



CAROLINE WABUYELE, CATHERINE AJAYI M.,
LINDA KALU

**Educational material: inserting and
removing nasogastric tube for adults
and children**

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<p>The aim of this thesis was to create educational material for nursing students at Satakunta University of Applied Sciences about Inserting and removing a nasogastric tube for adults and children.</p> <p>This thesis document comprises theoretical background, implementation, and evaluation discussions. The choice of educational material for this product was a presentation to illustrate the procedure for insertion and removal of a nasogastric tube. The product for this project was in form of PowerPoint presentation which illustrates the procedure for inserting and removing a nasogastric tube for adults and paediatrics.</p> <p>The methodology for this thesis project was by Hybrid methodology, which enables combining two different project management styles to create a suitable and flexible management style for performing project tasks effectively. Tasks were defined and shared amongst members at the start of the project.</p> <p>PowerPoint presentation for the educational material was sent to nursing students for evaluation, also a survey link that contains anonymous questionnaire was sent to 10 students to obtain feedback for the quality of the educational material. The survey had six closed ended and two opened ended questions. Five respondents answered the questionnaire. In conclusion, the overall result of the survey suggested that the PowerPoint (product) was clear and easy to understand and suitable as a learning material.</p>		
Keywords: nasogastric tube, digestive system, hybrid method. PowerPoint.		

1 INTRODUCTION	4
2 THEORETICAL BACKGROUND	5
2.1 Digestive system	5
2.2 Setting nasogastric tube.....	7
2.2.1 Different types of nasogastric tube	11
2.2.2 Step by step procedure for inserting and removing nasogastric tube.	15
2.2.3 Patient education and documentation	27
2.3 Educational material.....	29
3 DEVELOPMENT FOR THE PROJECT.....	31
3.1 Purpose and Objectives.	31
3.2 Project methodology	31
3.3 Resources, swot analysis and target group.....	31
3.4 Development stages for the project.....	33
4 EVALUATION.....	36
4.1 Summary of statistics for the questionnaire	37
5 CONCLUSIONS.....	38
REFERENCES	
APPENDICES	

1 INTRODUCTION

This thesis is for development of academic educational material. The topic for this thesis is "Educational material: Insertion of a nasogastric tube for adults and children". The purpose for this thesis was to create an educational material for nursing students. Lack of sufficient knowledge of health situations or clinical skills poses a risk to patient safety.

The students developing this report developed an educational material for the procedure of nasogastric tube placement, and removal by utilizing PowerPoint presentational that had instructions and picture illustrations for the nasogastric procedure. A few illustrative pictures from other authors were used for the educational material.

Tresca & Yepuri (2022.) conclude that while most of the insertions for nasogastric tubes happen without incidences, there are potential risks that could occur during the insertion procedure, resulting in esophageal injury, injury of the throat and sinuses, or the stomach. There is a possibility for further complications if the nasogastric tubes clogged, mispositioned, or torn. Nasogastric tube placement errors cause aspiration problems that could be triggered by food or medication administration. Aspiration risks are fatal if untreated immediately. On the other hand, when placement of a nasogastric tube is performed accurately, a nasogastric is known to have various benefits in healthcare.

The topic for this thesis is important because it shall provide a good educational platform based on scientific evidence-based research, whereby nursing students will learn from researched academic content, practical guidance materials on insertion of a nasogastric tube, enhance practical skills, and learn complications during the procedure.

2 THEORETICAL BACKGROUND

The theoretical background explains the main key terms for this thesis report. The key terms used for this thesis are the digestive system, Hybrid method, aseptic technique, nasogastric tube, and PowerPoint learning tool.

2.1 Digestive system

The digestive system, also known as the gastrointestinal tract, begins from the mouth and ends at the anal canal. The digestive system facilitates movement, digestion of food, absorption of nutrients and elimination of fecal waste from the body (Ahonen et al. ... 2019, 495; Robinson, 2020; Khatri, 2022.)

The digestive system (figure 1) comprises the mouth, pharynx, and the throat (esophagus), the stomach, small intestine (ileum), and the large intestine (colon), the rectum and the anus (Ahonen et al. ... 2019, 495; Robinson, 2020; Khatri, 2022.) The digestive system has “accessory organs” that help with digestion. Accessory organs include the oral cavity where food is grinded, and the salivary glands which produce chemical enzymes for further breakdown of food. Once food is transported into small intestines, the gall bladder, the liver, and the pancreas produce secretions for food digestion (Chruścik et al. ... 2021, 875-876.) Specialized muscles in the digestive system aid the movement of food, and digestive cells produce enzymes that break down food which is absorbed in the body in form of nutrients. The digestive system helps eliminate waste from the body in fecal form through the anal route (Khatri, 2022; Ahonen et al. ... 2019, 495; Robinson, 2020.)

The digestion process begins from the mouth; whose function is to chew food, moisten the food with saliva, and aid in swallowing food (Robinson, 2022.) In the mouth food mixes with amylase, (a protein produced by salivary glands) which breaks down starch and sugar from food (Ahonen et al. ... 2019, 496.)

The throat (pharynx) facilitates breathing and directs food from the mouth to the esophagus and lubricates food and the passage tract The esophagus directs food to the

stomach, lubricates food and movement path (Chruścik et al. ...2021,858, 876.) The epiglottis covers the opening of the trachea (windpipe) during swallowing and prevents food from entering the windpipe (Healthline website, 2018.)

The esophagus is 25 cm long, it is posterior to the trachea and the circulatory system, its passage is through the diaphragm ending into the stomach. The esophagus glands secrete mucus for food lubrication and aid in the involuntary transportation of food to the stomach from the pharynx through a process termed peristalsis (Ahonen et al. ... 2019, 495; Robinson, 2020.) The diaphragm surrounds the esophagus and seal the esophagus opening (sphincter muscle) when inactive the improperly closed esophagus is causative of gastroesophageal reflux disease (Gerd) also known as heartburn (Chruścik et al. ... 2021, 877.)

The stomach is an organ shaped like a sac whose volume is about 1,5 liters, it links the esophagus to the duodenum. The stomach accelerates the digestion of food by gastric acid from its mucosal membranes. Gastrointestinal acids comprise the hydrochloric acid, and pepsinogen, termed "Gastric juice". Hydrochloric acid in the stomach maintains the stomach's acidity to a pH of 2. The ileum is 5-7 meters long; made up of the duodenum, jejunum, and the Ileum. The caecum is the ending part of the small intestine that enhances the digestion process; by using enzymes from the pancreas and bile from the liver to break down food. Duodenum facilitates processing of food, and the small intestine help with nutrient absorption into the cells of the body (Ahonen et al. ... 2019, 495; Robinson, 2020.) Undigested food is passed to the large intestine's four sections "the ascending, traverse, descending and sigmoid colon" consecutively, and is directed to the rectum and eventually to the anus where it is defecated in fecal form (Alexander, Brooker & Nicol, 2014, 74.)

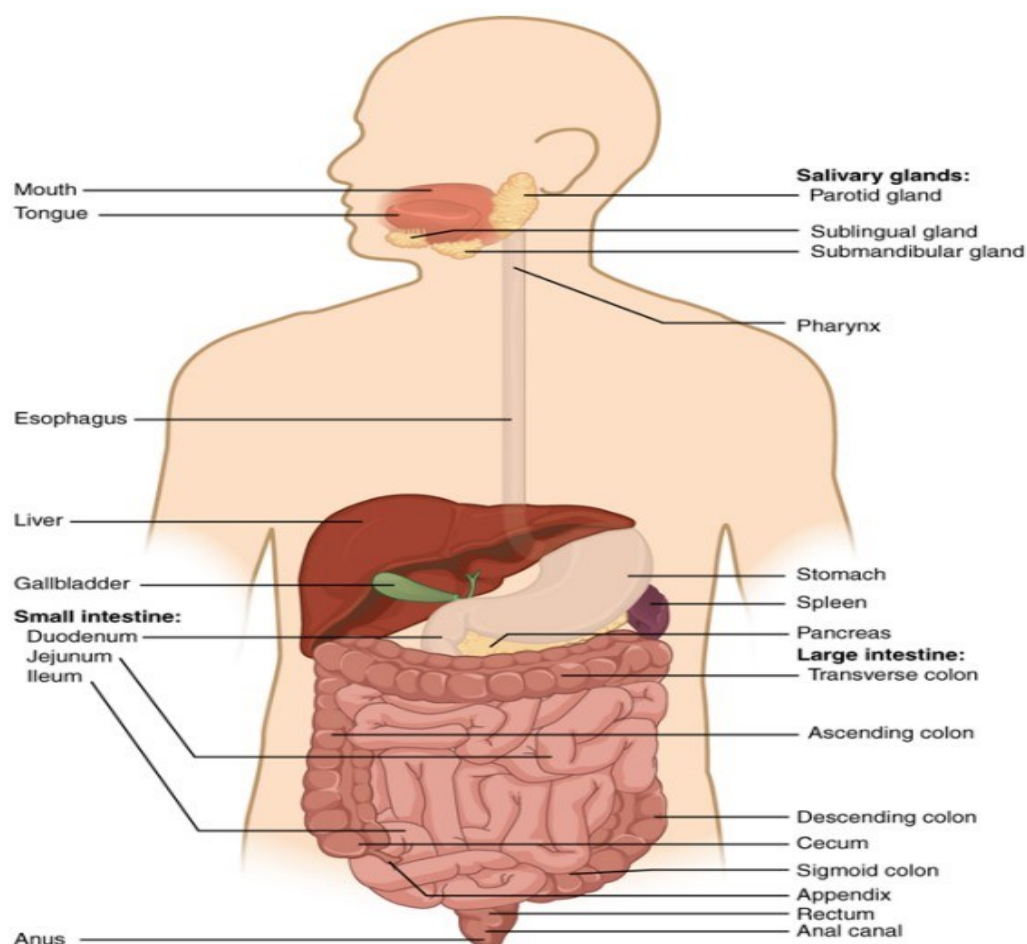


Figure 1: The digestive system (Chruścik et al. ... 2021, 860.)

2.2 Setting nasogastric tube

In healthcare settings, pathogens such as bacteria could infect a caregiver's hands or surfaces for a short time, and transmission risks through contamination increase. Working aseptically is important for healthcare workers to prevent the spread of microbes causing infectious diseases through use of aseptic techniques (Rautava-Nurmi et al. ... 2019, 105-109.) The general hygiene standards termed standard precautions in nursing work, involve proper hand hygiene, and use of Personal Protective Equipment at work; gloves, masks, eye protectors, and gowns for contact protection of the skin with mucosal membranes, blood, and bodily fluids (Perry, Potter, & Ostendorf 2016, 75.) Aseptic working should be by handling sterile- to- sterile field, and non-sterile to non -sterile field, moreover, working should be by first handling

clean areas and proceeding to dirty example during patient care (Rautava-Nurmi et al. ... 2019, 109, 113, 2019.)

Using nasogastric tube has many indications. Diagnostically used for evaluating upper gastrointestinal tract (GI) bleeding, extraction of gastric fluid content for testing, identification of esophagus and the stomach on chest radiograph, administration of radiographic contrast dye in upper GI tract, and identification of cancer cells for gastric cancer patients (Shiel, n.d.)

Therapeutic purpose: gastric decompression by use of suctioning through continuous or intermittent suctioning to remove gastric contents for patients with blocked intestines, and impaired bowel movement also known as paralytic ileus due to of abdominal surgery. Additionally, the tube is for the prevention of aspiration and vomiting for trauma patients, for aspiration of gastric fluid content for lavage (irrigation for flushing out gastric content for laboratory tests. A nasogastric tube is used for drainage of lavage in drug overdose or drug poisoned patients (Wayne, 2018.)

Via nasogastric tube can give administration of medication and Enteral nutrition. It can be used for medication administration for a patient with swallowing problems, feeding of patients with the inability for adequate nutrition intake from food or oral supplements, or unsafe oral ingestion example for a neurological condition of dysphagia. Used for patients with swallowing challenges from illnesses such as stroke, gastrointestinal disease such as inflammatory bowel syndrome, oral and gastrointestinal infections, ulcers, and for radiation therapy requiring cytostatic. Additionally, feeding gastrointestinal surgery patients (University of Glasgow 2021, 2; Alexander, Brooker & Nicol, 2014, 750.)

Nasogastric tube has also contraindications. Nasogastric tube is not used for a patient with suspected fracture of the skull base, patients with leakage of cerebrospinal fluid through the nasal route (CSF rhinorrhea), and nasal fractures, in such cases, an orogastric tube is used (Alexander, Brooker & Nicol, 2014, 750.) Further referral from specialized doctor should be sought before inserting nasogastric tube for patients with the conditions for blood clotting problem, anticoagulant medication, or for a patient with esophageal varices (enlarged esophagus veins), skull fracture, head and neck

surgery, esophageal tumors. A nasogastric tube should not be placed on a patient with tracheostomy unless a patient is in the intensive care unit (Stirland & NHS, 2017,7.)

Safety must take account when setting nasogastric tube. Valvira concludes from pasts clinical investigations in Finland that nasogastric tubes were clinically estimated to be located correctly but chest x-rays proved the tubes were in the airways of patients. Valvira recommends healthcare professionals should follow safety instructions during insertion and confirmation of the nasogastric tube. X-rays are considered the safest method for confirming the position of a nasogastric tube (Valvira, 2016.)

A nasogastric tube can only be prescribed by a doctor for a patient after an assessment of the patient's health situation. An enteral feeding tube should be inserted to a patient by a trained health professional either a nurse or a doctor (Rautava-Nurmi et al. ... 2019, 257.) A nurse for patient with nasogastric tube should monitor and calculate the fluid balance daily, and follow-up on with laboratory tests, and make the necessary electrolyte supplements as instructed by a doctor (Ahonen et al. ... 2020, 521.)

During care for a patient with a nasogastric tube safety should be observed. Patient safety during healthcare procedures is achievable by performing hand hygiene, introducing yourself to the patient, confirming identity using two methods for crosschecking (e.g., name and date of birth), explaining the process to the patient and implementing prescribed pain killers (analgesics), moreover offering the use of a washroom. A nurse should listen act on patient signals, ensure patient's privacy and dignity, assess the (ABCCS)/ Airways, Breathing, Circulation, consciousness, and Safety. Lastly a nurse should apply principles of asepsis, check vital signs, and complete necessary focused assessments (Doyle & McCutcheon 2015, 663.)

Confirming position of a nasogastric tube is important. Valvira (2016.) states the confirmation of nasogastric by listening to stomach's sound using a stethoscope is not considered a reliable method because through clinical findings it was discovered the location of the nasogastric tube was reported to be correctly located, but by x-ray records proved otherwise. Rautava-Nurmi et al. ... (2020, 262.) states that international recommendation for confirming the position of the nasogastric tube does

not recommend listening to sound. In unclear situations, a patient should have an appropriate chest X-ray to confirm the position.

Assessing the color and Ph of gastric content aspirated for continuous monitoring of a nasogastric tube has been proved as an effective and less costly method (Perry, Potter, & Ostendorf, 2016, 296.) Walsh et al. ... (2016, 13.) conclude that testing position using the pH paper method is cheap and reliable, and that X-rays to confirm nasogastric position is costly. Regular use of an x-ray is not practical due to side effects for radiation exposure. Rautava-Nurmi et al. ... (2020, 262.) summarizes that the confirmation for a nasogastric tube location by use of pH paper is done by aspirating stomach content into a syringe and placing the contents on a litmus paper for indication. The correct pH should range is between 1-5.5.

Nursing care for a patient with nasogastric tube is important. A patient with a nasogastric tube should be monitored for feelings (comfort or discomfort), cleanliness of the tube, fluid balance, fluid intake, urine output, and intestinal emptying should be monitored on daily basis. A patient's condition should be monitored daily, and weekly measures for weight, urine sugar and ketones, blood glucose and laboratory tests for urea serum, electrolytes, albumin, prealbumin and transferrin should be performed. Before commencing enteral nutrition, a doctor evaluates a patient's diet, energy, and fluid needs. A nurse should administer as necessary fluid electrolyte supplements as per the doctor's instructions for a patient with a nutritional imbalance. Calculating fluid balance is very important before initiating enteral nutrition for a patient (Ahonen et al. ... 2020, 521 & Rautava-Nurmi et al. ... 2020, 262-264.)

Aspiration occurs when a foreign substance such as food or liquid leaks into the lung and trachea (Wayne, 2022.) Aspiration is caused by muscular and nerve problems, and obstruction in the digestive tract that presents swallowing problem(dysphagia). Swallowing ability depends on the coordination of cranial nerves and muscles of the tongue, pharynx, larynx, and the jaw (Perry, Porter & Ostendorf, 2016, 293.) Before administering food, the tube should be tested to confirm position by litmus pH paper test. If the nasogastric tube is not retracting, it is probably blocked. In this case, the tube should be aspirated with a record-syringe. When you get content of the stomach

to the syringe, the tube is open. If the nasogastric tube does not open by aspiration, 10ml of room temperature soda, carbonated soft drink, strong tea or 10% saline can be injected to the tube. Then you should wait for about 20 minutes and rinse the tube with water. If the tube is blocked, it must be replaced with a new one. Medication administered to the patient should be compatible through the nasogastric tube in case medication cannot be administered through the hose the doctor should be contacted (Rautava-Nurmi et al. ... 2020, 262-264.)

A nurse's expertise is crucial for the maintenance of nutritional management for a critically ill patient. Patients with a critical illness are usually at malnourishment risk. Enteral nutrition should be implemented with urgency for a critically ill patient during hospital admission to protect the gastrointestinal quality, and to eliminate the risk of electrolyte and fluid imbalance, decrease infection and facilitate quick wound healing. A nurse has the responsibility to ensure that a nasogastric tube is correctly placed for a patient, especially before the enteral feeding. The position of the tube should be regularly inspected by checking the pH of stomach content using a pH strip, or through x-ray (Alexander et al. ... 768, 2014.)

Perry, Potter, & Ostendorf (2016,312.) summarize that an adult patient with a nasogastric tube, and diabetes disease should receive enteral nutrition to reach the target level of blood glucose of 140 to 180 mg/dl. Interruptions for enteral feeding can result in hypoglycemia. Carbohydrate replacement such as dextrose IV fluids should replace tube feedings when a patient is on basal insulin and tube feeding is interrupted

2.2.1 Different types of nasogastric tube

Nasogastric tubes are in different sizes, lengths, and materials. The most used are eight to twelve French tubes (Jamieson & Tadi, 2022.) The smaller sizes are for Pediatric patients while the bigger sizes are used for adults. In pediatrics, the correct nasogastric tube size varies, and it usually depends on the patient's age. To get for a particular age, add sixteen to the age of patient in years and multiply the result by two. Adults can use nasogastric tube sizes 16-18 French (Shlamovitz, 2022.)

Rautava-Nurmi et al. ... (2020, 258.) states that a nasogastric tube is 120 cm in length, and standard nasogastric tube have measurement mark at 45, 55, 65 and 75 cm. Nasogastric tubes are according to international standard unit known as the “Charrier Unit (Ch)” and these usually have an x-ray positive longitudinal strip to confirm the position through x-ray scans. Nasogastric tubes meant for emptying stomach contents are usually large than feeding nasogastric tubes. The procedure for insertion of feeding and stomach content emptying nasogastric tube is usually the same.

Nasogastric tubes are made of different materials, polyvinylchloride (PVC), polyurethane, or silicone. Polyvinyl chloride can be used for a short duration of up to 2 weeks because its integrity is affected by gastric acid. Polyurethane and silicone tubes can be used for a longer duration as they are not affected by gastric acid. (Henderson & Bonsal, 2019.) Nasogastric tubes for newborn care similarly to adults comprise polyvinylchloride (PVC) as well, polyurethane, or silicone. The sizes of neonatal nasogastric tubes range from 3-5 to 10 French and have different lengths (Wallace & Stewart, 2014, 3-4.)

Nasogastric tubes not used for feeding are **Levin tube** (Figure 2) is hollow tube made of rubber or plastic with holes at the end part and on the side. The size of Levin is between 42" to 50". The tube helps drain gastric contents (106- 127 centimeters) (Lippincott Williams & Wilkins, 2013, 499.)

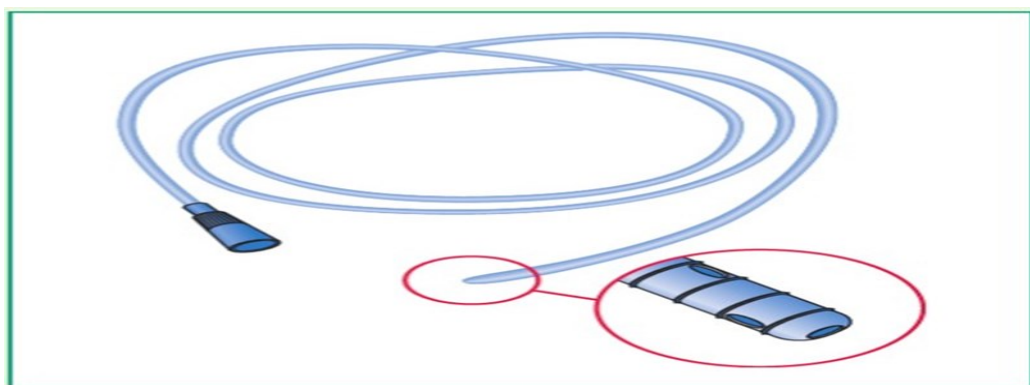


Figure 2: Levin tube (Lippincott Williams & Wilkins, 2013, 499.)

Salem pump tube (Figure 3): A Salem pump has a double lumen made of clear plastic and has a blue sump port (pigtail) to allow airflow to enter the gastric area. The tube floats freely and does not stick to or damage the gastric mucosal lining. The large part

of the tube 48 inches (122 centimeters) is used as a suctioning tube. The tube has openings at 45-, 55-, 65- and 75-centimeters measurement spot with a radiopaque line for x-ray verifications (Lippincott Williams & Wilkins, 2013,499.)

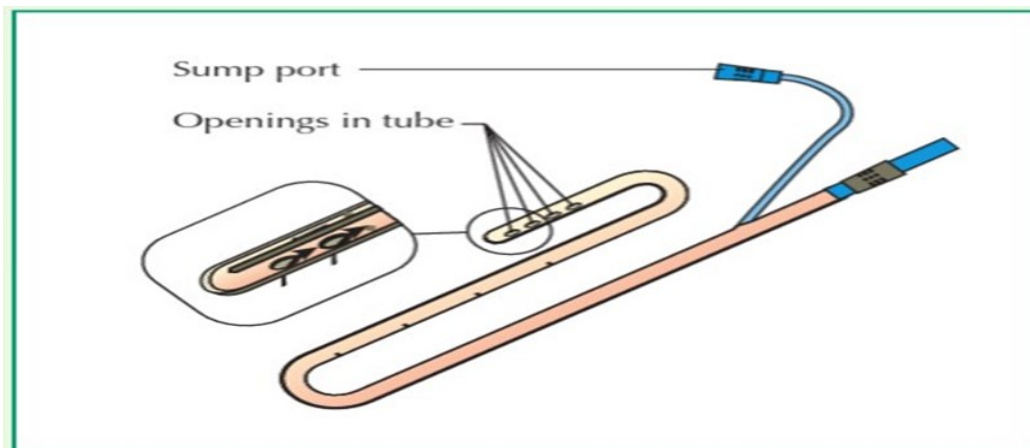


Figure 3:Figure 9: Salem sump tube (Lippincott Williams & Wilkins,2+13,499.)

Ryles (Figure 4) is made of polyvinyl chloride (PVC) are larger-bore tubes up to 24 French gauge. These tubes are only used for gastric decompression and aspiration of gastric contents, they are not indicated for feeding purposes. These tubes are not usually ENFit- compliant (Enteral Nutrition Fit-compliant). The ENFit adapters at the end of enteral feeding tubes are non-compliant with feeding syringes or devices (Nursing Times, 2019.) These tubes are transparent and clear, have an x-ray opaque line in the tube and are stainless steel in the French size 10-18. They are color coded back, white, green, orange, red or yellow (CN Meditech, n.d.)



Figure 4:Polyvinyl chloride Ryle's tube (CN Meditech, 2014.)

Nasogastric tubes used for feeding are **Polyvinyl chloride (PVC)** tubes are used for enteral feeding lasting 10 days and are used for gastric decompression and aspiration of gastric contents. PVC tubes have no guide wire and if used for long time they easily get damaged (Nursing Times, 2019.) The materials vary in strength, stiffness, ease of placement and costs, moreover the PVC is inexpensive, but the material is stiff. These tubes solidify after exposure to gastric acid in the stomach over time, hence they are not reliable due to stiffness and concerns for exposure to plasticizer Di (2-Ethylhexyl) phthalate (DEHP)³ (Wallace & Stewart, 2014, 3-4.) Figure 5 illustrates a polyvinyl chloride (PVC) Levin tube.

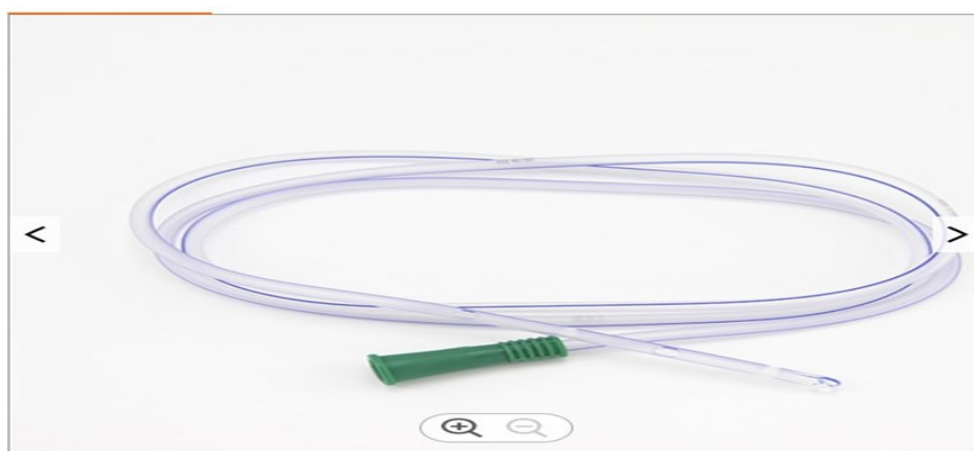


Figure 5: PVC Nasogastric Levin Tube (Alibaba, n.d.)

Polyurethane (Fine bore) is prominent for short-term use for feeding, they are used for 6-8 weeks (Nursing Times, 2019.) Polyurethane is expensive and has a thin wall that enhances its toughness to prevent breakdown. Polyurethane becomes softer when exposed to body temperature. Most double-lumen gastric tubes are made of polyurethane due to its favorable characteristics (Wallace and Stewart, 2014,4.) The example for polyurethane nasogastric tube (Figure 6) with guidewire is used for feeding children and adults. The polyurethane ENFit tubes are 6-14 French with a diameter of 55-130 centimeters, and popular sizes include 8 and 10 French (Medicina, n.d.) Figure 12 illustrates a ENFit polyurethane nasogastric feeding tube with guide wire.

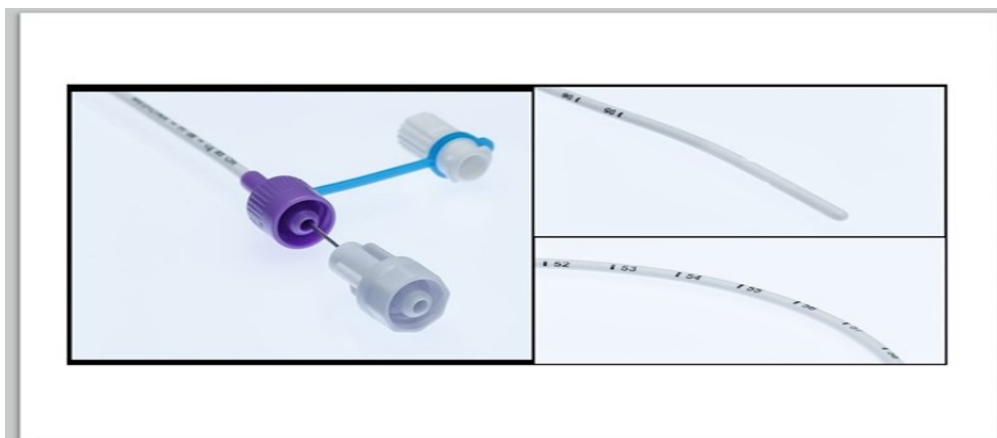


Figure 6:ENFit polyurethane feeding tubes with a guide wire (Medicina, n.d.)

Silicone tube (Figure 7) is the least expensive of all the tubes but are the softest and least likely to cause injury. Silicone tubes have thick walls that affect the stability and strength due to softness of the tube. "Experts discussions conclude softer tubes are more likely to coil or turn during insertion" (Wallace and Stewart, 2014, 4.) Silicone tube sizes range from 10, 12, 14, 16, 18 and 20 French sizes (CN Meditech, n.d.)

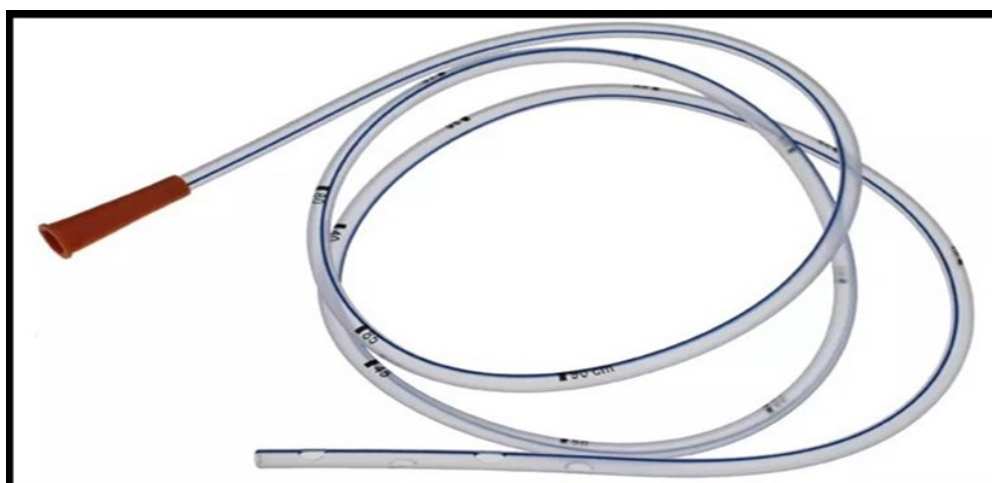


Figure 7:Silicone clinical nasogastric tube (CN Meditech, n.d.)

2.2.2 Step by step procedure for inserting and removing nasogastric tube.

The equipment for nasogastric tube insertion should be correct according to the size and age of the patient. Collect to the patient's room the correct type of equipment needed for the nasogastric tube by patient age and size to a working trolley or table. Below is a list of items needed: (Rautava-Nurmi et al. ... 2020, 259.) the picture for

Figure 8 represents a picture for working trolley with equipment for setting a nasogastric tube.

1. Nasogastric tube (according to age and size of a patient)
2. PH litmus paper strips paper for testing nasogastric tube position
3. Tape for securing nasogastric tube on its position on the nostrils.
4. 100 ml feeding / medication administration syringe
5. 2ml syringe for drawing gastric content from nasogastric tube for pH test
6. Xylocaine syringe
7. Natrium chloride solution for lubricating nasogastric tube.
8. A disposable cup with water and drinking straw
9. Factory clean disposable gloves
10. Cotton swabs on an arched bowl
11. Disposable hand paper towels
12. A towel or sanitary napkin to protect the patient and the bed from fluid contents.
13. Disposable protective cloth for the working tray
14. Hand disinfectant solution
15. Disposable disinfectant wipes
16. File for recording patient data
17. A cap for closing nasogastric tube when not in use.
18. Collection bag with a rack (Used when stomach should be kept empty.) (Rautava-Nurmi et al. ... 2019, 259.)

19. A pacifier should be available for an infant patient, whereas for a child drinking straw and water should be given to a child during procedure for inserting nasogastric tube (Stonvik-Sydänmaa, Tervajärvi, Hammar, 2019,357.)



Figure 8: Picture tray Equipment for nasogastric tube placement (Ajayi, Kalu & Wabuyele, 2022.)

First thing before inserting nasogastric tube is identify the patient for example by checking the name and identity of the patient, this ensures safety by confirmation of the correct patient (Perry, Potter, & Ostendorf, 2016,297.) Check the patient's vital signs before the procedure (Anderson, Doyle & McCutcheon, 2018, 555.) Collect all needed items on a trolley cart or a working table. Nasogastric tube size should match patient age and size of a patient (Rautava-Nurmi et al. ... 2020, 259.)

1. Disinfect hands and inform the patient why the procedure is to be done, how the procedure shall be done and how the procedure of inserting the nasogastric tube shall feel. Handle the tube aseptically unless you are using a separate measuring hose (Rautava-Nurmi et al. ... 2020, 259.) Aseptic techniques methods are used by healthcare workers to prevent the spread of infections by working while observing hygiene standards (Rautava-Nurmi et al. ... 2020,105.) The aseptic technique comprises the use of barriers for microbes

like gloves, masks and sterile gowns, the use of contact guidelines to keep sterile objects sterile, using sterile tools and equipment for the care of patient's example when in contact with open skin, and maintaining hygienic environment (Brennan, 2021.)

2. Measure length of the tube by placing the end of the tube at the middle point of the nose. Extend the tube around the ear lobe to the xyphoid process, this is termed as NEX measurement (Figure 9) (Perry, Potter, & Ostendorf, 2016, 296; Rautava-Nurmi et al. ... 2020, 259.) Press or memorize the location of the mark at the tip of the hose attachment. Place the hose on a working table or accessory tray on top of open wrapping paper, unless you have used a separate measuring hose (Rautava-Nurmi et al. ... 2020, 259.)

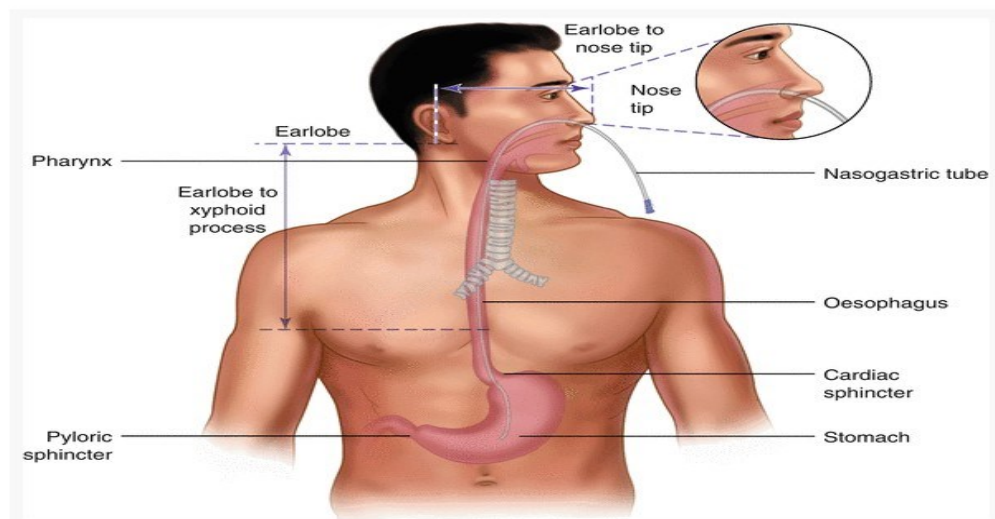


Figure 9:NEX confirmation of Nasogastric Tube Placement, SIFSOF, California. (n.d.)

3. Protect the patient with a meal napkin or a waterproof towel and give the patient an arched bowl and glass of water with a drinking straw. The nasogastric tube is easy to insert if a patient is in a half- seated position, for bed patient laying on the bed patient should be lying on the side.
4. Half seated position reduces the risk of lungs aspiration in case a patient vomits (Perry, Potter, & Ostendorf, 2016, 296.)
5. Ask the patient to pinch his/ her nose and confirm that the nostrils are clean. Inquire the patient to choose the nostril from which the hose will be inserted before inserting the nasogastric tube. Determine whether the patient has had any nasal problems such as polyps, epistaxis, or any anomalous to determine

whether to pay extra caution during insertion of the tube (Rautava-Nurmi et al. ... 2020, 259)

6. Disinfect your hands and wear clean protective gloves. Place the anesthesia gel on the nasogastric hose and a little also on the patient's nostril (Rautava-Nurmi et al... 2020, 259.) Close the nasogastric hose from the closure point and handle the hose aseptically and correctly. Push the hose from the nostril to the pharynx, when the end of the tube feels in the patient's throat, ask the patient to take water into the mouth with a drinking straw and swallow. Drinking water makes the insertion easy. Proceed and push the hose towards the mark measured earlier on the hose. The hose is in appropriate depth when the measurement mark is at the patient's nostril as the tip of the tube extends to the stomach (Rautava-Nurmi et al. ... 2020, 259.) Swallowing allows the tube to pass past the oropharynx. While swallowing, the epiglottis shuts and the risks of the tube entering the trachea is reduced (Perry, Potter, & Ostendorf, 2016, 299.)
7. Patient safety: If the tube has resistance, do not push or force insertion. If a patient begins coughing or has decreased oxygen saturation; the tube would easily enter the respiratory tract. withdraw the tube into the posterior nasopharynx until normal breathing starts. Monitor pulse oximeter readings for the patient during the procedure (Perry, Porter & Ostendorf, 2016, 299.) In the event a patient experiences breathing difficulty during the procedure, the color of the face changes or the patient begins to sneeze, the hose should be removed fast because the hose may be lodged in the bronchus (Rautava-Nurmi et al. ... 259, 2020.)
8. Attach the hose to the patient's nose with a fastening bandage and clean the patient's nose (Rautava-Nurmi et al. ... 2020, 259.) A hypoallergenic tape fastened to the nose helps prevent pulling of the tube, thus preventing injury to the nasal tract. Frequent change of the tape is required if the tape is soiled. The tube can be secured with a transparent tape to the cheek, and the extending tube could be fastened to the patient gown when the tube is not in use; this reduces pulling on the tube, and enhances its securement in position (Perry, Potter, & Ostendorf, 2016, 300-301.)

9. Remove gloves and disinfect the hands. Ensure the positioning of the patient is comfortable. Dispose the equipment and clean the working station. Discuss with the patient about feelings concerning the procedure and guide the patient to adapt to having the tube (Rautava-Nurmi et al. ... 2020, 259.)
10. Document in the patient report the time of placement of the nasogastric tube, the size, patient's feeling, and needed necessary course of action for the procedure. Confirmation of the tube position and inspection of the fastening tape of the tube to the nose should be done on daily basis (Rautava-Nurmi et al. ... 2020, 259.)
11. Nasogastric tube for enteral nutrition should be sealed at its opening using a cap or connected to an enteral nutritional transfer tube. A collection bag or a suction device is used for purpose of emptying the stomach (Rautava-Nurmi et al. ... 2020, 259) Figure 10 represents path for a nasogastric tube from the nose to the stomach.

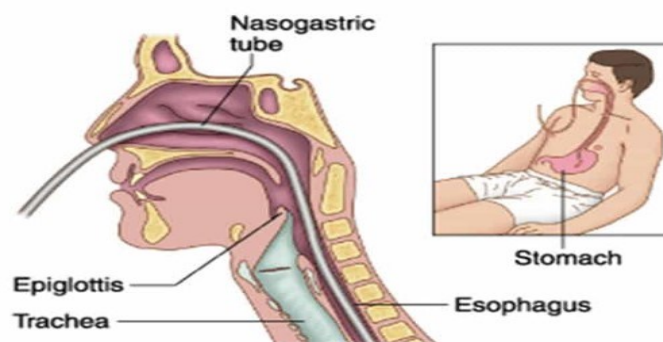


Figure 10:Nasogastric tube path (Wayne,2018; Nurseslabs website)

Removal of a nasogastric tube is done to investigate whether a patient can tolerate oral feeding. Removal of nasogastric tubes is contraindicated when there is still more need for enteral feeding or suctioning of gastric content. Before commencing removal of the nasogastric tube, it is important to check the doctor's order authorizing the removal of a nasogastric tube. Gather needed equipment ready for use to a working tray in the patient room to make working easy and items reachable. Removal of the tube is easier when a patient is in a half-seated position known as the semi-fowler position Equipment needed for the procedure are, Tissues, a plastic disposable bag, a towel of a disposable napkin, clean disposable gloves (Wayne, 2018.)

The procedure for **removal of a nasogastric tube for an adult** is done in the steps described below.

1. Inform the patient about the procedure and obtain their consent for removal of the nasogastric tube (Wayne, 2018.)
2. Clean hands to prevent the spread of microbes and put on clean disposable gloves on the hands to prevent abdominal secretions contact (Wayne Gil, 2018.) If the tube is connected to a feeding device disconnect the tube from the device before withdrawing the tube. Remove the tape securing the tube from the patient's nose and unclip the tube from the patient's gown to enhance easy removal of the nasogastric tube (Wayne, 2018; Perry, Potter, & Ostendorf, 2016, 302.)
3. Inform the patient to breathe and to hold breathe; this helps prevent involuntary aspiration of gastrointestinal contents during removal of the nasogastric tube (Perry, Potter, & Ostendorf, 2016, 302.)
4. Twist the end of the tube securely by folding it around itself Remove the tube by pulling it in steady and smooth motions Dispose of the tubing in the proper disposal area; this helps prevent residual leakage of fluid from the tube and reduces patient's discomfort, moreover, helps prevent transmission of microorganisms (Perry, Potter, & Ostendorf, 2016, 302.)
5. Assist the patient to clean up by offering a tissue to wipe the nose and providing dental hygiene to improve the patient's comfort (Perry, Potter, & Ostendorf, 2016, 302.)
6. Nasogastric tube indicated for drainage of gastric content; measure the nasogastric drainage to be able to record the correct output of gastric contents. Dispose properly of the gastric contents. Record the procedure of removal of a nasogastric tube, the patient's reaction, and the measurement of gastric drainage if any. After the procedure, dispose of the used equipment, and clean your hands (Wayne, 2018.)

To **confirm the position of nasogastric tube for adults and children**, a chest X-ray should be performed to confirm the location of a nasogastric tube when there is uncertainty of the position. The test of using air syringe to pump air to the stomach

and using a stethoscope to listen to sound does match international recommendations for nasogastric tube positioning check. Finnish method for confirming nasogastric tube position is by withdrawing stomach contents from the nasogastric tube opening by using a small syringe. Stomach contents withdrawn from nasogastric tube are placed on a pH paper litmus paper to test the position of nasogastric tube. The pH should be between 1-5.5 (Rautava-Nurmi, 2020, 262.)

For pediatrics the procedure of measuring the position of nasogastric tube is according to international recommendation using a Ph paper strip, the correct indication should be below 5,5 for a child. However, it should be noted that for a child other factor can affect the pH measurements due to concentration of gastric contents such as antacid medications may cause changes of measurement (Stonvik-Sydänmaa, Tervajärvi, Hammar, 2019, 356.) Assessing the color and Ph of gastric content aspirated for continuous monitoring of a nasogastric tube has been proved as an effective and less costly method (Perry, Potter, & Ostendorf, 2016,296.) Figure 11 shows a pH strip paper test and how to place stomach contents on the pH paper strip

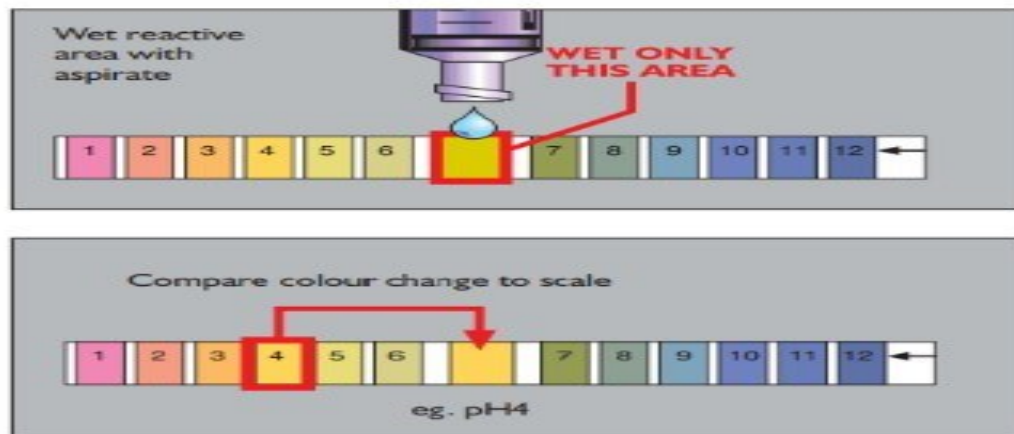


Figure 11:pH test paper for the nasogastric position (University Hospital of Leicester & NHS Trust,2017.)

The steps to **inserting a nasogastric tube** are different **for babies and children**. Before commencement of the procedure, the health care professional should ensure that the materials or equipment required are available (Northington et al. ... 2018, 150). Nasogastric tube for babies and children should be according to the correct size. The equipment needed comprise nasogastric tube, scissors, tape, sterile water, syringe, water for flushing, and litmus paper for gastric contents test (Northington et al. ... 2018,

150). In addition, a pacifier for babies, water and drinking straw for a child, towel, or sanitary napkin (Stonvik-Sydänmaa, Tervajärvi, Hammar, 2019, 357.)

The procedure for inserting nasogastric tube for pediatrics is as enlisted below.

1. Age-appropriate language is used to tell the child what is going to happen and that the process will go better if he or she does not move. All the materials for the procedure are placed within reach (Northington et al. ... 2018, 150); Stonvik-Sydänmaa, Tervajärvi, Hammar, 2019, 356.)
2. The person performing the procedure will perform hand hygiene, and then measure the NG tube to find the correct length. It is usually measured using the NEMU (Nose-earlobe-xiphoid process to the midpoint of Xiphoid and umbilicus) method (Northington et al. ... 2018,150.) Alternatively, the measurement of NG tube can be by NEX measurement, measure distance from the tip of patient's nose to Earlobe to Xiphisternum is measured. A record of the measurement should be kept in medical notes (University Hospital of Leicester & NHS Trust, 2017, 22.) Measuring nasogastric tube for a pediatrics (Figure 12 NEX and NEMU measurements.)

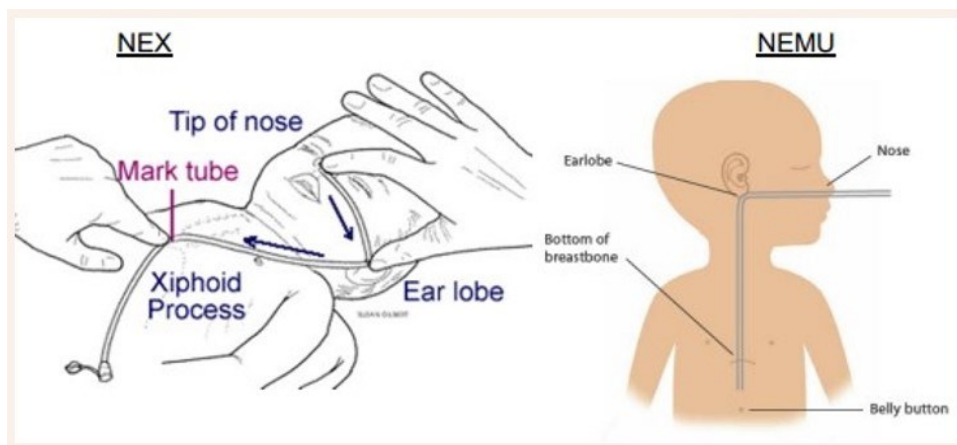


Figure 12:NEX and NEMU NG tube measurement University Hospital of Leicester & NHS Trust, 2017,22.)

Alternatively, according to (Northington et al. ... 2018, 150) for infants, measurement of nasogastric tube can be done by measuring from the ear to the tip of the nose at the center part of the nose and multiply the measurement results by two then adding 4 cm to the results. Older children measurement is from the earlobe to the tip of the nose and extending to the xiphisternum (Stonvik-Sydänmaa, Tervajärvi, Hammar, 2019, 356.)

Positioning of a child or infants before inserting nasogastric tube (Figure 13.) Infants under one year should be swaddled in a blanket or a sheet and placed in temporal immobile position during the procedure of inserting nasogastric tube, and the head should be maintained in a steady position throughout the procedure (University Hospital of Leicester & NHS Trust, 2017,22; Stonvik-Sydänmaa, Tervajärvi, Hammar, 2019, 357.)

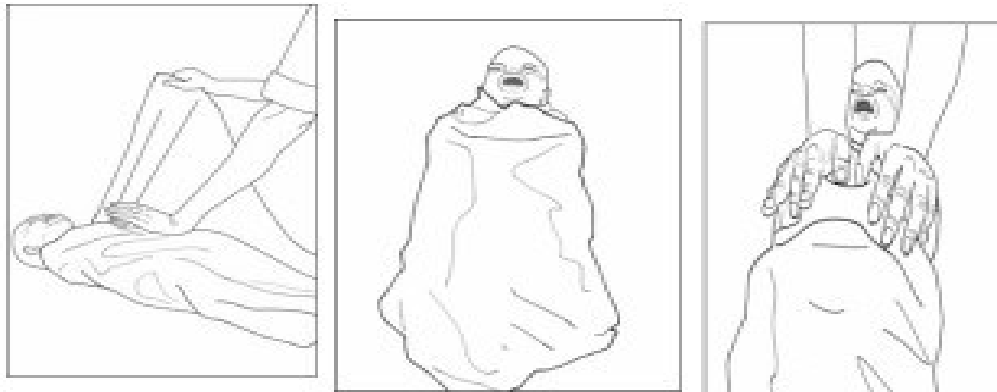


Figure 13: Infants under 1-year position for NG tube placement (University Hospital of Leicester & NHS Trust, 2017,22.)

A child should be guided to sit up straight, babies will lay face up with the chin slightly raised. If the child will be uncooperative, he or she will be immobilized to prevent trauma during insertion (Northington et al. ... 2018, 150). It is recommended for small children to seat on the parent's laps and preschoolers could be supported on the laps; if the child agrees (Stonvik-Sydänmaa, Tervajärvi, Hammar, 2019, 357.)

3. Guiding a child before inserting nasogastric tube:

For small children, the nostrils should be sucked to empty the nose if running or have mucous. Older children should be guided to blow the nose empty (Stonvik-Sydänmaa, Tervajärvi, Hammar, 2019, 357.)

4. Lubricate the end of the nasogastric tube with water- or water-soluble lubricant, then advance the tube towards the back of the nares but do not force the tube. A child allowed to take water could use a straw for drinking, and an infant can be given a soother to help them swallow while the nasogastric tube is being passed (Northington et al. ... 2018, 150). If the child is on nil per oral, he or she is told to swallow as the tube goes down (Northington et al. ... 2018, 150).

5. Secure the nasogastric tube on the side of a child's cheek with a piece of tape. For additional safety for the nasogastric tube not to dislocate during movement, secure the tube to the shirt of a child. Check for correct placement before administering feeds or drugs (Northington et al. ... 2018,150).

A nasogastric tube can **be removed for pediatrics'** when it is no longer needed and the procedure for removing it is usually simple and fast. Before a nasogastric tube is removed, it is necessary to ensure there is a physician's order. If the nasogastric tube was inserted to remove gastric contents, the physician's order may state that the tube should be closed off from nutritional administration for several hours to see if the patient will tolerate oral intake before removal. However, if the patient experiences nausea, vomiting or abdominal distension, then the nasogastric tube will be simply reattached to suction (Anderson, Doyle & McCutcheon, 2018, 566.)

The safety precautions to be considered before removal of the nasogastric tube should include this sequence; performing hand hygiene; cross-checking the patient's room for additional precautions; introducing self to the patient; confirming the patient's identity by confirming twice the patient details (an example is name and date of birth); Explaining the process to the patient and offering comfort measures; ensuring patient's privacy and dignity; applying principles of asepsis and safety and completing all necessarily focused assessments (Anderson, Doyle & McCutcheon, 2018, 811.)

After ensuring all safety precautions, the procedure is commenced by verifying the health provider's order to discontinue the nasogastric tube because order is required to remove it. Collect supplies cotton swabs, 20 ml feeding syringe, wipes, normal gloves, and a trash bin. Verify the patient's identity by using two identifiers following guidelines of the healthcare unit for a patient and explain the procedure to the patient and place the patient in high Fowler's position (Anderson, Doyle & McCutcheon, 2018, 812.)

After confirming safety precautions, perform hand hygiene and wear clean gloves, after which a waterproof pad will be placed patient's chest. Depending on the indication of the tube, stop feed and disconnect from tubing; or disconnect from suction tubing. Unclip Nasogastric tube from patient's gown. Remove whatever was used to secure the tubes from the nose as the last step before the removal: prevents accidental removal of the tube before the patient is ready. Tell the patient to breath in

and hold the breath. Grasp the nasogastric tube close the nares and gently remove the tube in quick, steady motion. Dispose the tube in a waste bin. Give the patient tissue or clean the nares of the patient and offer oral care as needed. After removing the nasogastric tube, remove gloves and place patient for level of comfort. Perform hand hygiene. Document procedure according to the organization's policy (Anderson, Doyle & McCutcheon, 2018, 812- 816).

For pediatrics the procedure of measuring the position of nasogastric tube is according to international recommendation using a Ph paper strip, the correct indication should be below 5,5 for a child. However, it should be noted that for a child, other factor can affect the pH measurements for instance if there is usage of antacid medications (Stonvik-Sydänmaa, Tervajärvi, Hammar, 2019, 358.) Assessing the color and Ph of gastric content aspirated for continuous monitoring of a nasogastric tube has been proved as an effective and less costly method (Perry, Potter, & Ostendorf, 2016, 296.)

After insertion of the nasogastric tube, a health professional should encourage the patient to speak, and should monitor the vital signs of a patient or use capnography used in the intensive care setting to determine if the tube is in the trachea or lung (Perry, Potter, & Ostendorf, 2016, 302.) Capnography measures the inspiration and expiration of partial pressure of carbon dioxide from the airways non-invasively. The method detects ventilation, perfusion, and metabolism for airway management of a patient (Physiopedia, 2022.) Unlike pulse oximeter which measures oxygen inhalation by the lungs into the bloodstream, capnography assesses ventilation, detects, and determines hyperventilation that causes hypoxia for patients. The normal end-tidal carbon dioxide (ETCO₂) in a capnometer is between 35-45mm Hg (Sullivan, 2020.) On the other hand, Walsh et al. ... (2016, 13.) states that however commonly used as verification for nasogastric tube position the method should not be considered a final reliable method for verifying nasogastric tubes.

When performing evaluation post nasogastric tube insertion, a nurse should check the location of the external marking of a nasogastric tube and the color and pH of fluid withdrawn from the tube. In case of an x-ray done, the guidewire in the tube should be retracted after x-ray verification of correct placement of the tube. Moreover, frequent

inspection of the nasal opening for irritation or pressure should be performed (Perry, Potter, & Ostendorf, 2016,302.)

Detecting whether a nasogastric tube is placed in the respiratory tract is sometimes not possible unless an x-ray is performed. Respiratory symptoms could be one sign of a misplaced tube for a semi-conscious or unconscious patient. The tube should be removed, and the incident reported to the doctor immediately. Order for re-insertion should be obtained from the doctor (Perry Anne et al. ... 2016, 302.)

When stomach contents are aspirated in the respiratory system, immediate irritation response by a conscious patient comprises emesis with cough, hyperventilation, cyanosis, or decreased oxygen levels in the bloodstream during the procedure. The patient should be placed in recovering position to protect the respiratory tract, and suctioning should be done by tracheal intubation through the nose or the mouth to remove aspirated fluids. In the event stomach contents were as aspirated into the respiratory tract (detected by delayed patient response or little level of aspirated content) there is a crackling sound or wheezing, dyspnea, or fever. The signs should be reported to the doctor immediately, and it is recommended to obtain a chest x-ray and possible preparations for antibiotics administration is to be done (Perry Anne et al. ... 2016, 302.)

2.2.3 Patient education and documentation

Farahani et al. ... (2013.) conclude that Patient Education is the process by which health professionals provide necessary information to patients about their health status and health needs to enable them to improve their health. Education for patients has been proved to enhance patients' motivation to participate in treatment management, and stress levels and anxiety are reduced. Perry, Potter, & Ostendorf (2016, 308-303.) Before educating a patient or parents for a child concerning care for a nasogastric tube, a health professional should assess the ability of the patient or family to maintain the care and feeding schedule (Perry, Potter, & Ostendorf, 2016, 302.)

A patient or a parent for a child should be advised to contact a health caregiver if the following symptoms occur; redness, swelling, warmth, draining or bleeding on the areas touching the NG tube. The patient is instructed to report immediately to the doctor the signs for difficulty in breathing, tender and hard abdomen, bright red or dark blood in stool, and blood or bile in vomit (Drugs.com Website, 2022.) The presence of a nasogastric tube can be mildly uncomfortable but should not be painful or cause breathing difficulties, coughing, choking, vomiting, or skin breakdown. A quick alert to the primary clinician if these signs/symptoms occur. It is recommended to request assistance when changing the patient's position or getting the patient out of bed to avoid dislodging the tube (Walsh et al. ... 2016, 14.)

A patient or family of a patient should be advised manage regular oral hygiene to promote the patient's comfort and integrity of oral mucosal membranes. Hands should always be cleaned, and disinfected, and clean gloves used before touching the nasogastric tube to avoid transfer of bacteria or germs. Patient positioning should always be in a high Fowler's position unless contraindicated; helps reduce aspiration risk (Perry, Potter, & Ostendorf, 2016, 308-309.)

A nasogastric tube should be taped on the side of the cheeks and fastened in position using a clip to the patient's gown to reduce pulling, to relieve downward pulling of the tube in the nasal opening hence pressure ulcer risk is reduced. The tape securing tube should be changed as needed, tape removal should be done by securing the tube with a non-dominant hand while removing the old tape. The skin condition should be inspected during tape removal, and cleaning of the taped site is with saline water by use of cotton gauze (Perry, Potter, & Ostendorf, 2016, 301,313.)

Documentation of patient care guides health care organizations to provide good care and support for a patient. These contain information for documentation, planning and organizing, implementation and follow-up care (Valvira, 2018.) Rautava-Nurmi et al. ... 2019, 49.) conclude that patient and client centered care and documentation are the backbone of nursing competence requiring knowledge, skills, and ethical standards. Moreover, nursing records store information that justifies treatment given to a patient or serves as evidence for the effectiveness of treatment.

Cole (2015.) recommends that documenting for nasogastric tube should be done by documenting the reason for nasogastric tube insertion. The detail for insertion should be documented as follows; the purpose for a nasogastric tube, the length and size of the nasogastric tube that has been inserted, the nostril into which the tube was inserted, and documentation of whether gastric content was obtained for pH measurement. Confirmation for the position of nasogastric tube or its failure should be noted, and the method of confirmation used example whether an “aspirate with ph. 5.5 or less, a chest x-ray is documented in a patient’s care notes”.

Perry et al. ... 2016,302, 304, 306.) state that factors such as documenting the color of gastric content aspirated, and intervention used to unclog nasogastric tube such as “use sterile water to flush a nasogastric tube and recordings for suspected displacement” and noting of patient discomfort for a nasogastric tube is to be done. Any unprecedented outcomes and interventions used to solve nasogastric tube problems should be recorded. The normal pH value is a range of 5.5 or less. Additionally, Stirland (2017, 9.) conclude that the name of prescribing doctor for an X-ray should be included, moreover the person confirming situation of nasogastric tube by x-ray should be documented.

2.3 Educational material

Educational materials are resources meant for learning purpose, they could be in printed or digital form. Educational materials are designed for the purpose of teaching students for instance for traditional teaching lectures, or as learning material for student independent learning sessions for example during revision of coursework; students use educational content for personal reflection and self-evaluation of attained knowledge during studies. Educational materials comprise for instance digital content or printed materials, and could be in the form of books, dictionaries, atlases, encyclopedias, among others (Mazgon & Stefanc, 2012, 174.)

Learning content meant for education purpose should be specific to the subject presented, and information should be developed reasonably to maintain attentiveness,

and to improve learning process (Karageorgakis, 2021.) For efficiency, learning should not only be centralized on the main objectives of a certain topic and expected learning results from teaching and learning process, but also by relating learning objectives and different learning techniques such as problem solving, using rules and principles for topics, and focusing on specific learning content. Having the right choice of design for an educational material depending on the subject to be presented during learning has a direct impact on the learning outcome for students, moreover, influences the perception of students towards learning material. Furthermore, it is recommended to take into consideration learner's previous knowledge during the design of an educational content to enhance learning (Mazgon & Stefanc, 2012, 176.)

Educational tool chosen for the design of educational material for this thesis report is PowerPoint presentation that illustrates instructions for nasogastric tube insertion and removal. The advantage of PowerPoint presentation is that different features can be incorporated into the same learning tool for easy understanding of subject to be learned such as graphs use, pictures, and written content on slides.

PowerPoint is a software tool that can be used to share valuable information such as business plans, educational lessons, and entertainment purposes. PowerPoint can also be used for presenting data through sequence of slides. The software incorporates other applications in Microsoft office such as graphs and charts, videos, and audio functions without having to switch between different applications. (Donohoe, 2020.)

Choice of colors for PowerPoint presentation should be simple, and background of slides as well should be of neutral color, the font size and color of words should be visible enough and distracting features such as unnecessary music, audio or visual effects should be avoided. Key points should be presented in an emphasized manner to grasp the attention of learners, such as use of bold font size or text highlights (Vanderbilt University website, 2022.) recommends using titles for each PowerPoint slides, to avoid heavy use of texts on one slide, the slide numbering should be planned at least for one slide per minute to facilitate students' ability to reflect on the learning content. Moreover, too many wordings or difficult wordings should be avoided (Northern Illinois University, 2022.)

3 DEVELOPMENT FOR THE PROJECT

3.1 Purpose and Objectives.

The purpose of this thesis report was to create a simple educational learning material represented on easy-to-follow PowerPoint slides. The learning material provides insight on how to insert a nasogastric tube in adults and children and the procedure of removal of a nasogastric tube. The educational material is meant for nursing students. The objective of this thesis is to increase nursing students' knowledge about precautions during insertion and removal of the nasogastric tube in adults and children, and to increase the author's knowledge as regards to the topic.

3.2 Project methodology

Hybrid methodology: Hybrid is a term that means combining two different elements to perform a certain function. Hybrid project management is a methodology whereby two or more different project management methods are combined to create a new method suitable to perform project tasks effectively. Examples of methodologies used are the waterfall project management, critical path method (CPM), six sigma, and outcome mapping. Hybrid method provides flexibility, there is the possibility flexibility enabling a team to choose working methods that suit the team (Boogard, 2021.) The project team used a hybrid methodology for the execution of project tasks.

3.3 Resources, swot analysis and target group

The resources used to develop this project did not require financial expenditure by the research team, and neither did the SAMK institution incur financial costs for the project to be accomplished. Research students used library resources in form of books, and the online library portal for theoretical analysis of the thesis report. The students used simulation room, equipment, and dolls to make the pictures for PowerPoint educational material. Documentation was done virtually using Microsoft Office 365; students could work easily and view each other's work in real-time. Communication was achieved using WhatsApp during meetings, and on a few occasions at the learning premises.

The students used a Swot analysis method to assess possible strengths, weaknesses, and risks for the project tasks. "SWOT analysis a method for identifying an organization Strengths, Weaknesses, Opportunities and Threats". Swot analysis helps organizations to formulate strategies for maximizing on strengths, minimizing weaknesses, and identifying and preventing threats that may hinder organization success through the creation of effective solutions to prevent threats and solve problems (Mariana, Greggio and Reolon, 2017, 40.)

Green (2015, 2-3.) states that a risk is an uncertain or undesirable outcome for an event or an uncertain effect for an objective. Risk management helps in coordinating set objectives, processes, activities, responsibilities, and infrastructure developed for managing an organization's direction regarding its potential risks The risks for this project comprised Internet problems and computer system breakdowns that happened on a few occasions, however, the students anticipated possibilities for the happenings and saved the theoretical analysis tasks for this thesis report on their laptops and other data devices.

The strengths of the team developing this project were that the nursing students developing this thesis report have educational knowledge and clinical training facilitated through learning at the SAMK Pori campus for nursing students. The students made use of knowledge gained from learning to develop theoretical analysis and simulation for developing education material for the insertion and removal of a nasogastric tube for children and adults.

The weakness of the team in developing this report was having different time schedules and study programmes. Due to time differences, sometimes achieving favorable times for everyone in the team was challenging. However, the team members tried to resolve this challenge through collective agreements for meeting times.

The opportunities for the team comprised having access to learning premises for conducting research for the educational material. The library premises and online library portal enabled students to search for academic research that aided in developing the theoretical part of this report. Moreover, library resources helped the team to develop the educational material a nasogastric tube. The simulation room was resourceful for developing the educational material in PowerPoint slides.

Threats were events that would affect the outcome or progress of the project. The team noted that possible uncontrollable factors such as the corona pandemic, having different study programmes, breakdown of the internet for communication or breakdown of the school system could affect the progress of the team's tasks. To prevent loss The students saved their researched work for theoretical analysis for this thesis report to different saving devices and different virtual clouds like the google drive.

The **target group** for this project is nursing students. Students using English and Finnish language can use the educational material to increase knowledge on the topic. In addition, teachers can benefit from the material.

3.4 Development stages for the project.

The initial stages of the project began in October 2021 whereby research students were tasked with developing this thesis report formed a group to develop an educational material. The students chose thesis topic “Educational material: Inserting and removing a nasogastric tube for adults and pediatrics”. A project timetable was made to guide the phase of project development. The students proceeded to search academic content related to the topic for this report, moreover, searched other previous educational material developed for the topic; to expound on their knowledge and to determine aspects that have not been discussed in previous educational materials. The students used instructions from the Finnish National Board on Research Integrity also named TENK (2012.)

The assessment of the effectiveness of the educational material was done by use of an anonymous questionnaire sent to the target group who are nursing students. The questionnaire would enable the team to assess the effectiveness of the educational material and to determine the possibility of readjustments of content from the educational material for the effectiveness of learning. The students chose the Hybrid methodology as the project method for the development of this report. Boogaard, (2021.) concludes that hybrid project method involves combining two or more different project management methods to create a new method suitable to perform project tasks effectively. The advantage of this method is the possibility of flexibility whereby a team can choose a favorable method that suits the team well and make readjustments to working methods

Through the hybrid system, the project's team was able to assess the risks for the project and developed strategies to mitigate risks. Moreover, the project team was able to use its strengths and resources to accomplish assigned tasks.

At the beginning of the project the students developed a timetable (Table 1) to guide the team during working on the project.

Table 1: Timetable for the project, 2021-2022.

Initiating stage October 2021 Project design phase	<ul style="list-style-type: none"> • Choosing project topic • Project partner meeting
Planning stage December 2021- January 2022	<ul style="list-style-type: none"> • Presentation of the project plan • Acceptance of Project Plan
Execution December – March 2022	<ul style="list-style-type: none"> • Writing theoretical background for project & assessment. • Documenting PowerPoint presentation for learning material and thesis article • Questionnaire design, Submission of project work to supervisor and making corrections from assessments
Evaluation stage March 2022 – April 2022	<ul style="list-style-type: none"> • Sending PowerPoint presentation & anonymous questionnaire to the target group for assessment of project & obtaining consumer feedback. • Evaluation questionnaire responses & presentation of findings in pie chart/graph form. Obtaining feedback for correction from the project supervisor
Closing stage October 31, 2022	<ul style="list-style-type: none"> • Making corrections from feedback replies for thesis, and report writing. Final evaluation from project supervisor and team project members • Publication of thesis

4 EVALUATION

Finnish National Board on Research Integrity TENK (2012.) principles for responsible research comprise observation of research organization guidelines for integrity, accuracy, professionalism for the research process, recordings, presentations, and evaluation of research outcomes. Publications for research should be openly communicated with justifications and credit to original authors of research works should be indicated correctly.

According to research organization, the main rules for good scientific research writings should comprise ethical considerations for honesty, responsibility, using reliable sources appropriate referencing techniques, avoiding plagiarism by good referencing and citation of other's research works. Copyright considerations should be taken into consideration when making a thesis article according to the Copyright ACT 404 OF 8 July 1961. Good use of referencing when quoting other work should be observed, and names of authors for borrowed theoretical research information and sources should be indicated. Good referencing includes names of authors, publication year, and specific page section for intext reference. Research data must be sourced from reliable websites from Finna library portal that provided research articles such as PubMed, WebMD, and E-book central (SAMK website, 2021.)

The evaluation method for the educational material for this thesis report was done using an anonymous questionnaire to ten nursing students. The analysis for the questionnaire was done by Tixel software and Microsoft Office Excel application. Questionnaire had six closed-ended questions and two open-ended questions for students of the product to write their own opinion regarding the educational product. Questionnaire results were analysed in excel software into statistical data.

Five out of ten respondents replied to the anonymous questionnaire. The questions used for the questionnaire for this thesis project (Appendix 1).

4.1 Summary of statistics for the questionnaire

Summary of feedback for questionnaire about paediatrics nasogastric tube showed 100% of the respondents rated the product contents of the PowerPoint product to be good. The procedure for insertion of nasogastric tube for paediatrics was clear enough to understand. 100% of the respondents agreed that the procedure for confirmation of nasogastric tube for paediatrics was clear enough to understand. Concerning the overall look for the presentation, 25% of respondents concluded the presentation was well done, 25% considered the presentation was well understood and 50% of respondents concluded that there was nothing more to be improved for the PowerPoint product, and that the content was perfectly executed.

Rating the effectiveness for the product for paediatrics nasogastric tube procedure from scale 1-10 numerical value, 60% of respondents rated the procedure for paediatrics nasogastric tube 10 points overall, while 40% of respondents rated the product's effectiveness to be 8 points out of 10 total numerical value points.

Summary feedback for adults' nasogastric tube, 100% of the respondents agreed that the procedure for insertion of nasogastric tube for adults was clear enough to understand. 100% of the questionnaire participants agreed that the procedure for confirmation of the position for nasogastric tube for adults was clear enough to understand. Concerning what could have been done better for the presentation for nasogastric tube for adults (insertion and removal of nasogastric tube), 25% of respondents concluded that that there was nothing more needed to be done and that information was easy to follow, 25 % of respondents concluded the PowerPoint presentation was well done, and 50% of the survey respondents concluded that they would have done the presentation same way as it was done for the project.

The rating for the effectiveness for the product from scale 1-10 numerical value, 20% of respondents rated the overall outlook of the product for nasogastric tube procedure for adults to be 7 points, 20 % rated the presentation as 9 points, and 60 percent of the remaining respondents rated the product for adults to 10 points out of overall total of numeric scale of 10 points.

5 CONCLUSIONS

The result of the survey showed the product is clear and easy to understand. To get familiar with the procedure, students can access the product before going into the stimulation room. The thesis topic was selected based on the lack of sufficient knowledge of health situations or clinical skills related to the topic. Even though weakness occurred, which we stated during the planning phase. This may have delayed the progress of the project, but the end purpose of the project was achieved.

The authors benefited greatly from the project. More knowledge was gained during the writing and completion of this thesis. Authors became more aware of the importance of insertion and removal of nasogastric tube in adults and children. During the studies, reliable scientific materials was accessed. The correction made by the supervisor for this thesis enhanced the author's academic writing skills and expertise on how to produce a good learning material. For future perspective, the authors recommend that an update of the product could also be updated as new research is done.

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Form is scheduled: publicity starts 20.9.2022 22.00 and ends 20.12.2022 23.59

Anonymous questionnaire for educational material "Inserting and Removing a Nasogastric tube for Adults and Pediatrics"

This questionnaire is meant to obtain feedback from SAMK nursing students about evaluation for educational material for the procedure of inserting and removing a nasogastric tube for adults and paediatrics. A general summary of respondents' feedback shall be evaluated in excel application in the numerical summary and summarised in graph format. The general analysed feedback from respondents for this questionnaire shall be published in the thesis report for this educational material.

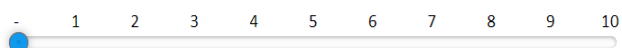
Please answer the questions with yes or no answers. Glide the rating scale for evaluation range 1-10. You can type your opinion on the open-ended question in the free text box. This feedback for this questionnaire is voluntary, the identity of respondents shall not be disclosed. A general summary of respondents' feedback shall be discussed with a graphical illustration in the thesis report's main work for the educational material.

NASOGASTRIC TUBE FOR PEDEATRICS.

Was the procedure for insertion of the nasogastric tube for pediatrics clear enough to understand? ☐ Yes
☐ No

Was the procedure for confirmation of nasogastric tube for pediatrics clear enough to understand? ☐ Yes
☐ No

Was the content interesting and easy to follow? (Slide the bar left or right for rating. 1 is least point and 10 is highest point)



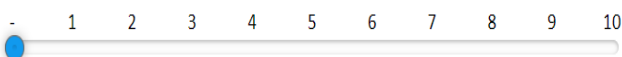
What could have been done better for the presentation? describe briefly in the text box.

NASOGASTRIC TUBE FOR ADULTS

Was the procedure for insertion of the nasogastric tube for adults clear enough to understand? ☐ Yes
☐ No

Was the procedure for confirmation of the position of nasogastric tube for adults clear enough to understand? ☐ Yes
☐ No

Was the content interesting and easy to follow? (Slide the bar left or right for rating. 1 is least point and 10 is highest point)



What could have been done better for the presentation for nasogastric tube for adults (insertion and removal of nasogastric tube)? Describe briefly in the text box.

Proceed

Save