of which is about half the inner dimension of the tracheostomy cannula, Y-connector between the suction catheter and suction device (which may be attached to the hospital wall or mobile and powered by electricity battery or compressed air). Sterile 0.9% saline solution or sterile water for catheter flushing. Disposable napkins and mugs, factory-clean or sterile protective gloves, plastic apron, mouth, and eye guard for the nurse. (Rautava-Nurmi et al...2020, 342).

To carry out this process, the health personnel require some equipment. These may include the following: A vacuum assisted delivery system or a suction machine. See (Figure 3)



Figure 3. Vacuum assisted delivery system by Medela healthcare

Preparation for suctioning depends on the level of urgency of the case. If acute respiratory distress is noticed, the procedure should be considered an emergency case, and even with minimal preparation; it should be carried out while maintaining sterility during the suctioning process. Before beginning the process, prepare all the essential equipment at the patient's bedside and explain to the patient how the suction will feel and why it is necessary. You may consider possible pain medication in case it will be needed. Once the explanation is done and the patient gives their consent for the procedure to be carried out, disinfect your hands, and put on sterile gloves, apron, and other needed personal protective equipment such as the mouth and eye protectors, especially if using the open suction technique. With the absorbent paper, protect the eyes and body of patient from secretion (Elsevier, 2021.)

The suctioning phase suctioning phase entails aseptic technics and suctioning should begin from trachea to mouth then pharynx and lastly nose. First help the patient into a comfortable supine position. If possible, place the head sideways if their health condition permit, raise the bed to about 30-45degree, and administer oxygen to the patient before starting the suctioning procedure if necessary. Select the catheter to be used based on the inner diameter of the tracheostomy tube. Turn on the suction device and ensure that it's in good

working condition. Regulate the suction power to suit the age and size of the patient. In this thesis we focus on adult patients and set the suction pressure between 10-20 kPa maximum 20 kPa. Connect the Y-connector to the suction hose of the suction device. Pour some saline solution or sterile water into the disposable mug ready for use to flush the catheter after suctioning. Open the protective paper of the suction catheter and connect it to the Y- y-connector of the suction tube. Leave the protective paper of the suction catheter still in place. With your dominant hand, hold the sterile suction catheter. The hand touching the sterile suction catheter should only touch that part. The part of the catheter leading into the respiratory tract must not be touched even with protective gloves. Gently introduce the catheter into the airways with the side arm of the Y connector open through an intubation tube or tracheostomy tube. For shallow suctioning, insert the catheter to not go beyond the tip of the tracheostomy tube. If you are doing deep suctioning, the catheter should go beyond the tip of the tube. (Rautava-Nurmi et al., 2020, 342.)

Suction is achieved by closing the open branch of the Y-connector. Carefully pull off the catheter while the suction device is on and at the same time gently suck the different parts of the pharynx. The catheter should not be moved back and forth in the respiratory tract. One suction episode should last not more than 5-15seconds due to the risk of hypoxia. Repeat, if necessary, one intake may comprise multiple suction times of up to 10 seconds, the un-intubated patient will have to settle for sucking in the upper respiratory tract and lower tract. Do not exceed three episodes per suctioning session. Respect minimum seconds interval between suction episodes for patients to rest (Rautava-Nurmi et al...2020, 342.)

Moreover, once suctioning is completed, rinse the catheter using the saline solution from the disposable mug, clean the suction tubing with sterile water; check the position of the cannula as well as the tightness of the attachment. Check Skin color, cyanosis, Oxygen saturation, respiratory rate. Also note the quality, color, and quantity of secretions, breathing sound and heart rate. Record your procedure and observations in the patients' record book as

required (Rautava-Nurmi et al., 2020, 342.) It is also important to care for the tracheostomy which includes cleaning the stoma and the surrounding skin, moist it is using cotton buds dipped in sodium chloride solution. Avoid moving the cannula; place a cannula pad between the tracheostomy and the cannula, the cannula should be replaced quickly and aseptically according to instruction (Waenerberg, 2021).

To sum up, tracheostomy suctioning is a lifesaving procedure that must be carried out by experienced health care personnel. It is associated with some significant health complications. To carry out this procedure it must be evidence-based and not on a regular schedule. Care must be taken to assure the patient of the safety of the procedure making sure where possible that the patient understands and is ready to cooperate with the nurse who is going to perform the suctioning. All needed equipment should be collected and tested to make sure it is functioning properly, and appropriate measures taken to endure that the working condition is aseptic. Once the procedure is completed following the guidelines of the hospital institute, all equipment must be cleaned up and sterilized, ready for another suctioning session. Records of the procedure and observations are kept in the patients' health record book (Endotracheal tube and tracheostomy tube suctioning-ce 2021.)

In Endotracheal tube suctioning patients suffering from certain illnesses like heart failure, pneumonia, respiratory failure and heart failure usually need their airways opened in order to provide oxygen, medicine and anaesthesia. To achieve this purpose, an endotracheal intubation procedure is carried out on the patient. In this medical procedure, a tube is inserted through the patient's nose or mouth into the trachea. Typically, the insertion is done through the mouth. Irrespective of the patient being conscious or unconscious, some medication is administered to the patient to make intubation less traumatic for the patient. During the intubation a laryngoscope is used to permit a view of the vocal cord as well as the upper section of the trachea. The tube is

implanted beyond the vocal cord up to the area where the trachea branches into the lungs for the purpose of breathing. The tube is later attached to a mechanical ventilator which assists the patient's breathing. Some complications may occur during endotracheal intubation which includes bleeding, trauma of the larynx, thyroid gland, oesophagus. Endotracheal intubation is usually carried out in situations of emergency thus very little or no preparation before the procedure is usually done. After the intubation, the patient usually stays in the hospital for medication, as well as control of their breathing and blood oxygen level (Borke,2020.)

Suctioning the endotracheal tube is performed by nurses to preserve the patency of the artificial airway, increase gas exchange, minimize airway resistance, and lower the risk of tracheal infection. The insertion of the endotracheal tube prevents effective coughing clearing the airways of mucus, ensuring that the airway remains open, and prevention of kinking of the intubation tube. This renders necessary the periodic removal of the secretions from pulmonary apparatus by suctioning. In recommending suctioning for a patient, the medical personnel should have observed that there are secretions in the tube, noticed increase in respiratory rate of the patient or a slow or abrupt drop in arterial blood oxygen or sudden onset of respiratory distress. Suctioning is a required operation for artificial airway patients such as the endotracheal tubing. There are however some complications linked to endotracheal suctioning for the patient such as increase in blood and intracranial pressure, heart rate increase or decrease due to vagus irritation, also deep suctioning and high suctioning predisposes the patient to pneumothorax, infections, bronchospasm, and pressure atelectasis (Jansson et al., 2017.)

There are two techniques commonly used for endotracheal tube suctioning, the open and the closed technique. The patient is unplugged from the ventilator during the open suction procedure for the duration of the suction meanwhile in the closed suction technique, the patient is kept connected to the ventilator throughout the suctioning process. In this section, we focus on the open

technique to suction the airways of adult patients. This operation necessitates the use of an open-suction setup with an appropriately sized suction catheter, 0.9% NaCl solution, packaged suction catheter for oral care, suction device either mobile or fixed to the wall, factory clean gloves or sterile protective gloves, clean bowl, connecting tube, and mask with eye shield or goggles, Protective apron, and pharyngeal tube. (Jansson et al..2017.)

The suctioning procedure may be carried out in three phases. The first involves preparing the patient and their family members or care givers for the exercise and assessing and preparing the patient. To do this, first properly identify the patient with two identifiers to be sure that it is the right patient for the right process then check for signs of respiratory tract obstruction. After that, Explain the method so that the patient and caregiver may comprehend and cooperate; this will help reduce anxiety on the part of the patient and help the carer to be more cooperative and empathetic during the procedure. Place the patient on a comfortable position either a semi-fowler or a fowler position and raise the bed to the waist level of the nurse. (Jansson et al..2017.)

Begin the suctioning process by turning on the suctioning device and adjusting the suction pressure to 20 kPa. Attach the suction catheter to the suction hose's connector while the catheter is still in its packaging. Disinfect the puncture point of the elbow of the intubation tube with an alcohol wipe and allowed it to dry. If necessary, the patient is oxygenated before starting the suction procedure with 100% oxygen for at least 30 seconds. Disinfects the hands and puts on factory-clean protective gloves. Carefully remove the protective packaging of the suction catheter so that the end of the catheter entering the intubation tube remains sterile. Do not moisten the suction catheter before suctioning so it does not become contaminated. Insert the catheter into the intubation tube with the suction turned off (the opening of the connector is open) until resistance is felt. After that, the catheter is pulled out 1-2 cm and suction is started. Another option is to estimate the correct suction depth by measuring the length of the intubation tube from an identical tube.

The suction catheter may extend a maximum of 2 cm deeper than the intubation tube. (Alenen, et al., 2022, p.172.)

Suction is started by closing the opening of the connector while at the same time, the catheter is pulled out with a steady, calm pull. The suction should not last more than 15 seconds. Once the suctioning episode is completed, the used suction catheter is wrapped in a protective glove and thrown into the waste container. After removing the protective gloves, the hands are disinfected. If a second suction episode is needed, new factory-clean protective gloves are put on and a new, sterile catheter is used. Finally, the suction line is rinsed by suction through sterile water from a factory-clean container (Alenen, et al., 2022, p.172.)

2.3 Guidebook as an educational material

The purpose of this project thesis is to produce an easy-to-understand, evidence-based clinical guidebook for nursing students on how to perform suctioning in the upper and lower airway. A guidebook is a book that provides useful information about a specific subject (Merriam Webster, 2021).

In the context of the healthcare business, a clinical guidebook consists of statements that include suggestions designed for patient care maximization, because of a systematic review of the evidence and an evaluation of the benefits as well as the risks of different care alternatives. It's a convenient method to package evidence and present recommendations to healthcare practitioners and decision maker. The relevance of continuous education for both students and practicing professionals in our modern fast-paced society cannot be overemphasized and a clinical guidebook for nursing students is fundamental for their professional development. A guidebook will enable nursing students to develop appropriate knowledge and update their practical skills in the domain. The main goal is to improve the efficacy and quality of care provided to patients. Additionally, it helps reduce clinical practice

variation, costly and preventable errors, and adverse events. It provides a benchmark by which practitioners can be evaluated and improved. (Kredo et al., 2016, p. 122-128)

The clinical guidebooks will contain clearly written sequential statements that guide student nurses through the various airway suctioning procedures. The sequential statement shall be illustrated by photos of the equipment used as well as the action of the nurse. These pictures shall be of natural color and clear and distinct. Therefore, providing a clinical guidebook as a continuing education tool for nursing students on airway suctioning will most probably improve their practical skills and theoretical knowledge in this subject."

3 PURPOSE AND OBJECTIVES OF THE PROJECT

The purpose of this project thesis therefore is to produce an easy to understand, evidence-based guidebook for nursing students on how to perform suctioning in the upper and lower respiratory tract. With respect to the objective, the goal is to provide nursing students with instructions by use of a guidebook to boost their knowledge and improve their skills on the implementation of airways suctioning.

4 PROJECT IMPLEMENTATION

The implementation of the project, otherwise called the strategic process was a step-by-step guide used to attend author's goal. Using the waterfall model, which is a model which divides project processes into successive phases, the designing and implementation, the progress, and evaluation of the project's

cycle are examined. Each phase of the project was meticulously planned before going on to the next, and the evaluation phase occurred at the conclusion. The waterfall model was used for this project because it is a simple but detailed model that clearly outlines the planning, implementation, and evaluation of an instructional guidebook on suctioning of the upper and lower respiratory tract to help nursing students at Satakunta University of Applied Sciences learn this lifesaving clinical procedure. (Aroral, 2021,93.)

During the implementation phase of this project, authors focused on identifying and evaluating the various risk involved and identifying the appropriate tools necessary for its management. Implementation of the theoretical part focused on airway suctioning and equipment used for it, the human respiratory system, and aseptic procedures needed in the implementation to minimize side effects. The product which is a guidebook contain pictures of common suctioning equipment and suctioning procedure from start to finish. Theoretical information was be retrieved from Hoitotyön taidot ja toiminot, Tehohoitotyö, Terverysportti, Pubmed and WebMD to name a few.

4.1 Project Methodology

A project is a method worked out in advance for achieving some objective (Website of Merriam-Webster 2022). It involves a series of transitional tasks with the purpose of attaining some specific objective. It is temporal and involves people working on it with different skill sets. It is unique and changes as the project move from one phase to another toward the final projected end. The project's commencement phase, planning, execution, and implementation phases, as well as the closing phase when the goal is fully attained, are among these phases. (Axelos limited, 2020, 9.)

Since each project is unique, its lifecycle is also dependent on the nature of the project and the method used to carry out the project is unique, To carry out this thesis project successfully, the authors adopted the following phases to

complete the educational clinical guidebook for the suctioning of the upper and lower respiratory tract. The stages of the "Waterfall" project management model, which the authors utilized, are as follows: the initial stage, the planning stage, the execution stage, and the concluding and evaluation stage (McBride, 2016.)

When Winston Royce first proposed this strategy in 1970, software project managers embraced it. (Aroral, 2021, 9). Authors chose this model because it laid out succinctly the project phases rendering clarity to the whole process and making the final product, which is a clinical guidebook easy to use by nursing students and nursing professionals wishing to upgrade their skills in patients' respiratory management. Using the waterfall model of project management, each step of this thesis project is carefully analyzed and completed before going to the next stage (Aroral, 2021, 93).

While, producing this guidebook, each stage was carefully planned by the authors, sufficient resources were collected, and project risks and solutions were identified to ensure that the project moves to its logical end successfully.

4.2 Literature retrieval

When the authors started this project, authors realize that not much research has been carried out and published in Finland on this topic in English language. Authors used Finnish websites and textbooks like Terveystieto and Hoitotyön taidot ja toiminnot and Tehohoitotyö respectively from Finnish authors for the realization of this project since the aim is to produce an evidence-based guidebook on airway suctioning that overlap with Finnish practice in that domain

Moreso, in this project, two main databases were used. The keywords used included airways suctioning and the respiratory system. Searched result under PubMed generated 26 results for airways suctioning and 4 were accepted. For Webmed, respiratory system researched produced 170001 results and 1 was

accepted. Also, authors used other website like American lungs association, clinical guideline for government of Australia, article and journals on satakunta university of applied science electronic library. Authors found researched materials from previous publications from pasrija D. and Hall CA as well as Melinda Ratini, from Theseus four topics related to our thesis topic were found. Authors used MOT Kielipalvelu Kaantaja, for the successful translation of material in Finnish language.

4.3 Description of the target group

Target group refers to individual's authors want to spot with an objective of educating them to achieve a positive effect or outcome. (Hinze, 2017).

This project thesis is designed for nursing students of Satakunta university of applied sciences. During their studies which last for about three and a half years they will undertake internships like elderly care and medical nursing, and this guidebook will massively assist them theoretically and practically.

(Satakunta University of Applied sciences).

4.4 Resources, personnel, and risk

Resources used for the implementation of this project included computers, notebooks, cameras, information from evidence-based website, databases, and articles, the internet, and the Satakunta University of applied sciences simulation room and Fonya Marelice, Kamgang Fozing ,and Nouako Webedjo authors considered the risks related to this project, as a sudden unforeseen circumstance that might arise during the project implementation phase, and which must not necessarily be something negative yet have the capacity to impact the project objectives reasonably or adversely. (Project Management, 2022). Authors encountered difficulties like reservation of simulation rooms,

taking pictures for the guidebook, and lastly authors had different schedule in terms of daily activities this really slowed down the progress of the Project.

4.5 The stages of the project and schedule

A project has phases which include initiating, planning, executing, implementing, and closing phases. On the other hand, project differ in lifestyle. In this thesis Authors adopted the above-mentioned phases of a project to complete the project. In the initiation and planning stage, authors have choosed databases good for the thesis project; decision on the purpose, objectives, and method used in the project. Financing, risk, ethical point, an assortment of evidence-based information, literature review, and writing a project report was done in the execution stage. In the monitoring stage, modification and guidance was suggested with the help of the supervisor. The closing phase involved finalizing all activities for the project. (McBride 2016.)

This project started in August 2021 with the provision of a thesis topic from the Satakunta University of Applied Sciences. The first project plan was made in December 2021 and was sent back to the authors for corrections.

The second project plan was submitted in January 2022, and it was rejected and sent back for modification with several comments from the supervisor. The third submission of the Thesis plan was scheduled to be done by the end of January 2022. The submission was affected on the scheduled date and was approved in February 2022. The authors immediately kicked off the initiation and planning phase of the project at the beginning of February 2022 as soon as the approval was received. During the month of February, the authors searched pertinent databases, resources, and the partition of time, and discuss responsibilities, risk, financing, and project method.

At the beginning of March 2022, the authors distributed tasks to implement the project. This stage of the project lasted until the end of April.

In the months of May and June authors gathered most interventions, measures, and project methods needed for this project.

Working from July to December 2022, the Authors completed the manuscript as well as the draft guidebook which was presented to the supervisor for evaluation and feedback in December 2022. Feedback was received in December from the supervisor. Having received the supervisor's feedback, the final draft of the guidebook is being finalized for submission in January 2023. If the authors get positive feedback from the evaluation, then the authors will close and submit the project by the end of January 2023. Table 1 explain the date and task, or stages used to realize this project

Table 1. Project schedule

Date	Task
February 2022	Project plan approval
March to April 2022	Task distribution and implementation
May to June 2022	Gathering information, analyzing relevant information, summarizing information.
July to December 2022	Creating manuscript, shooting of photos, and writing the guidebook.
January 2023	Presentation of guidebook for assessment and feedback and deliberation meeting, target time of Project realization, Reflection and Summarizing feedback.

5 EVALUATION OF THE THESIS

Assessment of this project has been realized by the supervisor and other tutors of nursing department of Satakunta University of Applied Sciences. The authors planned to produce a short electronic questionnaire for the second-year nursing students so as to get feedback from the student audience but this was not realized due to time constraint as a result of the difficulties in obtaining the photographs necessary to produce the guidebooks.

The authors have achieved a self-evaluation through the planning of the project, implementation of the plan to the point of obtaining the objective which is a clinical guidebook, and the successful closure of the project. This has been very important because it has enabled us to minimize the chances of errors, thus hastening the process of the project.

Firstly, the supervising teacher evaluated the thesis plan, upon acceptance of the thesis plan, authors moved on to planning on how to write the thesis manuscript after writing of the manuscripts which comprises mostly the theoretical knowledge of the topic, authors submitted for feedback and evaluation from the supervising teacher, corrections were made, and authors got permission to proceed in the making of the guidebooks.

Secondly authors proceed in the making of the guidebooks, theoretical evidenced based material and photos taken from Satakunta university of applied science simulation room were used in these guidebooks, guidebooks were submitted for evaluation and feedback were given, many photos were rejected and corrections based on theoretical context was given by the supervising teacher. After a couple of resubmission and corrections, guidebooks were finally accepted. Authors decided to produce three guidebooks to keep it short and simple, hence facilitating reading. Electronic PDF manuals on Upper respiratory suctioning, tracheostomy tube suctioning, and endotracheal tube suctioning have been developed and will be attached to the written portion of the Theses.

The completion of this thesis and guidebook has enhanced the writers' work-related skills. During the writing of this thesis and guidebook, authors also

acquire extra collaborative skills, which are essential for all healthcare professionals.

5.1 Ethical consideration.

While executing all the different phases of this project, the authors agreed on maintaining a high standard of integrity with respect to the research and presentation of the final product- the clinical guidebook. The authors based their research integrity standard on the advice of the Finnish National Board on Research Integrity (TENK), which suggests that in order for any research to be ethically acceptable, reliable, and have credible results, it must be carried out in accordance with responsible conduct of research. whose guidelines demand that certain principles be observed strictly during the research. The board advocates practices of essential ethical principles such as honesty, justice confidentiality, accountability, transparency, competency, and legality as measures for responsible publication. It cautions the avoidance of research misconduct like falsification, plagiarism, fabrication, and misappropriation. Therefore, in compliance with these principles, while gathering information through various research means for use in the implementation of this project, authors are guided by the above-mentioned principles to ensure the integrity and uphold responsible publication at the end of the project (Finnish National Board on Research and Integrity, 2022.)

5.2 Conclusion

Following the selection of the authors' topic, the authors advanced in the project planning, this took a while because this was the authors' first academic writing. Everything seems challenging but with a guardian from the supervisor, the authors successfully validated the project plan, Following the validation of the project plan, the authors moved on to writing the introduction and theoretical base of the project, this was also challenging as the authors

found many evidenced-based materials in English, however, it was not based on Finnish guidelines as one of authors objective was to produce an evidenced-based guidebook in accordance with Finnish guidelines. Nevertheless, the authors use databases and textbooks from Finland and with the help of MOT Kielipalvelu, authors were able to get an unmediated translation which helped in the production of the guidebook and the Thesis.

Despite the difficulties encountered during the handbook's production, the writers were happy with the outcome because they gained a lot of fresh material while creating the instructional guidebook, which would undoubtedly be useful to authors in their future careers. Authors recommend that in the future, more guidebooks should be made like this as it is a great technique in the acquisition of knowledge.

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