NURSES SPECIALIZED IN WOUND, OSTOMY AND CONTINEN CANADA
INFIRMIÈRES SPÉCIALISÉES EN PLAIES, STOMIES ET CONTINENCE CANADA

PERCUTANEOUS ENTERAL FEEDING TUBES: CANADIAN BEST PRACTICE RECOMMENDATIONS

SEPTEMBER 2023

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The content of this document was created by a task force of nurses specialized in wound, ostomy, and continence (NSWOC) led by Valérie Chaplain. It should be noted that at the time of writing, the title of NSWOC is not yet recognized in Quebec, where NSWOCs still use the title of enterostomal therapy nurse.

Technical writer and project manager John Gregory, IIWCC, ISWA, Opencity Inc., edited and produced these best practice recommendations in collaboration with a task force of volunteers.

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PERCUTANEOUS ENTERAL FEEDING TUBES TASK FORCE

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Note. The symbol † has been chosen to represent expert opinion of the task force.

INTRODUCTION

Food plays a vital role in human development, culture, and interactions.[1] It is not only essential to the survival of individuals, but it is surrounded by rituals, whether for its preparation, cooking, or presentation.

When an individual cannot meet their nutritional needs orally, it can be alleviated by adding nutritional support. Two routes of administration can provide nutritional support to an individual, either the enteral route (digestive system) or the parenteral route (other than digestive system).[2,3] The enteral route provides nutritional support in individuals with a functional gastrointestinal (GI) system but who cannot orally ingest sufficient nutrients.[4,5] The parenteral route is the only solution when the GI tract is nonfunctional, or in the presence of specific medical conditions which, despite optimized enteral feeding, cannot be adequately tolerated or absorbed (e.g., intestinal obstruction, prolonged ileus, complicated inflammatory bowel disease and other congenital or acquired anomalies such as short bowel syndrome).[6] Enteral feeding (EF) is superior to parenteral nutrition because it results in fewer infectious complications, decreased cost, stimulates bowel function, and preserves the integrity of the intestinal mucosa while reducing the length of hospital stay.[2,7-10] Undoubtedly, EF has many benefits, but it is not without its side effects. The involvement of a multidisciplinary team working in an interprofessional manner and being aware of best practices ensures delivery of safe care. It reduces complications associated with using EF by decreasing errors related to the process surrounding its administration.[8]

These best practice recommendations aim to equip nurses and any other health care professional offering support in the context of EF. It is recognized that increasing the knowledge of health care professionals facilitates an individual's transition through the continuum of services. This is also true for the individual receiving EF and their significant others. In a context of care that increasingly shifts postprocedural care to community services and where nurses often play a pivotal or liaison role within interprofessional teams,[11] practice recommendations are essential for optimal and standardized service delivery. The first part of this document presents basic information to explain the terminology specific to this field of practice. Next, the methodology used to arrive at the recommendations will be described. Finally, the recommendations and supporting information from the clinical literature consulted will be presented.

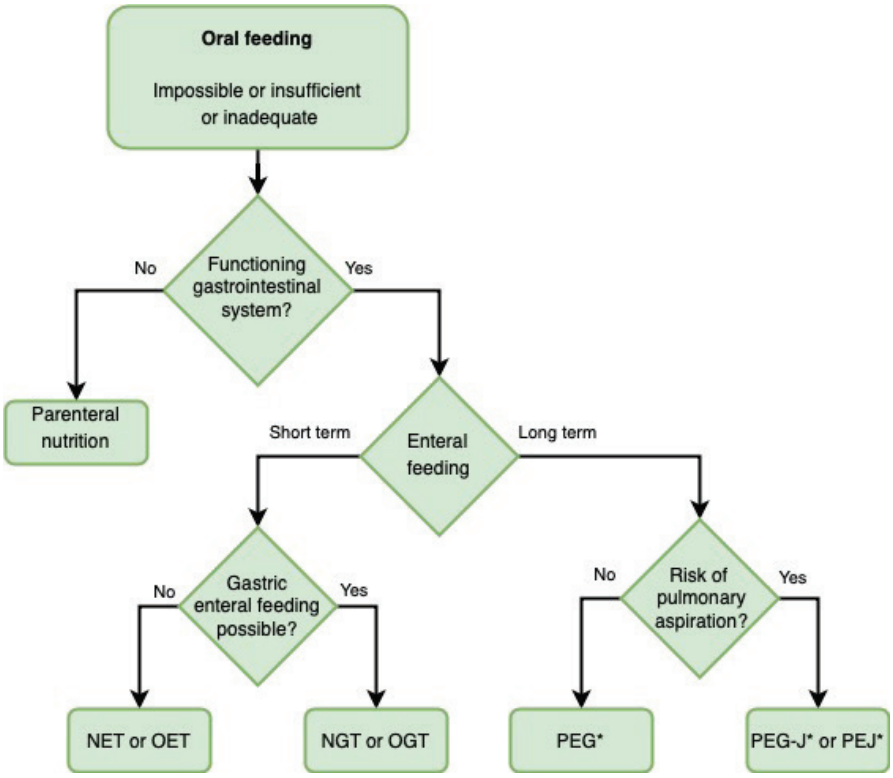
Despite the large number of articles identified in this project (see Methodology section), it must be noted that only a few randomized controlled studies are available on the subject. The evidence base for the care of people using feeding tubes is generally weak. While there are many practice recommendations such as this one, they are generally consensus-based, potentially leading to unintended biases that reflect existing practice.[12]

BASIC NOTIONS

The enteral route is accessible through two natural orifices, the nose and mouth.[13] It is also possible, by passing directly through the skin of the abdomen, to reach the digestive system, either in the stomach or in the intestine. When the access to the enteral route is through the skin, it is called percutaneous access. Regardless of whether the route chosen is natural or percutaneous, the administration of EF, often called formula or gavage, uses an enteral feeding tube (EFT).

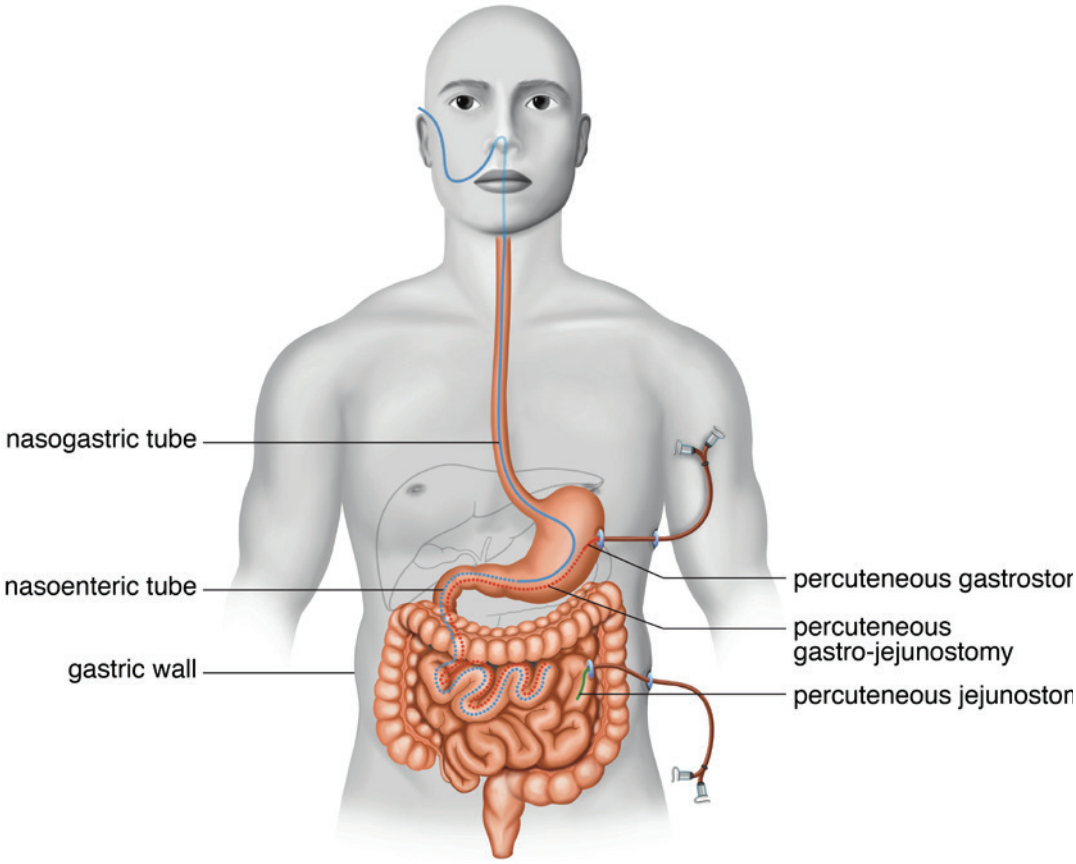
Generally, it is agreed that nutritional support planned for less than 4 weeks will be administered via an EFT that will pass through the natural routes, whereas nutritional support planned for more than 4 weeks will be administered via a percutaneous EFT, see Figures 1 and 2.[9,10,13-16] In paediatrics, the 4-week period is often far exceeded, explaining why a tube through the nose, may remain in place for few months.[†] Administration of EF can be temporary or permanent, depending on the individual's condition.[17]

Figure 1 *Decision-Making Algorithm in the Enteral Feeding Setting*



Note. Abbreviations NET = naso-enteric tube, NGT = nasogastric tube, OET = oro-enteric tube, OGT = oro-gastric tube, PEG = percutaneous endoscopic gastrostomy, PEG-J = percutaneous endoscopic gastrojejunostomy, PEJ = percutaneous endoscopic jejunostomy © NSWOCC 2023. *In adults, an endoscopic procedure is generally preferred over a surgical procedure because of lower risk, lower cost, and faster turnaround.[15,18]

Figure 2 *Routes for Enteral Feeding*



An EFT installed for long periods without any oral intake can lead, particularly in children, to a dependence on enteral feeding. This dependence leads some individuals who theoretically no longer require food support to maintain EFT use due to difficulty in transitioning to oral feeding.[19] When this is the case, a gradual decrease in enteral formula volume over 3-weeks is suggested to induce hunger without allowing for more than a 10% weight loss.[19] In individuals who can concomitantly use the oral route, a night-only schedule for EF is suggested, which encourages oral feeding activities during the day and may prevent dependency from developing.[19] Even more, especially in paediatrics, and depending on how enteral feeding is administered, it should be administered at mealtimes with other family members.

The choice of a percutaneous EFT compared to an EFT through the nose or mouth has interesting advantages such as:

- decreased risk of accidental tube displacement and the need for reinsertion;
- reduced risk of aspiration;
- discretion;
- safer and more reliable access;
- optimization of language skills development (especially in paediatric patients);
- less blockage because the diameter of the tube is larger, and the length of the tube is shorter;
- less interference in daily activities;
- better quality of life;
- no irritation/congestion/trauma to the nasal septum;
- reduced anxiety at mealtimes; and
- reduced feeding time.[7,20]

However, insertion of a percutaneous feeding tube (or reinsertion if dislodged) requires expertise and technology only available at some centres. In these circumstances, an EFT through the nose may be a safer option in the longer term.[20]

To identify the chosen enteral route, it is agreed to name it by combining prefixes referring to the entry orifice (e.g., oro, naso, or percutaneous) and suffixes referring to the position of the distal end of the feeding tube (e.g., gastro for the stomach, jejuno for the small intestine). Thus, we will see a nomenclature that follows the pattern of the following examples: nasogastric EFT, gastric percutaneous EFT. It is customary for these feeding tubes to be designated by abbreviations, and the most used abbreviations are those in English as shown in Table 1. In French, it is customary to add the term stoma for percutaneous accesses, which is how we say percutaneous gastrostomy for example. The abbreviation PEG, regularly encountered, describes its passage through the skin, the method of guidance and the site of the distal end of the tube, percutaneous endoscopic gastrostomy. Note that the abbreviation PEG is often misused to refer to all types of percutaneous EFT.

Table 1 *Nomenclature of Enteral Feeding Tubes*

Entry site	Distal end of tube	Tube name	Abbreviation used in English and in French
Nose	Stomach	Nasogastric	NGT
Nose	Intestine	Nasoenteric/nasojejunal	NET/NJT
Mouth	Stomach	Oro-gastric	OGT
Mouth	Intestine	Oroenteric/orojejunal	OET/OJT
Skin	Stomach	Percutaneous endoscopic gastrostomy	PEG
Skin	Intestine	Percutaneous endoscopic jejunostomy	PEJ
Skin	Stomach and intestine	Percutaneous endoscopic gastrojejunostomy	PEG-J
Skin	Stomach	Gastrostomy	G-tube
Skin	Intestine	Jejunostomy	J-tube
Skin	Stomach and intestine	Gastrojejunostomy	GJ-tube

Note. Not an exhaustive list.

Tubes that are installed other than endoscopically (e.g., laparotomy, radiology) are commonly referred to as “G-tube” for a gastrostomy, “J-tube” for a jejunostomy, and “G-J-tube” for a gastrojejunostomy.

The pylorus is a muscular valve located at the exit of the stomach just before the small intestine, which is composed successively of the duodenum, the jejunum, and the ileum.[1] Postpyloric feeding refers to feeding directly into the jejunum or duodenum.[21] It is performed either by inserting a tubular extension via a preexisting gastrostomy tube and is then termed a gastrojejunostomy, or by inserting the feeding tube through the abdomen directly into the jejunum, a procedure that results in a percutaneous jejunostomy.[1,17] The jejunostomy tube is used for individuals who cannot process food in the stomach and, therefore, must be fed directly into the jejunum.[22,23] Individuals prone to pulmonary aspiration are also good candidates for jejunostomy placement.[18] In addition,

more gastrojejunostomy tubes are installed than jejunostomy tubes, due to the type of procedure required. Gastrojejunostomies can be created radiologically, whereas the majority of jejunostomies are created surgically.

Indications and Contraindications

Indications for EFT are varied. However, recall that the digestive system must be able to digest and assimilate nutrients.[23] Indications (Table 2) can be grouped into three broad categories:[14,24]

- clinical conditions that interfere with safe oral intake; and
- acute or chronic illnesses causing a catabolic state where oral intake becomes inadequate.

The NSWOCC working group specifically addressed percutaneous feeding tubes. While many of the recommendations presented in this document could be applied to tubes passing through natural orifices, readers should be aware that the purpose of this work was explicitly to review the literature and develop recommendations for percutaneous tubes.

Table 2 *Examples of Indications for the Installation of a Percutaneous Feeding Tubes*

- Dietary support lasting more than 4 weeks or stomach decompression
- Dysphagia
- Gastroparesis
- Pulmonary aspiration
- Congenital complications of the mouth, esophagus, or intestines
- ENT/neck cancer treated with chemotherapy/radiotherapy
- Cranial trauma
- Craniofacial anomalies
- Growth retardation (in paediatrics)
- Major GI resection
- Unresectable pyloric mass
- Pancreatitis
- Enteric fistula
- ENT, esophagus, stomach surgery

Note. ENT = ear, nose, and throat; GI = gastrointestinal. Not an exhaustive list.[1-3,10,22,24-28]

Contraindications to EFT placement are often related to the placement procedure itself (Table 3). For example, obstruction of the pharynx or esophagus that prevents the passage of the gastroscope or interposition of organs such as the liver or intestinal loops that prevent access to the stomach or intestine via the percutaneous route.[26]

The few absolute contraindications are GI obstruction distal to the site of enteral formula administration, a septic state, peritonitis, colonic ischemia, or advanced peritoneal carcinomatosis.[2,28-30] Severe uncorrected coagulopathies are generally considered absolute contraindications.

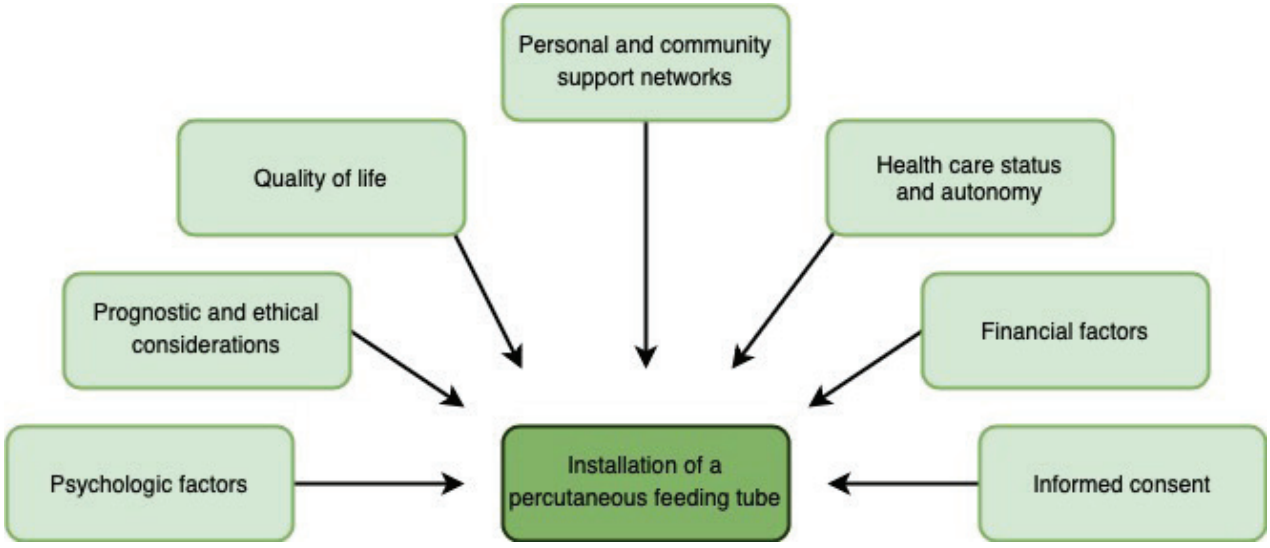
Table 3 *Examples of Relative Contraindications for the Installation of a Feeding Tube*

- Dementia
- Limited life expectancy
- GI bleeding
- Hemodynamic or respiratory instability
- Severe ascites
- Obesity
- Pregnancy
- Peritoneal dialysis

Source. [9,13,14,26,28,30,31]

Thus, the decision to put an EFT in place must be made on an individual basis, weighing the benefits and impairments it may have on quality of life. Finally, the choice to proceed with installing an EFT is based on a set of factors shown in Figure 3 that need to be analyzed rigorously.[15,30]

Figure 3 *Factors That Influence the Decision to Install a Percutaneous Feeding Tube*



Note.[15,20] © NSWOCC 2023.

Installation

For many years, the route of feeding tube insertion was specifically associated with the technique guiding the installation, e.g., endoscopy was associated with feeding tube insertion using the oral (transoral) route, whereas imaging (e.g., radiology) was reserved for direct transabdominal insertion.[29] Over time, the different guidance techniques were used independently of the insertion route.

The purpose of the following section is not to review EFT installation procedures in detail, but rather to provide a brief overview of the different techniques. The choice of installation procedure will depend upon the resources and expertise available at the medical centre and anatomical considerations that may affect the ability to place the tube by one route rather than another (e.g., insertion site difficult to identify by the endoscopic route due to prior surgery or excessive abdominal

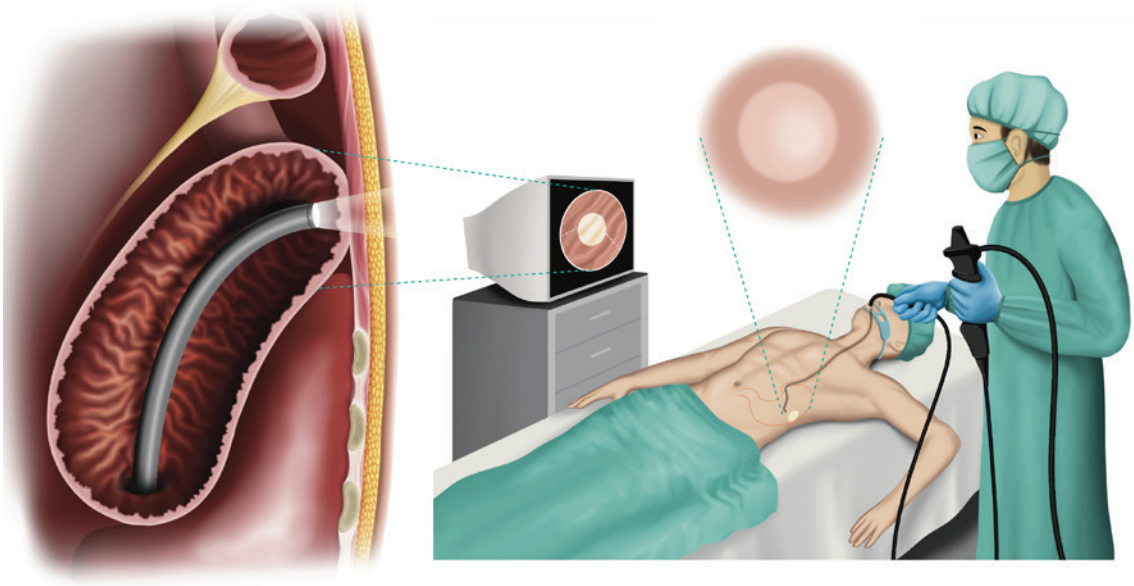
fat). In addition, if the person is to undergo surgery for other reasons, the placement of an EFT will be performed during this operative procedure. The individual is typically sedated and under local anesthesia for the transoral or transabdominal-guided procedure.[17]

The percutaneous endoscopic procedure using the transoral approach was first published scientifically in 1980 by Gauderer and colleagues and had a success rate of over 95%.[7] Mortality associated with the procedure is estimated to be 0.5%.[32] The percutaneous endoscopic procedure has become the most common method of gastrostomy creation worldwide.[33] The endoscopic procedure can be performed using the *pull* technique, referring to the action of pulling the EFT from the inside to the outside of the wall, or conversely, the *push* technique, which refers to the action of pushing the EFT from the outside to the inside.[7] The *pull* and *push* techniques have been shown to be equivalent in terms of insertion success.[29] Each procedural approach (transoral and transabdominal) and guidance method has advantages and disadvantages.

The EFT installed during the procedure leading to the creation of a feeding stoma has long been a tube with a noninflatable internal retention device.[29] However, more and more authors are reporting using tubes with inflatable internal retention devices, also known as balloons.[34]

In the transoral approach with endoscopic guidance, the endoscope is inserted through the mouth and air is injected to inflate the stomach. The light source of the endoscope is visible through the skin (transillumination), and the clinician marks the area of tube insertion, see Figure 4.[34]

Figure 4 *Endoscopic Transillumination*

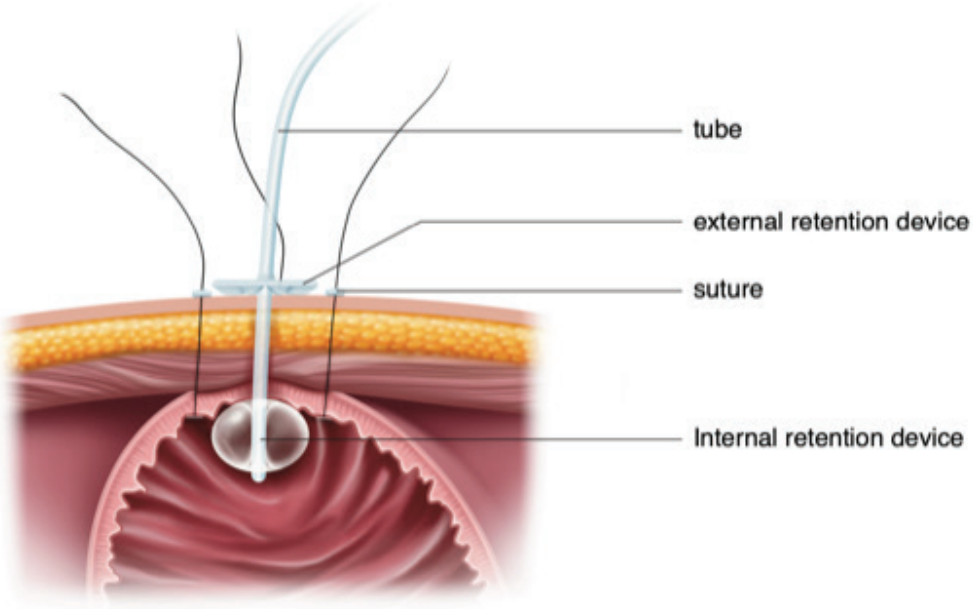


Radiation-guided percutaneous gastrostomy is a minimally invasive technique that uses imaging (e.g., fluoroscopy) for EFT placement.[35,36] This technique is used when it is impossible to pass an endoscope through the transoral approach,[22] radiological installation offers the same advantages as the surgical approach. In addition, there are other guiding techniques, such as ultrasound or CT scans.[35]

Finally, percutaneous surgical gastrostomy can be performed laparoscopically or using an open approach. T-fastener sutures or anchoring system are often used to secure the stomach to the abdominal wall (see Figure 5), which expedites the adhesions of the two anatomical regions.[35]

Typically, for the paediatric population, the surgical technique requires general anesthesia. Carefully selected adolescents, however, can have a percutaneous EFT inserted under conscious sedation, as it is more common in adult populations.[20]

Figure 5 *T-Fastener Sutures*



Studies comparing percutaneous surgical and endoscopic setups in adults have shown no difference in morbidity or mortality between these two approaches.[9,35] In paediatrics, the data favour the laparoscopic surgical technique.[37] Indeed, meta-analysis, including eight studies involving 1,550 patients, showed that the risk of major complications was 3.86 times higher with the endoscopic technique than with the laparoscopic technique. In this study, major complications require reoperation within 30 days, such as an organ or visceral injury, intra-abdominal leakage, and fistula formation.[37] However, the percutaneous endoscopic route is less expensive, less invasive, and faster.[9] Thus, the surgical route is generally reserved for patients who are already in the operating room for another surgical procedure or when insertion via endoscopic or radiological guidance is not possible (e.g., esophageal obstruction, presence of a colonic loop between the stomach and abdominal wall).[35] In addition, the presence of gastric varices increases the risk of severe bleeding and is generally considered a contraindication to endoscopic or radiological insertion of a gastrostomy tube. Obesity, on the other hand, makes

transillumination used during the endoscopic method complex.[35]

Laparotomy may be particularly useful in tiny infants with numerous adhesions or significant anatomic abnormalities.[34]

The feeding jejunostomy is often created surgically, preferably in the proximal jejunum.[2] A definitive jejunostomy is commonly performed as part of certain types of gastric resection.

The choice of EFT type is therefore determined by the following:

1. The anatomic site where nutrition will be administered: gastric, postpyloric (jejunal), or both gastric and jejunal. The choice of the administration site (stomach versus intestine) of the EF should favour the stomach. The jejunal route should be chosen only in patients with unfavourable gastric anatomy (e.g., previous surgery), impaired gastric emptying, intolerance to gastric feeding, or a high risk of pulmonary aspiration.[14]
2. Route of access (based on, among other things, anticipated duration of EF support): oral/nasal or percutaneous abdominal.
3. Preferred insertion technique (alone or in combination with multiple techniques): open surgery (laparotomy), laparoscopy, endoscopic, or radiological.
4. Specific characteristics of one tube over another (refer to Types of Tubes section).

Mode of Administration

There are four modes of delivery of EF, including continuous, cyclic, intermittent, or bolus.[38]

Continuous pump feeding involves administering enteral formula at a predetermined rate (ml/h) via a volumetric pump. Continuous feeding is administered for 16 to 20 hr in a 24-hour period but will vary depending on the rate of administration and the volume of formula required.[1] This mode of administration improves tolerance to EF in general. Continuous administration is particularly recommended in individuals benefiting from postpyloric feeding.

This is because when the distal end of the EFT is in the intestine, the stomach cannot act as a reservoir. If the feed were given as a bolus directly into the jejunum, it could cause abdominal pain, diarrhea, and dumping syndrome because of the difference in osmolarity between the jejunum and a large volume of enteral formula. Therefore, formulas administered directly into the jejunum are much preferred to be administered slowly by continuous infusion. A volumetric feeding pump allows precise control of the delivery rate.

It is strongly encouraged that an EF schedule allows for a continuous 90-minute break without the administration of enteral formula, medication, or water, especially in the context of gastric administration. This break allows the gastric pH to return to normal limiting bacterial growth in the stomach and thereby limiting the risk of infection.[1]

The cyclic mode is a variation of the continuous mode. The same volume of enteral formula is administered over a shorter period and, therefore at a faster rate. Administration usually takes place over 8 to 14 hr in a 24-hour period, preferably at night. This has the advantage of interfering less with activities of daily living and can be combined with oral feeding when possible. EF can also be given by volumetric pump for greater accuracy. The cyclic mode is often used during a transition to oral feeding.[7]

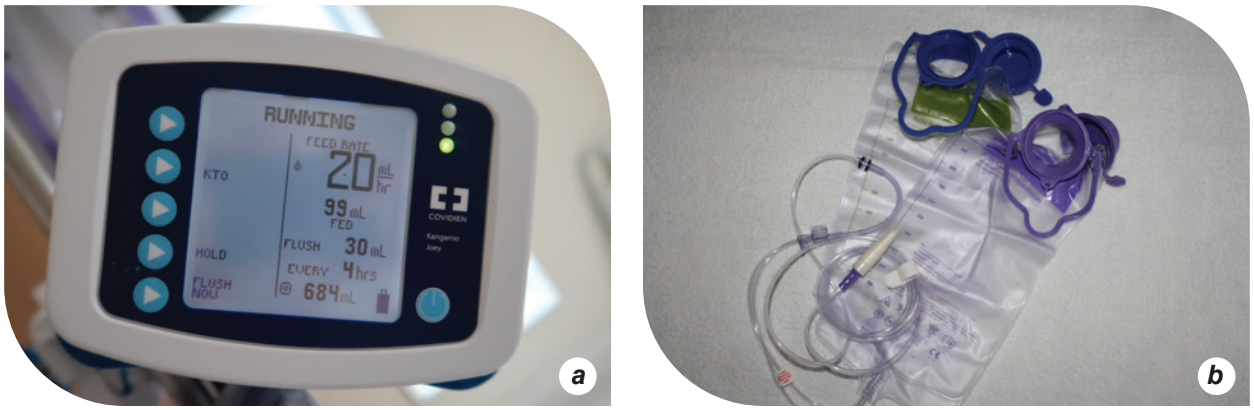
The intermittent mode is a repetitive administration (4 or more times per day) of a specific volume over a short period,[39] either over 20 to 60 minutes in adults or 120 to 180 minutes in children.

Finally, bolus feeding involves an infusion (100-400 ml) of enteral formula over 10-30 minutes.[7] This mimics the feeding periods of a

typical schedule.[39] Boluses are delivered using syringes or gravity.[1] The main disadvantage of this mode is that it can cause diarrhea. Risk of pulmonary aspiration is also associated with this method. However, this risk is related to the anatomy of the stomach, which by its anatomical bulge capable of stretching, allows a transient accumulation of enteral formula. In the presence of significant gastroesophageal reflux, this accumulation of enteral formula, even temporarily, could lead to aspiration into the airway. This mode is generally used for infant milk administration.[39]

Regardless of the mode of administration, a volumetric pump, see Figure 6, can always be used.[15]

Figure 6 *Example of a Volumetric Pump and Associated Tubing for the Administration of Enteral Formulas*



a) volumetric pump, b) tubing and bags for enteral formula administration.

The main advantages of the volumetric pump are the control and accuracy it offers over the flow of EF and the reduction of errors and complications (e.g., tube occlusion) provided that the manufacturer's instructions for use (IFU) are followed (e.g., alarm activation).[38] Continuous or cyclic modes of feeding require the individual to be connected for extended periods by tubing to a volumetric pump or gravity system. In certain vulnerable populations (e.g., paediatrics, dementia), the risk of accidents associated with these tubes (e.g., strangulation) is genuine and special vigilance is required.[40]

Gravity administration is also possible. Monitoring is more critical due to the risk of over or under administration.[39]

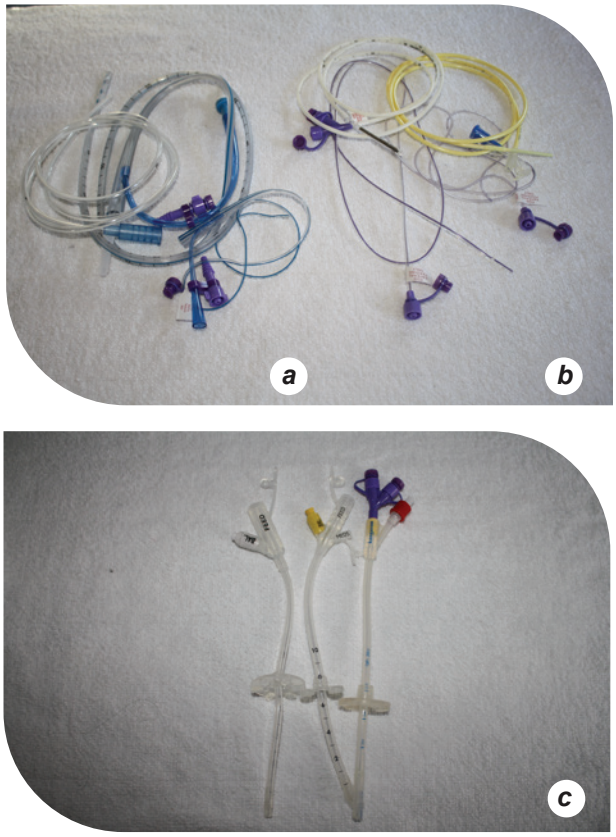
Types of Tubes

Tubes are named by their entry site and the site of administration of the EF or drugs (refer to Table 1). Beyond this nomenclature, tubes can be grouped by specific characteristics such as:[16]

- the external diameter of the tube (e.g., 12 to 30 Fr; some models are as small as 5 Fr);
- the internal retention device: inflatable (e.g., balloon) or noninflatable (e.g., plastic dome or mushroom funnel or retractable loop [pigtail]);
- the length of the external segment: standard (e.g., visible tube coming out of the abdomen) or low-profile (tube that stops at the level of the skin's abdomen);
- the material of manufacture (e.g., polyurethane, silicone); and
- the external retention device (e.g., bumper).

Note that the internal and external retention devices can take different names depending on the region of the world where you are.

Figure 7 *Examples of Different Enteral Tubes*



a) adult and child nasogastric tubes, b) adult and child nasoenteric tubes, c) standard-length gastrostomy balloon tubes.

Figure 8 *Inflatable Internal Retention Device*

This is why we will see terms such as bumper or disc. To remain more general, the term retention device has been used throughout the document. On the other hand, the expression *buried bumper syndrome* has not been changed, even if it is in fact the burial of the internal retention device (see section Complications). Each feature has advantages and disadvantages that are important to consider when selecting the EFT to be installed.

In general, G-tubes are less likely to become blocked compared with nasal or oral route tubes,[16] in part because of their larger internal diameter (Figure 7) and shorter length. Tubes for jejunal feeding in paediatric clients have a particularly narrow internal lumen, which increases the risk of blockage.

FTs have internal retention devices that may or may not be inflatable. Inflatable devices are shaped like small balloons and are called as such. These balloons are filled with water, which maintains their shape, see Figure 8.

There are also noninflatable internal retention devices, which are more rigid but generally remain flexible, and take a variety of shapes, shown in Figure 9 (e.g., dome, mushroom). In all cases, the internal retention devices are not visible when the tube is in place since they are inside the body and prevent spontaneous expulsion of the tube.

Figure 9 *Dome-Type Internal Retention Device*

Figure 10 *Examples of External Retention Devices*

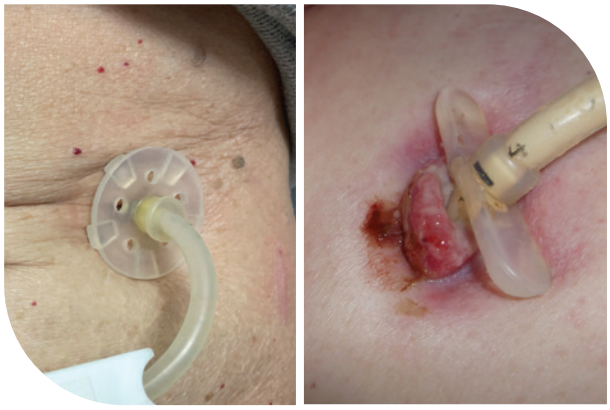


Figure 11 *Gastrostomy Tube with Clamp*

Percutaneous EFTs with internal retention devices in the form of a balloon are easier to remove and replace but require more frequent replacements than those with other internal retention devices.[16,41]

EFT also typically have external retention devices visible on the abdomen's surface. They help prevent the migration of the tube into the interior of the stomach or intestine. Therefore, the portion of the tube that passes through the abdominal wall is trapped between the internal and external retainer, see Figure 10.

External retention devices are generally movable along the tube. Therefore, adjustments can be made to maintain a minimal gap between the skin surface and the device. Tubes may also have a clamp to prevent reflux of gastric fluids when not in use, see Figure 11, or an internal anti-reflux valve. Note that the anti-reflux valve is not a suggested feature for an individual needing to perform gastric decompression.[41] In addition, tubing specifically designed for decompression is available.

Low-profile (skin level) feeding tubes devices shown in Figure 12 are commonly referred to as Mic Key.[16]

Figure 12 *Low-Profile Enteral Balloon Feeding Tube Device*

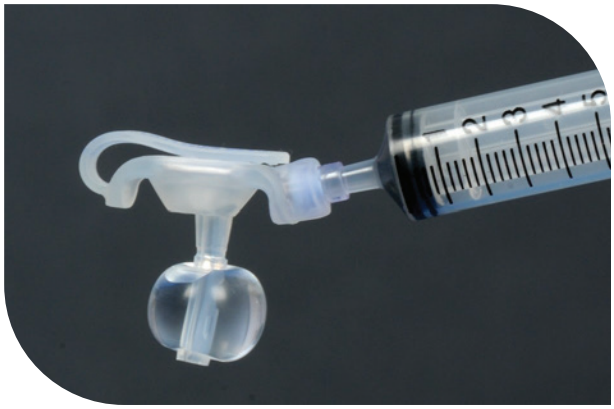
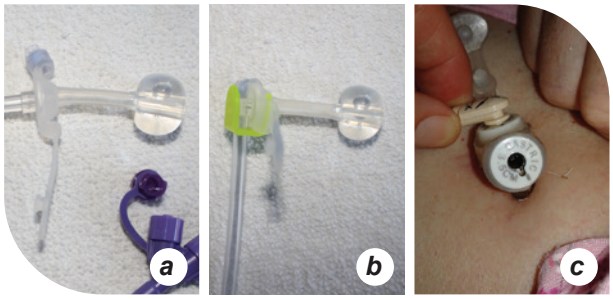
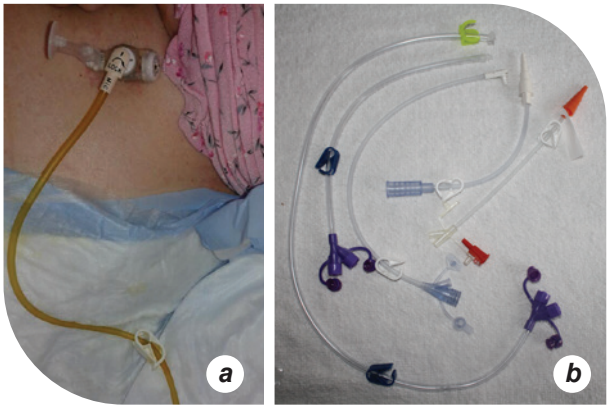


Figure 13 *Connectors*



a) straight tip, b) and c) 90° tip

Figure 14 *Extension Tubing*



a) low-profile EFT and extension, b) various administration tubing or extensions.

The visible part on the abdomen is a flared access port with a hooded closure, which also serves as an external retention device, preventing the access port from migrating into the abdominal wall. To be flush with the abdomen, the fistula track to the stomach must be measured in centimetres for the tube length to be appropriate. These low-profile devices are more discreet and lighter, cause fewer mobility restrictions, do not require an additional fixation system (e.g., transabdominal sutures) and are less likely to become dislodged by getting caught in something.[13] This is often the preferred type of feeding device for the paediatric population.[16] A separate tubing (extension) is connected to the low-profile device during administration and then removed when the administration of the EF is finish. The length of the administration extensions is variable, and the angle of the connection tip can be straight or 90° shown in Figures 13 and 14.

The only drawbacks of low-profile EFT are that they are more expensive than a simple gastrostomy tube and may need to be changed every 4-6 months, depending on the manufacturer's IFU.[20] The change may even be necessary beforehand, depending on the person's weight gain. Even more, the type of enteral formula used, and how rigorously the EFT is maintained, can also affect the device's lifespan.

A person with a standard-length EFT may choose to replace it with a low-profile-type device. On the other hand, in the presence of a peristomal infection, a stoma track longer than available devices, or an unhealed stoma, insertion of a low-profile replacement EFT is not recommended.[7] In a surgical EFT installation approach, a prospective study from 1995 of initial low-profile tube installation (n = 86) reported serious problems during installation and a high complication rate.[42] Other authors recommend waiting until the stoma has matured before installing any balloon feeding device.[30] However, current practice in many centres is tending to deviate

Figure 15 *Gastrojejunal Tube*

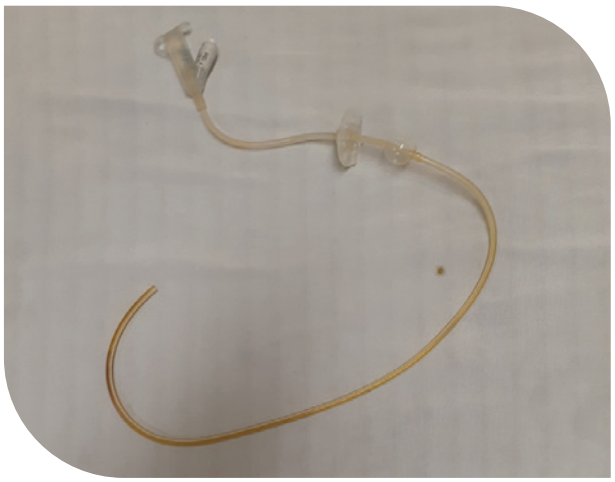


Figure 16 *ENFit Port for Safe Administration of Enteral Nutrition*

from these approaches. In fact, low-profile devices are increasingly being installed as part of the initial gastrostomy creation procedure, particularly for customers outside major urban centres, in order to simplify follow-up.

Anchoring sutures, also known as transabdominal T-sutures, are still frequently used when creating a new percutaneous feeding site fitted with a standard-length balloon EFT. These anchoring sutures secure the stomach to the abdominal wall, facilitating gastropexy.[34] This not only improves the stability of the fistulous stoma track during healing, but also simplifies the first EFT replacement without the need for a visit to a specialist centre. Note that low-profile devices are not secured with transabdominal sutures during initial installation.

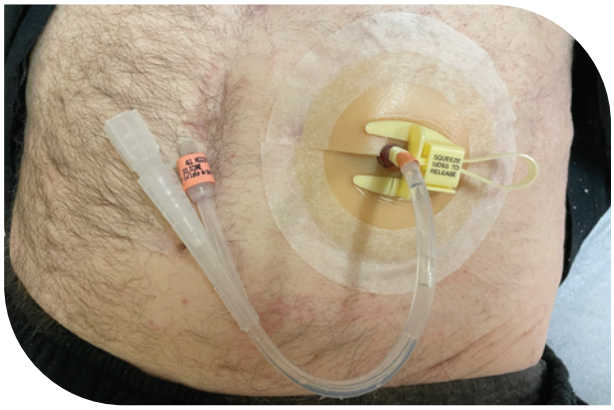
Percutaneous gastrojejunostomy, and percutaneous jejunostomy tubes are more prone to blockage due to their length and small diameter, as shown in Figure 15.[16,22,23]

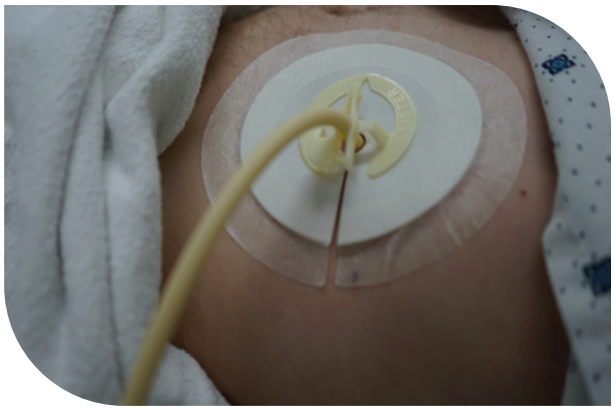
The gastrojejunostomy tube is typically a tube that enters the stomach through a preexisting gastrostomy and extends to the jejunum.[23] One lumen of this tube terminates in the stomach, and another, continues through the pyloric valve to the small intestine. The jejunal port allows feeding, while the gastric port provides a continuous or intermittent vent. However, it is mentioned that the small diameter of gastrojejunostomy tubes generally provides inadequate or insufficient decompression.[7] The gastric port is often dedicated to fluid and drug administration.[43] The outer tube will have, like other type of tubes, a Y shape with two access ports.[35] The main complications associated with the gastrojejunostomy tubes are retrograde displacement of the distal end of the tube and tube obstruction.[7] Procedural fixed sutures can effectively prevent retrograde tube migration, but they cannot prevent the occlusion problems that are specific to small-bore tubes.[7]

Figure 17 *Three Types of Needleless Syringe Tips*

Left to right: ENFit, Syringe Tip, and Luer-Lock..

Figure 18 *Fastening Systems*





To avoid accidental administration of enteric product to vascular pathways or other access devices,[15] health care organizations that ensure safe drug administration recommend that manufacturers design different tips for the administration ports of these different tubings. In recent years, the ENFit standard has emerged.[35] All tubes and accessories for EF should ideally meet this standard (Figure 16).

However, many centres still need to adopt equipment that meets this standard. Catheter tip irrigation syringes are routinely used in settings for tube irrigation, see Figure 17. Luer-Lock tips are designed to access the vascular system.

The material that comprises the EFT influences its degradation rate.[44] Tubes composed of silicone deteriorate faster than those made of polyurethane and more frequently exhibit fungal colonization that causes a blockage. Polyurethane tubing is probably best suited for drug delivery due to the chemical inertness of this material with the active ingredients of the drug. In addition, for the same external calibre, the internal lumen of a tube composed of polyurethane is superior to that of silicone.[44]

A variety of fixation systems also exist to immobilize the tube adequately. These devices can be used in addition to the external retention device, see Figure 18.

Teaching

The quality of life of individuals receiving EF is greatly influenced by their ability to cope with the challenges of this type of nutritional intake, as well as the degree and quality of support they receive from health care professionals.[1] While some individuals can ingest liquids and solids, those on long-term EF have described a sense of loss over no longer having the ability to eat or drink, particularly during social occasions, when food is central.[45]

Effective communication is essential between health care professionals, the individual and significant others in the context of EF. Following a survey of relatives of individuals receiving EF, McClaren & Arbuckle (2020) report that 62% (*n* = 24/39) of respondents had not been counselled on medication administration by EFT.[1] Medical jargon was also identified as a barrier to the ability of individuals and significant others to understand the instructions provided by health care professionals. This may especially be true depending on the individual's education level or literacy challenges. Therefore, it is essential to use educational materials presented in simple, accessible language.[20]

Recent studies of the impact and education of ostomy feeders and their relatives have found that they generally don't feel adequately trained in managing EF administration in the home.[46]

Individuals and their families report a lack of knowledge about enteral nutrition in general, including the ingredients in commercial formulas, and concerns about whether the person will be hungry, or whether the person will choke.

Teaching the person with an EFT and significant others (especially in the paediatric population) about the realities and care of a feeding stoma is critical to adaptation. One of the most important nursing interventions involves teaching about the prevention and appropriate management of potential complications.[47] While standardized teaching to individuals and their families is necessary and appreciated, nurses and other health care professionals must be trained and equipped to provide this teaching.[48] Indeed, when nurses know the recommendations well, the resulting care and teaching are optimized and a notable decrease in complications and readmissions is observed.[49,50]

Rarely, there may be an unanticipated effect on body image, especially in adolescent clients. The presence of a permanent EFT sometimes requires psychological support to facilitate adaptation to such a change.[20] Well before percutaneous EFT insertion, children and adolescents should be appropriately prepared for such a change.

The psychological impact more commonly encountered in EFT carriers and significant others involve anxiety, stress, and depression.[51]

Moreover, in a context where more and more procedures of this type are performed in day surgery, the assessment of the ability to adequately care for the EFT by the person and their loved ones,[52] may seem difficult to reconcile with, in this context, the short hospital stay. This transformation in the supply of care obliges community services to compensate for the lack of time to ensure a transfer of knowledge necessary for the safe management of EFT and provides an additional argument for the establishment of outpatient services dedicated to the population with EFT.

METHODOLOGY

An NSWOCC task force was convened in June 2022 to work on the development of national best practice recommendations to improve care for individuals requiring EF. The Canadian task force had the distinction of all being French speaking, which allowed most of the work and meetings to be conducted in French.

Search terms with inclusion and exclusion criteria were agreed with the task force. A literature review was conducted in July and August 2022 by Véronique Synnett of the Institut du Savoir Montfort in Ottawa, Ontario.

The search strategy used focused on keywords related to gastrostomies and jejunostomies, care, complications, management skills, self-care and all their synonyms in both English and French: *gastrojejunostomy, gastrostomy, G-tube, jejunostomy, J-tube, gastrojejunostomy, gastric-jejunal tube, GJ-tube, PEG, percutaneous endoscopic gastrostomy tube, PEJ, percutaneous endoscopic jejunostomy, feeding tube, enteral feeding, enteral nutrition, nursing care, nursing management complications, percutaneous radiologic gastrostomy patient, family, teaching, self-care.* All articles in English and French from the last 20 years have been retrieved.

Databases searched included: CINAHL, Cochrane Database of Systematic Reviews, Dynamic Health, Embase, Érudit, JBI, LISSA, Medline, NRC, OMNI, Scholar, ScienceDirect, and Up to Date search conducted by narrowing the concepts generated 1,685 titles.

These were evaluated for relevance to the project based on the title and abstract. Four task force members independently rated each title from 0 to 3, where 3 was considered very relevant, and 0 was not relevant. Only titles with a total score of 7 or higher were retained for further reading. At the end of this exercise, 243 articles were read and reviewed.

Two members of the task force independently reviewed each article. Of these, 207 were selected for their relevance to the project.

The content of the sections was developed by three subgroups, which served as the basis for drafting the recommendations. The drafting was done through a collaborative working document, where everyone could directly edit the document. Each task force member was invited to improve and modify the recommendations developed by the three subgroups. A working meeting was held to finalize a first version of the recommendations.

After reviewing the proposed statements, a Delphi methodology was used to reach consensus. This Delphi method, using a survey, allowed working group members to express their level of agreement with the wording of each recommendation.

Recommendations that did not reach 80% agreement were discussed, modified, and sent to a second Delphi round.
This process continued for a total of three rounds; if agreement could not be reached after three rounds, the recommendation was removed from the discussion and not included in the final list of recommendations. Consensus was reached on 54 recommendations (80% agreement or greater) related to the care and prevention and management of percutaneous feeding tube complications. During the Delphi process, a round of statement categorization was necessary to distinguish recommendations from more technical or overly technical care statements. Statements identified as such were moved into the text as a table. A final Delphi round was necessary due to changes in the wording of four recommendations following peer review comments. The four recommendations obtained 90% agreement at the end of this round of consultation.

Once the three first Delphi rounds were completed, the recommendations were submitted to a group of English-speaking NSWOCs for translation. The translation process for the entire document was also completed when the final document was finished.

The entire task force worked on the manuscript.

A group of reviewers from various fields of practice reviewed the document. A total of 15 peer reviewers provided valuable input to the document. Their feedback was collected via Survey Monkey in June 2023. Overall, 100% of reviewers stated that they would recommend these best practice recommendations to their colleagues and administrators to support clinical practices for percutaneous EFTs in Canada. Based on the feedback, refinements were made to the document, and the overall findings and ideas were discussed with the working group members.

Finally, the completed document was approved by NSWOCC Board of Directors before publication.

RECOMMENDATIONS

These recommendations are based on the available scientific evidence. However, it is important that health care professionals practice according to local health care policies and procedures. Furthermore, these recommendations do not replace individual or collective medical orders or manufacturer's IFU.

The recommendations have been grouped by theme for ease of reference. The following table (Table 4) presents all the recommendations, the level of evidence associated with each and the references that support them.

Note. The level of interpretation of evidence is described in Appendix 1.[53]

Table 4 *Summary of Recommendations*

No.	Recommendation	Level of evidence	References
General Principles			
1	An interprofessional team is best suited to provide safe and supportive care to individuals with a feeding tube and significant others.	Ia–V	15,18,54-57
2	Health care organizations providing care to individuals with a feeding tube and significant others should have policies and procedures in place to ensure best practice service delivery across the continuum of care.	V	15,18,54
3	Health care professionals providing care to individuals with a feeding tube and significant others must employ knowledge, skills, and judgment.	Ia	58
4	There are ethical considerations associated with the decision to insert an enteral feeding tube. In a holistic approach involving the individual and significant others, this informed decision must be made after a risk-benefit analysis.	V	31,59
5	Favour the insertion of a percutaneous feeding tube when, in adults, enteral feeding is planned for more than 4 weeks. For enteral feeding planned for less than 4 weeks, insertion of a nasogastric tube is preferred. In the paediatric population, the time that determines the preferred option is generally longer than 4 weeks.	V	10
Preoperative Care			
6	Conduct a preparatory meeting between the individual/relatives and a resource person, such as an NSWOC, clinical nurse, dietitian, physician, or nurse practitioner, to facilitate an informed decision when a feeding tube is being considered.	V	24,60
7	Follow standard preoperative protocol for elective procedures deemed at risk for bleeding.	V	2,24,57,60-63
8	Consider discontinuing proton pump inhibitors 24 hr before the procedure, as their use may be associated with a higher rate of infection. A prophylactic dose of intravenous antibiotics 30 minutes before the procedure is usually prescribed. Nasopharyngeal decontamination of MRSA carriers may be requested.	Ia–V	25,64-66
9	Consider disinfecting the oropharyngeal cavity with an oral antiseptic solution 30 minutes before the procedure when feeding tube installation involves the oral route.	V	60,63

No.	Recommendation	Level of evidence	References
Immediate Postoperative Care			
10	Provide standard postoperative care and monitoring of the tube insertion site and peristomal skin for the first 7 days.	IV–V	18,38,55,67-70
11	Maintain, upon installation, approximately 5 mm between the external retention device and the surface of the abdomen or between the feeding button and the abdomen.	V	67,70,71
12	Maintain the feeding tube at 90° to the surface of the abdomen.	V	67
13	If there are no complications, gastrostomy tube use in adults can be started 2-4 hr after placement and after 4-6 hr in paediatrics.	IV–V	3,10,15,26, 34,35,38, 55,72-75
14	Mobilize the feeding tube on a regular basis. The technique varies depending on the type of tube in place. The timing of the mobilization may vary.	V	3,15,18,22, 24,76-79
15	Leave a semiocclusive dressing in place at the insertion site for a minimum of 24 hr. If there is no discharge, the site can then be left open to the air.	V	16,26,29,80-84
16	If there is no peristomal inflammation, a shower is allowed one week after the procedure. For bathing, wait until the ostomy tract has healed.	V	20,28,76,80,81
17	Provide documentation at discharge on routine enteral feeding tube care. This documentation should include the specifics of the type of tube installed, who to contact in case of an emergency and the date of the first follow-up.	IV–V	3,47,52,85,86
Routine Care			
18	Clean the stoma, equipment and peristomal skin daily, and inspect their integrity.	Ia-V	3,9,15, 18-20,35,70, 71,76,78-80, 83,87-93
19	Continue oral hygiene, even in individuals who receive all nutrition and hydration through the feeding tube.	V	18,94
20	Wait for healing of the ostomy tract before replacing a feeding tube. It is imperative to know what type of tube is in place before attempting to remove or replace it. The first change should be done by qualified personnel with specific skills. The individual or their significant others can do subsequent replacements according to their skills and abilities.	V	15,35,69, 70,95-98

No.	Recommendation	Level of evidence	References
21	When the outer portion of the tube feels tight on the abdomen, ensure that the section inserted into the tract matches the thickness of the abdominal wall, especially when growing or gaining weight. Aim to maintain a 5 mm space between the skin and the tube.	V	83
22	May begin weekly balloon seal checks on enteral feeding tubes that have balloons after 4 weeks post insertion.	V	70,78,80,91,99
23	Change accessories and fastening systems on a regular basis and according to the manufacturer's instructions for use.	V	39,70,100-102
24	Apply a semiocclusive dressing following the final removal of a feeding tube.	V	35
Medication and Feeding			
25	Close collaboration between the pharmacist, physicians, and nurses is required before administering medication via an enteral feeding tube, and throughout treatment. Similarly, the collaboration of the interprofessional team involving a dietitian is essential to determine the appropriate mode of feeding administration.	IV–V	27,38,103-107
26	Adhere to the contraindications, interactions, warnings, precautions and prescribed dosage of each medication and their specificities related to enteral feeding.	V	27,104,106
27	Consider the administration of enteral feeding as a medication. Due diligence should follow provincial administration standards.	V	23,108
28	Administer enteral formula separately from medications. Administer each medication separately. Validate with pharmacy if it can be done otherwise.	Ia–V	15,38,69, 104,109,110
29	Administer medication in liquid form when available.	V	3,27,30,38,83, 102,106,111-116
30	Use only sterile water when dilution of medications is necessary. When liquid medication is unavailable, finely crush it only if its solid form allows it before diluting it. Check with the pharmacy if this is not possible.	V	38
31	Respect the frequency of irrigation of the feeding tube according to its use and the mode of administration of enteral nutrition. The individual's condition and age may influence the quantities and products used.	Ia–V	3,13,25,26, 31,38,39,83,92, 103,110,112, 117-119

No.	Recommendation	Level of evidence	References
32	Keep the individual in a sitting or semisitting position when the feeding tube is used and for 60 minutes after use.	V	3,23,38,85, 103,120
33	Check the location of the internal end of the feeding tube before use or irrigation.	Ia–V	3,18,21,38,69, 76,79,84,87, 121,122
34	Assess the individual receiving enteral feeding to identify signs of intolerance or complications, especially when initiating enteral feeding.	V	23,38
35	Apply the principles of infection control to all steps involved in administering enteral formula.	V	69,123
Complications			
36	Identify the cause of the complication, treat it and institute measures to prevent recurrence.	V	15,24,25,43, 57,61,67,72 95,111,119, 124,125
Buried Bumper Syndrome			
37	Be aware of the signs and symptoms of the buried bumper syndrome for optimal management.	V	69,126
38	Investigate all cases where buried bumper syndrome is suspected.	V	126
Tube Occlusion			
39	Apply the steps of the feeding tube unclogging procedure in cases of occlusion.	V	18,22
Bleeding And Hypergranulation			
40	Chemically cauterize hypergranulation buds 2-3 times/week until resolution.	Ia–V	7,13,16,31, 76,80,83,102, 112,115,117, 127-131
Leak And Contact Dermatitis			
41	If the leak is gastric fluid, administer proton pump inhibitors to decrease gastric fluid secretion. A prescription is required.	IIa–V	15,16,25,29, 83,117,127, 132-136
42	Assess the need for decompression by checking the gastric residual volume. This should be the exception. If aerophagia is present, there will not be significant gastric residual volume, but decompression may be necessary.	IV–V	15,83,97, 117,119,127

No.	Recommendation	Level of evidence	References
43	Check the integrity and function of the tube/button and change it if necessary.	V	127,136
44	Using a larger feeding tube is a last resort, reserved for health care professionals when all other options have been considered and is not a substitute for proper tube stabilization at the risk of recurrence of the leakage problem.	IV–V	15,25,41,63,73, 83,111,117, 119,127,136
45	If there is evidence of contact dermatitis, best practices for its management apply while respecting the approximately 5 mm distance from the external retention device and maintaining the 90° angle of the tube to the abdomen.	V	15-17,25, 83,111,134
46	Only if the leakage problem persists the interprofessional team may consider removing the tube and inserting a new feeding tube at a new site.	IV–V	15,17,25,31, 63,111,117, 119,135
Infection			
47	If there is clinical evidence of infection at the tube insertion site, perform a wound culture only if systemic antibiotic therapy is being considered.	IIa–V	35,111,133,135
48	Prefer the use of topical antimicrobial products such as wound cleansing solutions or dressings. Topical antibiotics are not recommended.	IIa–V	15,16,26,31, 35,70,72,78,88, 92,93,117,127, 133,137
49	Know the signs and symptoms of fungal infection so you can identify and treat it if it develops at the tube insertion site.	V	112
50	If a deep infection is present, the tube in place is considered contaminated and should be removed. A new temporary tube should be inserted, and the infection treated.	IIa–V	15,31,95,112, 127,133
Tube Accidental Fall			
51	Act promptly and refer to an experienced health care professional when accidental removal of a feeding tube that has been in place for less than 4 weeks.	V	3,15,98
52	Reinstall an equivalent size tube within 4 hr of the accidental removal of a feeding tube that has been in place for more than 4 weeks.	V	3,15,26,70, 111,138
Gastrointestinal Symptoms			
53	Consider medical, nutritional, or medication reconciliation consultation depending on the gastrointestinal symptom present.	V	18,57,125
54	Discontinue tube feeding if intestinal obstruction or ileus is suspected.	V	18,57,125

SECTION 1 – GENERAL PRINCIPLES

Recommendation 1: An interprofessional team is best suited to provide safe and supportive care to individuals with a feeding tube and significant others.

The interprofessional team allows for an exchange between professionals with unique perspectives and skills from each discipline. The impact of these exchanges is reflected in safe service delivery, appropriate nutrition support therapy for the individual, and is beneficial to the health care system, see Table 5.[15,18]

Note: Professional and local health care policies and procedures take precedence over the guidance provided in this table for information purposes. Significant variations may exist between provinces/territories and organizations.

Table 5 *Contribution of Different Professionals to the Management and Care of Feeding Tubes*

	NSWOC	RN	RPN / LPN	Dietitian	Speech therapist	Pharmacist	MD / Specialist	MD / General / NP
Deciding to initiate gastrostomy feeding. *Note.* This decision should be made in collaboration with the individual and significant others.								
Determine indications for a gastrostomy	✕	✕		✕	✕		✕	✕
Comprehensive swallowing assessment					✕			
Complete nutritional status assessment				✕				
Planning the insertion method and type of device	✕						✕	✕
Teaching the person and significant others before the procedure	✕	✕	✕	✕	✕		✕	✕
Initial facility / postfacility hospital care								
Preoperative preparation prior to insertion		✕	✕				✕	
Installation/confirmation of device location							✕	
Postinstallation monitoring		✕					✕	
Management of immediate complications	✕	✕					✕	
Assessment of nutritional needs and type of diet				✕				
Teaching the person and their loved ones about the care of the tube	✕	✕	✕				✕	
Evaluation/teaching for medication administration	✕	✕	✕‡	✕	✕	✕	✕	✕
Provide information about the physical and chemical properties of certain drugs and their different formulations, as well as an interpretation of published data on stability and compatibility						✕		
Enteral medication planning/management						✕	✕	✕

	NSWOC	RN	RPN / LPN	Dietitian	Speech therapist	Pharmacist	MD / Specialist	MD / General / NP
Teaching about the administration of enteral feeding	✕	✕	✕	✕			✕	
Information on supplies and how to obtain them (e.g., syringes, tubing, enteral feeding, liquid thickeners)	✕	✕	✕	✕	✕			
Information on who, how and when to contact in case of emergency or technical problems	✕	✕	✕	✕	✕		✕	
Organizing transfer of care to the community	✕	✕		✕	✕	✕	✕	✕
Routine care *Note.* This is done in conjunction with the individual and significant others.								
Tube and stoma care	✕	✕	✕	✕			✕	✕
Nutritional status monitoring	✕	✕	✕	✕			✕	✕
Oral hygiene	✕	✕	✕	✕	✕	✕	✕	✕
Swallowing management.					✕			
Complication management: tube and ostomy	✕	✕					✕	✕
Determine the need to continue enteral feeding	✕	✕		✕	✕		✕	✕
Initial replacement of a balloon gastrostomy tube once the fistula track has healed. *Check your organization's protocols*	✕	✕	✕				✕	✕
Routine replacement of a balloon gastrostomy tube *Check your organization's protocols*	✕	✕⌗	✕⌗				✕	✕

	NSWOC	RN	RPN / LPN	Dietitian	Speech therapist	Pharmacist	MD / Specialist	MD / General / NP
Replacement of a nonballoon gastrostomy (gastrojejunostomy or jejunostomy) tube for a balloon tube. *Check your organization's protocols*	✕						✕	✕
Replacement of a nonballoon gastrojejunostomy tube for a balloon tube. *Check your organization's protocols*							✕	
Replacement of a nonballoon jejunostomy tube for a balloon tube. *Check your organization's protocols*	✕	✕					✕	✕
Definitive removal of a gastrostomy tube *Check your organization's protocols*	✕	✕	✕‡‡‡	✕			✕	✕
Transition								
Transition from paediatric to adult care	✕	✕		✕	✕	✕	✕	✕

Note. NP = nurse practitioner; ‡ = Only for teaching to the person and significant others; ‡‡ = Only if qualified for this procedure; ‡‡‡ = The type of internal retention device (e.g., balloon versus dome) may limit the act.[18,139]

Several recommendations and protocols based on the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) have clearly demonstrated that an interprofessional approach to EF management provides positive benefits to the care of individuals.[10] Depending on the method of the EFT placement, different medical specialties may be involved (e.g., endoscopy physician, anesthesiologist, gastroenterologist, or surgeon); after tube placement, management requires the involvement of an interprofessional team.[10] Access to such a team increases the quality of interventions, reduces complications, and contributes significantly to the improvement of the quality of life of the individual and significant others, and to the cost-effectiveness of the various measures implemented.[15,56,140] In the study conducted by Kurien et al. (2012) a 23% readmission within 6 months after the creation of a feeding stoma was observed when the support by a dedicated resource was insufficient.[50]

An interprofessional team focused on nutrition support should include physicians, nurses, dietitians, pharmacists, or other health care professionals with expertise in nutrition and who have a skill in managing the supplies associated with nutrition support therapy.[15,18,56,141] In addition, the presence of such a team increases the quality of the education provided and allows for better support of the individual and significant others.[51]

An NSWOC has the knowledge and expertise to support the individual and significant others throughout the episode of care involving EF. With expertise in fecal or urinary diversion stoma site selection, an NSWOC could be consulted during the procedural to help select a placement site in the context of a complex abdominal profile. Their training also allows them to provide the individual and their significant others with care and education for optimal management of the feeding tube, and management of potential complications especially those directly involving the peristomal skin and feeding tube.

In the absence of a dedicated interprofessional nutrition support team, a collaborative approach should be implemented to ensure the best care for people with EFT and their significant others.[18] Telemedicine offers the possibility of reaching people outside of major centres, and this service delivery modality should be considered.

Recommendation 2: Health care organizations providing care to individuals with a feeding tube and significant others should have policies and procedures in place to ensure best practice service delivery across the continuum of care.

Organizational policies should minimally include:[54]

- patient selection criteria;
- the process for selecting the optimal access route and installation technique based on available options, i.e., endoscopic percutaneous gastrostomy (PEG), gastrostomy by laparoscopy, radiology, etc.;
- immediate pre- and postgastrostomy care (e.g., prophylactic antibiotics, tube care and monitoring, and wound care);
- pre- and postinsertion education;
- frequency and types of follow-up and routine examinations;
- transition from paediatric to adult services; and
- discontinuation of tube feeding.

Considering tube feeding can be very worrisome for individuals and significant others. Candidates often have coexisting chronic conditions or limitations that require further treatment.

Access to skilled and specialized community resources can mitigate potential complications through early detection and provide professional support that is individualized and

tailored to each person's unique situation.[86]

Recommendation 3: Health care professionals providing care to individuals with a feeding tube and significant others must employ knowledge, skills, and judgment.

Numerous studies demonstrate that an interprofessional approach based on patients' nutritional status is associated with reduced mortality, hospital costs, length of hospital stay, and readmission rates.[10] These often-complex situations require the mobilization of diverse knowledge and specific skills to be able to provide safe and appropriate care.[18]

The training and scope of practice of clinicians who care for individuals and significant others should include minimally:[22,58,142]

- anatomy of the GI tract;
- identification of the type of feeding tube / device;
- the impact of the location of the inner end of the tube;
- methods of removing these tubes and devices;
- management of complications after initial insertion and in the routine care setting;
- risks and complications associated with inadvertent removal and replacement of feeding tube and management of associated complications;
- basic principles of safe administration of enteral nutrition and medication;
- equipment used (e.g., volumetric pump, administration tubing and extensions, and enteral formula);
- prevention of infection and connection errors; and
- contact details and roles of health care professionals to consult as needed.

Recommendation 4: There are ethical considerations associated with the decision to insert an enteral feeding tube. In a holistic approach involving the individual and significant others, this informed decision must be made after a risk-benefit analysis.

The decision to initiate the use of a percutaneous feeding tube should always be made in the person's best interest by attempting to maintain independence as much as possible.[18] More difficult ethical decisions often affect individuals with complex conditions (e.g., terminal/progressive conditions, stroke, dementia, intellectual disability, neurological disorders, decision-making disability, persistent vegetative states).[18]

Rajan et al. (2022) deftly explored situations that might at first glance seem appropriate for tube feeding, but in fact are not.[24] For example, in the presence of anorexia associated with an advanced oncological process, it is suggested that EF may not even be proposed due to an inability of the body to utilize nutrients, regardless of their source.[24] Similarly, in conditions such as a permanent vegetative state, the feeding tube is not recommended due to the inability of the person to experience any quality of life.[24] On the other hand, if the person has uncomplicated dysphagia with preserved quality of life, a percutaneous EFT is highly recommended due to the unequivocal nutritional benefit. While in malignant GI obstruction, decompression via a gastrostomy offers a clear symptomatic benefit that improves quality of life.[24]

The placement of a feeding tube in the setting of advanced dementia is controversial and ethically debated, as there is strong evidence that the procedure does not improve quality of life or survival in individuals with dementia.[30,31,60] A 2021 Cochrane review concluded that there is currently no evidence that feeding via a feeding tube improves survival or quality of life in people with severe dementia. Furthermore, this intervention does not reduce pain or mortality, nor does it decrease behavioral and psychological symptoms of dementia.[143] These same authors have shown that there is a clinically significant risk of developing pressure injuries in the advanced dementia population receiving EF.[143]

The limited prognosis of individuals with underlying disease or the presence of

comorbidities must be taken into account when considering the placement of an EFT.[9] Indeed, in the systematic review by Sánchez-Sánchez et al. in 2021, the use of a feeding tube in the palliative care setting increased the number of emergency room visits and no statistical difference in symptom management, comfort, and quality of life at the end of life was found between users of EF via NGT and percutaneous gastrostomy and those who did not. In contrast, EF was found to improve survival in the palliative care setting in the hospital.[144]

Finally, a study conducted in Japan, reported that proxies of people with dementia, lamented the absence or near absence of discussion with medical staff about EF and that sometimes families felt compelled to opt for feeding tube.[145]

Once the decision to initiate EF is confirmed, certain factors must be considered in selecting the most appropriate route. Indeed, further evaluation is required to determine if the intended device and method of installation is appropriate for the individual.

The selection of the most appropriate feeding tube should be based on the following characteristics:[18]

- access to tube replacement services;
- anatomical features;
- anatomical site of insertion;
- anesthetic risk;
- individual's age;
- individual mobility and the need to conceal the tube;
- individual / significant other capabilities and support available after the installation procedure (short and long term, and during periods of illness);
- individual / significant other preference and,
- risk of the patient removing / tearing out the tube.

If possible, it should be made clear at the outset whether the feeding tube is to be placed permanently or temporarily. If the feeding tube is temporary, goals should be set based on a transition to adequate oral intake and subsequent permanent removal of the feeding tube. This is particularly important for paediatric patients.[18]

To minimize the psychological effects of EF on individuals and significant others, caregivers must adopt a shared decision-making approach.[1] Although it may not always be possible to offer individuals a choice of feeding method due to the lack of alternatives to enteral nutrition, it is important to consider their values, such as preferences and expectations, when deciding to initiate EF.[1] This can help the individual reflect on their concerns about EF and weigh them against the potential benefits of EF, ensuring that they have been included in the decision-making process.

Recommendation 5: Favour the insertion of a percutaneous feeding tube when, in adults, enteral feeding is planned for more than 4 weeks. For enteral feeding planned for less than 4 weeks, insertion of a nasogastric tube is preferred. In the paediatric population, the time that determines the preferred option is generally longer than 4 weeks.

The pivotal period that health care professionals use to determine the need for a percutaneous feeding tube is 4 weeks. That is, nutritional support planned for less than 4 weeks will be administered via a feeding tube that passes through the natural tract, whereas nutritional support planned for more than 4 weeks will be administered via a percutaneous feeding tube.[9,10,13-15] In paediatrics, this 4-week marker is often greatly exceeded explaining why a tube passing through the nose, for example, remains in place much longer in this population. It should be noted that some publications speak of a feeding period via

NGT or NET that can go up to 6 weeks before considering the installation of a percutaneous EFT.[2,16,57]

Inserting a feeding tube requires access to expertise and technology that is not available in all centres, especially in remote areas. In these circumstances, a feeding tube through the nose may be the only option even in the longer term.[20] It is in this context of limited access that more and more centres are installing low-profile balloon devices as part of the initial procedure, as discussed earlier.

SECTION 2 — PREOPERATIVE CARE

Recommendation 6: Conduct a preparatory meeting between the individual/relatives and a resource person, such as an NSWOC, clinical nurse, dietitian, physician, or nurse practitioner to facilitate an informed decision when a feeding tube is being considered.

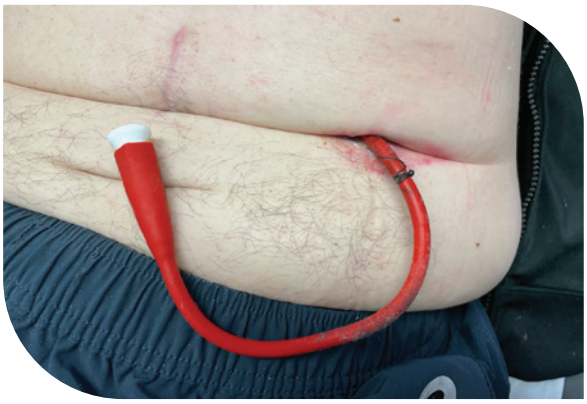
The preoperative appointment allows for a review of all the elements necessary for the procedure and for teaching the person and significant others. A well-structured preoperative meeting not only increases the knowledge of the person and significant others, but also ensures a standardized service.[64] It is an opportunity to plan for the equipment needed when the person returns home, to put the person and significant others in contact with a local supplier (e.g., pharmacy, medical product distributor) and to check whether the person is eligible for a particular reimbursement program (e.g., veterans, social assistance, Non-Insured Health Benefits for First Nations and Inuit, provincial/territorial departmental program for EF). The preoperative meeting allows for the verification of allergies,[25] not only to medications but also to disinfectants and latex. Developing a professional link with a resource dedicated to the care of EFT, facilitates postinstallation follow-up during virtual or clinic follow-ups.[86] Access to a dedicated resource team will help prevent complications by allowing their early recognition and management. In addition, such a resource increases accessibility to outpatient appointments.[86]

Written instructions should be provided to the individual and significant others at the preoperative meeting. These instructions should describe complications, prevention strategies, signs/symptoms of GI intolerance, what to do in case of an emergency, as well as any contact details. The level of language should be appropriate for the client.[20] It is important to anticipate that the individual and significant others need time to digest the information and ask questions.[20]

A consent form should be signed by the individual or their proxy for this type of procedure. The signature of the consent form is the responsibility of the doctor responsible for the installation procedure. However, the preoperative encounter is often an opportunity to ensure that consent is free and informed.[2] Informed consent for gastrostomy tube placement should also include information about routine care requirements and should not be limited to the placement procedure alone.[58]

Depending on the individual's abdominal profile, it may be warranted for the NSWOC to be involved in facilitating the selection of the tube insertion site. This would help facilitate subsequent maintenance, promote patient comfort, and avoid complications, see Figure 19.[†]

Figure 19 *Example of Feeding Tube Placed in a Suboptimal Site*



Note. The tube used here is not a tube specifically designed for EF.

Traditionally, the gastrostomy tube insertion site is placed at the midline (linea alba) to avoid hematoma formation and infection in the rectus muscle compartments.[26] However, case studies have reported hernias when a gastrostomy site is not placed in the rectus muscle region.[146-148]

Finally, in a 2022 study, Emmons shows that the time chosen for the first meeting between the resource person and the person and their significant others is important.[64] The first meeting is best done in the days preceding the procedure as it allows the patient and their significant other to properly assimilate the information presented, and to ask more specific questions during the postprocedural follow-up meetings.[64]

Recommendation 7: Follow standard preoperative protocol for elective procedures deemed at risk for bleeding.

To avoid the risk of bleeding and hemorrhagic complications during the procedure, it is important during this preoperative meeting to review the individual's list of medications to ensure that anticoagulants, including supplements, if any, are temporarily suspended.[25,60] Indeed, the installation of a percutaneous tube for EF is associated with a nonnegligible bleeding risk.[14] A preoperative blood workup is usually recommended; in particular a coagulation workup, hemoglobin, and platelet count.[60,62,149] An international normalized ratio (INR) of less than 1.5 and a count of more than 50,000 platelets/µL are the desired values.[29]

In paediatric clients, routine assessment of coagulation status in the absence of risk factors is not recommended.[20] Children with liver disease, malabsorption, severe undernutrition, or those who are immunocompromised, however, may be at increased risk for coagulopathy and thus in these cases, a coagulation workup is necessary.[20]

The risk of bleeding during the procedure should be weighed against the risk of a thromboembolic event,[24] particularly in those taking antiplatelet agents following coronary stenting, for example. Warfarin should generally be discontinued five days before gastrostomy placement. In high-risk individuals, low-molecular-weight heparin (LMWH) can be used in place of warfarin until the day before the procedure. Warfarin can then be resumed on the evening of the procedure.[24] Aspirin is generally not withheld.[29] In general, initial installation percutaneous procedures are considered high risk while procedures and techniques involving a mature stoma pathway are considered low risk.[29] This explains why it is generally not necessary to withhold anticoagulant or antiplatelet therapy for a routine tube change.

Recommendation 8: Consider discontinuing proton pump inhibitors 24 hours before the procedure, as their use may be associated with a higher rate of infection. A prophylactic dose of intravenous antibiotics 30 minutes before the procedure is usually prescribed. Nasopharyngeal decontamination of MRSA carriers may be requested.

Suspension of proton pump inhibitors (PPIs) 24 hr before the procedure reduces the risk of peristomal infection.[25] In the literature review conducted by Im et al. (2014), PPI use has been shown to inhibit neutrophil bactericidal activity, increase bacterial translocation, and promote the growth of gastric microflora. Moreover, the risk of wound infection after PEG placement has been shown to increase when the gastric acid level is low.

The use of a prophylactic dose of antibiotic prior to the percutaneous feeding tube placement procedure has been recognized for several years as an effective strategy to decrease the risk of postoperative infections.[20,25,151] This is especially true when the procedural intervention uses the oral route.[29] In this regard, a 2009 Cochrane review collecting 10 randomized controlled trials (*n* = 1,100) calculated a relative reduction in infection risk of 19% for those receiving antibiotics.[152] Alternatively, the administration of a cotrimoxazole solution in the tube after installation is possible, if antibiotic prophylaxis could not be offered.[25] The use of such prophylaxis is also successful in the paediatric population.[66] The doses are to be specified according to the target population.

Nasopharyngeal decontamination of MRSA carriers is indicated according to local health care organizational policies,[25,31,111] if so, it is usually started in the days prior to the procedure.

Finally, when shaving is necessary, the use of electric clippers is preferred to avoid unnecessary trauma to the skin,[3,25] which could promote the development of local infectious foci. A checklist can facilitate compliance with the various preoperative steps.

Recommendation 9: Consider disinfecting the oropharyngeal cavity with an oral antiseptic solution 30 minutes before the procedure when feeding tube installation involves the oral route.

In the minutes before the procedure, when it involves passage by the mouth, it may be necessary to clean and disinfect the oropharyngeal cavity. To do this, dentures should be removed, and secretions aspirated if present.[60] This disinfection decreases the bacterial load. To be effective it must be done within 30 minutes prior to the procedure using an oral antiseptic solution.[3,25,26,61,117,132] Using a solution as a gargle is generally adequate but should be reserved for individuals who are able to spit it out. If for cognitive or pathological reasons, the individual cannot perform the gargle without risking pulmonary aspiration, the use of a sponge-mounted wand is preferred to perform the disinfection.[18] As noted by Roveron et al. (2018), systematic reviews done on oropharyngeal cavity disinfection involve mechanically ventilated populations and not populations with feeding tubes.[3] However, because the observed 40% decrease in bacterial load is large enough to significantly decrease the risk of pneumonia compared to simple tooth brushing,[3] this preprocedural step may be relevant when placing a feeding tube via the transoral route.

SECTION 3 – CARE

Immediate Postoperative (up to 7-14 days)

Recommendation 10: Provide standard postoperative care and monitoring of the tube insertion site and peristomal skin for the first 7 days.

The placement of a percutaneous EFT is an invasive procedure that, like all operative procedures, requires close monitoring in the hours following the procedure. Thus, the assessment of vital signs will follow the postoperative protocol of the institution. Specific monitoring of the feeding tube is merged with the usual surgical site monitoring: integrity of the peristomal skin and skin around the sutures (when present), as well as the quality and quantity of drainage. A healthy, normal EFT insertion site should have the same colouring and temperature to the touch as the rest of the individual's skin, be dry, and free of discharge, crusting, or bleeding.[9,25] The same applies to the surrounding skin. See the recommendations on complications if this is not the case (see Complications section 4).

Because of the distension of the stomach caused by air being pushed into it during the procedure, many people complain of abdominal discomfort after percutaneous FT insertion. Adequate pain control remains a priority after the procedure.[32]

As soon as the postoperative dressing has been removed, i.e., at least 24 hours after the intervention, clean the insertion site daily with a sterile solution such as normal saline. In the absence of normal saline in the community, it will then be necessary to clean with boiled and then cooled drinking water. The cleaning is done from the tube, towards the periphery. A sterile swab or gauze pad can be used, taking care not to reuse the section of gauze or swab that has already touched the skin. Clean in this way until the 7th postoperative day. After this time, follow recommendation 18 (see Routine care section).

Some authors mention the use of antiseptic agents (e.g., chlorhexidine, povidone-iodine) for cleaning the tube insertion site during the postoperative period to help keeping it dry. However, these agents delay the healing process and are generally not necessary.[16,29,70,83,102,127] They should not be used in a preventive setting; rather, they are useful in a treatment setting for infection (see Complications section 4).

In general, suturing the rim of the external retention device to the skin is not recommended due to the minor complications associated (e.g., ulceration and local site infection), see Figure 20.[18]

During the healing period, anchoring sutures, or fixation or stabilization systems

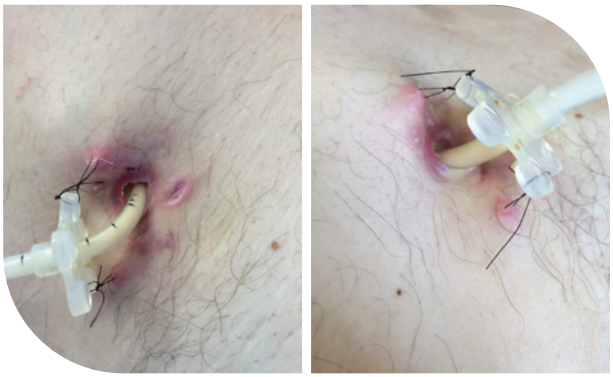
have been installed to avoid tube movement and prevent accidental removal.[70,78,139] Transabdominal T-fasteners allow the stomach wall to be in close contact with the abdominal wall to promote gastropexy.[72] Although their presence may disturb the patient or those close to him/her, it is important to keep the insertion site clean. Gastropexy is also promoted by the combined action of internal and external retention devices, which hold the stomach wall to the abdominal wall.

Although the standard for removal of nonabsorbable sutures in the surgical setting is 10 to 14 days.[73] It is generally necessary to leave anchoring sutures in place for longer to allow gastropexy, especially in clients with slowed healing processes.

If there are signs of inflammation, absorbable sutures still present after 14 days should be removed.[†]

It is important to remain vigilant about the removal of anchoring devices. Some FT are designed with a retractable loop (pigtail style) internal retention device.[98] These often have a nonabsorbable suture that holds the loop in its curved position, preventing tube expulsion. It is important in this case not to remove this suture. This adds to the arguments for the importance of knowing the type of EFT in place.

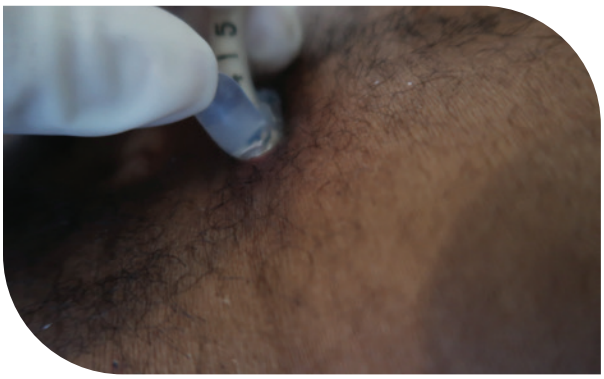
Figure 20 *Complications Associated With Nonabsorbant Sutures of the External Retention Device*



Recommendation 11: Maintain, upon installation, approximately 5 mm between the external retention device and the surface of the abdomen or between the feeding button and the abdomen.

The recommended distance between the external retention device and the abdominal skin varies in the literature consulted ranging from a minimum of 2 mm to a maximum of 20 mm, with the majority being between 2 and 5 mm.[3,15,18,35,62,70,98,149] These few millimeters of clearance are important in the immediate postoperative period to allow normal postoperative edema to establish itself without causing excessive tension on the external retention device.[24] On the other hand, it is not uncommon for postoperative edema to be significant enough to make the external retention device too tight. It is then necessary, when possible, to move the external retention device along the tube to regain approximately 5 mm of clearance, see Figure 21.

Figure 21 *External Retention Device too Tight Postoperatively*



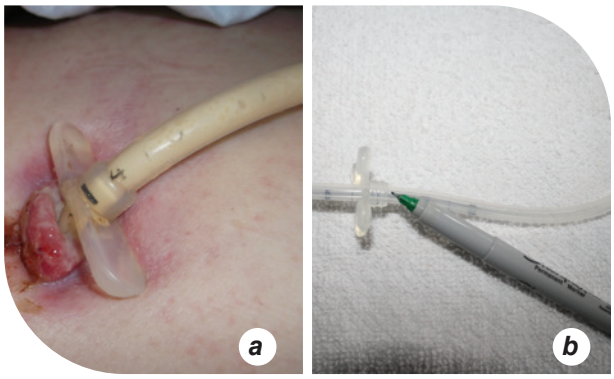
Note. The external retention device is very tight on the abdomen, there is no clearance space.

A tube held too tightly to the abdomen creates pressure that can lead to tissue necrosis, pressure injury, hemorrhage, or buried flange syndrome.[3,15,29,35] However, if this distance is too large, the process leading to gastropexy (attachment of the stomach wall to the abdominal wall) will

not occur properly.[24] This explains why a percutaneous EFT removed (voluntarily or not) before the gastropexy is completed can have serious consequences such as gastric fluid leakage into the peritoneal cavity, peritonitis, and even septic shock. Individuals with prolonged healing time (e.g., severe malnutrition, chemotherapy, corticosteroid therapy) are more likely to experience this complication because the gastropexy healing process is prolonged.[13]

If the tube is held too loosely, it may move freely, which promotes involuntary, early, and repetitive tube movements. This can not only cause pain, but also interfere with the gastropexy phenomenon and the formation of the stoma track.[15] These repeated involuntary movements of the tube can also widen the path of the feeding stoma, leading to leakage of gastric contents, infection or hypergranulation at the insertion site. The external retention device should therefore be neither too tight nor too loose. It is advisable to note the position of the external retention device on the tube. If it is graduated, the measure should be noted in the file and the information given to the person. Tubes that are not graduated should be marked with indelible ink, which will be helpful when routine care begins.[3,70] Note that the graduation on a new tube will eventually fade (Figure 22), it is safer to mark the tube regularly with indelible ink. The marking should be just above the retainer when the 5 mm distance is properly adjusted.

Figure 22 *Marking the Position of the External Retention Device*

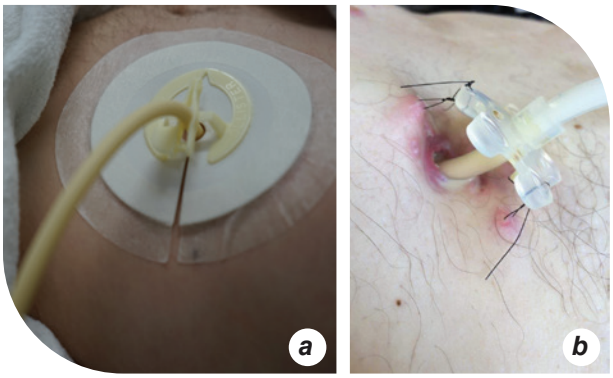


a) graduation partly erased, b) use of indelible ink to mark the position of the external retention device

Recommendation 12: Maintain the feeding tube at 90° to the surface of the abdomen.

To avoid stoma enlargement, it is important to keep the tube at a 90° angle to the surface of the abdomen. It is sometimes necessary to use fixation systems that stabilize the tube at this angle, see Figure 23. When the tube is not held at 90° it distorts the opening of the fistula track that widens and may cause gastric contents to leak.

Figure 23 *Feeding Tube Stabilization*



a) tube held at 90° to the surface of the abdomen by a fixation system, b) tube not held at 90° that caused stoma enlargement.

Recommendation 13: If there are no complications, gastrostomy tube use in adults can be started 2-4 hr after placement and after 4-6 hr in paediatrics.

In adults, the percutaneous gastrostomy tube can be used (feeding and medication) within 2-4 hr of insertion, but it is recommended to ensure that there are no early complications, especially bleeding. The average waiting time reported in the literature is 4 hr, which is considered early feeding. In children, the suggested delay is 4 to 6 hr.[18] This delay allows for sedation or anesthesia to dissipate.[55] It is often suggested to start with an irrigation of the tube with 30-50 ml of sterile water, in paediatrics volume in generally smaller. If pain is present, have the individual reviewed by the physician in charge of the procedure.[55] But there is no evidence to support testing with water before starting enteral nutrition via gastrostomy.[15,58]

When feeding early via a gastrostomy, no significant differences in local infections, diarrhea, bleeding, gastroesophageal reflux, fever, vomiting, stomatitis, leakage, and death were observed in adult individuals.[26] Studies show that similar results are observed in children.[74] In addition to being safe and well tolerated, early feeding has the benefit of reducing costs and decreasing hospitalizations.[26] In 2019, Shellnut conducted a systematic review of the literature regarding the safe time to device use through an EF site.[75] As a result, the author was able to conclude that early initiation of feeding and use of the gastrostomy tube for medication within 4 hr of placement is safe and secure.[75]

For jejunostomies, the initiation of feeding should be gradual over a variable period of approximately 6 days. Usually, the first 24 hr are spent with water administration only.[15] When postpyloric feeding is initiated without the need for an intestinal procedure (e.g., insertion of a jejunostomy tube via a preexisting gastrostomy tube), the risk of ileus is significantly lower, allowing for more liberal administration of EF.[15]

Recommendation 14: Mobilize the feeding tube on a regular basis. The technique varies depending on the type of tube in place. The timing of the mobilization may vary.

Mobilization of feeding tubes is a critical element of care for the prevention of buried bumper syndrome (BBS); see Complications section. It is essential to know the type of tube in place before mobilizing it, as the type of tube will dictate the mobilization technique. It is important not to rotate a jejunostomy or gastrojejunostomy tube as this can perforate the bowel or can displace the inner end of the tube.[3,22,70,79,137]

The frequency of feeding tube mobilization found in the literature varies from once a day to once a week.[61,63,70,72,90] Tubes that terminate in the stomach should be moved back-and-forth as well as rotated (Table 5). This helps maintain patency of the tract, and the back-and-forth movement of the tube helps relieve pressure on the gastric mucosa to avoid complications.[18,62,149]

Several authors report that the start of tube mobilization should be 7 to 10 days after installation, while healing is sufficiently initiated.[63,72] Keep in mind that this period may be longer in certain clinical situations (e.g., oncologic treatments that delay the healing process). This simple procedure is essential to prevent the BBS (see Complications section 4). When an anchoring system or sutures are in place, mobilization of the tube can only begin once they are removed, see Table 6.

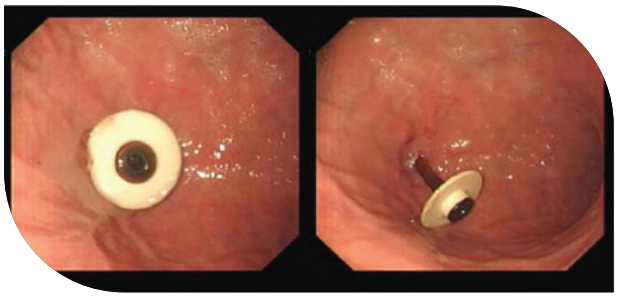
Table 6 *Gastrostomy Tube Mobilization*

- Ensure that the tube is a G-tube and NOT a G-J-tube or a J-tube or PEG-J.
- Make sure that the external retention device is not sutured to the skin.
- For enteral gastric feeding tube mobilization, move the external retention device (minimum of 2 cm) so that the tube can be pushed into the stomach. These centimetres of clearance ensure that the internal retention disc does not rub on the stomach wall when it is rotated.
- The recommended depth of the back-and-forth movement varies in the literature, a minimum of 2 cm is recommended.
- Once the tube has been pushed inward, rotate it 360° on itself.
- Once the rotation is complete, return the tube to its original position and replace the external retention device so that there is sufficient space (approximately 5 mm) between the abdominal wall and the device, but no more.
- There should be no sign of pressure on the peristomal skin. If necessary, adjust the external retention device. The length of the externally visible tube may vary depending on whether the patient is lying supine or seated.

Source. [15,35,98]

Rotating the feeding tube without first advancing it into the abdomen will not prevent burial of the internal retention disc (Figure 24). It is the action of moving the internal retention device away from the gastric mucosa (to ensure that it is free) that is most important.[76] This clears the tube from the gastric or intestinal mucosa.[77] If the back-and-forth movement is shallow, there is a risk of mobilizing only the abdominal wall during tube rotation.[10,15,17,28,35,72,78,83,102]

Figure 24 *Internal Retention Device Pushed Into the Stomach Before it is Turned*



For feeding tubes that go to the jejunum (J-tube or G-J-tube) the back-and-forth movement is the only one that is allowed, since the rotation of this long and thin tube in a narrow space may cause trauma to the intestinal mucosa, see Table 7.

Table 7 *Jejunostomy Tube or Gastrojejunostomy Tube Without Anchoring Sutures Mobilization*

- Ensure that the EFT is a J-tube or G-J-tube.
- To mobilize the J-tube or the G-J-tube, move the external retention disc (minimum 2 cm) to allow the tube to be pushed into the stomach.
- The recommended depth of movement back-and-forth varies in the literature, a minimum of 2 cm is recommended.
- Once the tube has been pushed inward, return the tube to its original position, and replace the external retention device so that there is sufficient space (about 5 mm) between the abdominal wall and the device, but no more.

Source. [15,35,98]

In general, balloon-type internal retention devices (see Figure 8) are at less risk for buried flange syndrome than disc or dome-type devices (see Figure 9). As a result, balloon low-profile feeding devices, which cannot be pushed far into the abdomen because of their short length, do not have more buried flange syndrome than other types of tubes. However, it is still necessary to push the low-profile feeding device slightly before turning it to still allow for minimal clearance of the gastric mucosa. In addition, checking the amount of water in the balloon every week, and thus deflating and reinflating the balloon, helps to relieve the pressure on the gastric wall (refer to Recommendation 22).

Recommendation 15: Leave a semiocclusive dressing in place at the insertion site for a minimum of 24 hr. If there is no discharge, the site can then be left open to the air.

The use of a postoperative dressing helps to keep the site dry to decrease skin irritation and prevent the development of hypergranulation (see Complications section 4). The literature consulted varies on the duration of the use of a postoperative dressing, ranging from 24 hr to 14 days.[16,26,80,81,83,84] For closed surgical wounds, maintaining a semi-occlusive dressing for the first 24-48 hr allow for protection of the surgical site and absorption of discharge as needed.[82,153] The use of such a semi-occlusive dressing could also be considered in the immediate postoperative period during the placement of a feeding tube.[†] In addition, conventional gauze pads tend to adhere to moist wound beds, leaving debris upon removal.[70,78]

To avoid too much traction on the internal retention device of the tube (in the stomach) it is not recommended to place the dressing under the external retention device (the one visible on the abdomen) without changing the fit of the latter. The goal is to maintain a clearance of approximately 5 mm between the external retainer and the skin surface or dressing when the latter is required.

Some authors propose specific types of dressings such as hydrogel and glycerine-based dressings which help maintain controlled moisture at the insertion site to optimize healing.[15] However, these types of dressings often have limited absorption capacity and are too occlusive, which can cause maceration and promote the development of mycosis. Dressings without vertical absorption capacity cause longer contact with gastric secretions, when present. A few authors also report the use of a sanitary pantiliner type cut in half and split down the middle.[112,154,155] This option, if considered, should be a last resort, for financial reasons and/or unsuccessful attempts to manage discharge, and it is necessary to bear in mind that such products can cause maceration. †

Recommendation 16: If there is no peristomal inflammation, a shower is allowed one week after the procedure. For bathing, wait until the ostomy tract has healed.

While some authors state that showering is allowed after a minimum of 48 hr,[20] the majority of literature recommends waiting 7 days.[76,80,81,90]

The time to heal the path of a new feeding stoma varies greatly in the literature ranging from a few weeks to 3 months.[16,20,24,26,67,76,80,81,90] Indeed, comorbidities such as concomitant malnutrition, the presence of ascites, or steroid treatment prolong the healing process.[24] Therefore, it is important for the clinician to use judgment and consider the overall health situation of the individual to establish a safe and appropriate intervention plan based on the individual's healing abilities. For example, bathing or swimming, usually allowed once healing is complete, may, in a person with an oncologic diagnosis undergoing chemotherapy, result in having to wait 8 to 12 weeks before being able to bathe or even shower.[80]

Recommendation 17: Provide documentation at discharge on routine enteral feeding tube care. This documentation should include the specifics of the type of tube installed, who to contact in case of an emergency and the date of the first follow-up.

The person and his or her next of kin should receive a document detailing the specifics of the tube installed. This document should contain in addition to the date of installation the following: type of tube, size, length of tube visible above the skin, type of internal retention device, the presence or absence of sutures and whether or not they are absorbable, and volume of water used if applicable. An emergency contact number is also highly recommended.[3,48,67,93] This information will be useful for purchasing supplies and will greatly facilitate subsequent follow-ups.

Creating a teaching booklet not only serves as a reference for the individual and significant others, but also standardizes the essential teaching points that need to be addressed, regardless of the resource person who is present when it is given.[64]

One study also reported a significant decrease in emergency room visits for those with regular follow-up at 1 month, 3 months, and 1 year after the initial insertion procedure.[156] Few articles address the need for routine follow-ups for individuals with EFT. When this is discussed, it is suggested that at a minimum, an annual follow-up appointment, in person or by phone, with a competent resource person be offered to ensure the integrity of the insertion site and tube.[41]

Finally, at the time of discharge from the hospital, it is important to validate with the nutritional service the equivalence of enteral formulas. It is possible that a long-term care centre may use a different type of formula than that provided in an acute care setting. It is important to ensure that the transition is seamless for the individual.[157]

SECTION 3 — ROUTINE CARE AND MONITORING

Recommendation 18: Clean the stoma, equipment and peristomal skin daily, and inspect their integrity.

Adherence to the instructions surrounding routine care generally prevents many complications (see Complications section) or at least allows for early intervention when the first clinical signs of a complication are detected.

Daily cleaning of the ostomy site allows individuals to observe the site and identify signs and symptoms of infection early.[3,15,17,69,78,80,89,90,102] In addition, cleaning reduces the microbial load and removes contaminants from the site.[93] It is best to clean the site starting at the skin and continuing away from the tube to decrease the risk of contamination of the insertion site. Antiseptic solutions should be avoided as they can lead to complications such as dry skin and irritation.[78,80] Ostomy care can be done directly in the shower with a pH-balanced soap (pH around 5.5) when the postoperative period is over (see previously).

To prevent the proliferation of pathogens, creams and powders should be avoided in and around the insertion site.[3,20] These products make the skin more permeable increasing its susceptibility to irritation.[76]

Recommendation 19: Continue oral hygiene, even in individuals who receive all nutrition and hydration through the feeding tube.

The oral cavity contains a significant number of microorganisms that proliferate in this moist and warm environment. The lack of oral care further encourages the proliferation of these microorganisms, which can become a source of infection.[94]

The risk of oral hygiene deficiencies increases in the presence of dementia, dependence on others for activities of daily living, mental health problems, treatment for ENT cancers, and the presence of an EFT.[94] It is therefore important to explain to the individual and significant others the importance of maintaining healthy oral hygiene habits, despite the presence of a feeding tube.

Recommendation 20: Wait for healing of the ostomy tract before replacing a feeding tube. It is imperative to know what type of tube is in place before attempting to remove or replace it. The first change should be done by qualified personnel with specific skills. The individual or their significant others can do subsequent replacements according to their skills and abilities.

The first percutaneous tube change should be performed within 4 to 12 weeks after the insertion of the feeding tube in both adults and paediatrics. The change is usually done between 4 weeks and 8 weeks, with changes at 12 weeks usually done in those with slower healing processes.[35,69,70,95,98] Some practitioners prefer

to routinely wait until 3 months to ensure that the ostomy tract has healed, and the stomach wall has attached to the internal abdominal wall (gastropexy).[16,20,26] Each health care organization's protocols may vary widely in terms of the qualified person authorized to perform the first feeding tube change. Risks associated with early replacement of the standard-length tube include the creation of a false path leading to perforation. This false path can lead to leakage of gastric contents into the peritoneal cavity during tube replacement, ultimately resulting in peritonitis.

Kinikini & Fang (2021) explain that manufacturer's IFU recommend regular replacement every 4-6 months for balloon devices and every 6-12 months for nonballoon devices.[41] However, these can remain in place for up to 2 years.[84] These scheduled replacements can prevent unexpected displacement or removal of the tube.[83,118] Importantly, however, the scientific community disagrees on the predetermined change frequency, which other authors have suggested does not limit complications.[35,70,98] Thus, the current standard of care is rather poorly defined, and the tube remains in place until it is dysfunctional or according to manufacturer's IFU or local health care policy and procedures without neglecting the clinical judgment of the nursing staff.[16,20,26,35,41,70,95,98]

A team of researchers in England specifically looked at the longevity of gastrostomy devices.[158] This retrospective study (*n* = 277) found that the longevity of a PEG was 95.1% of cases at 1 year and 5 years in 68.5% of cases. In addition, age of the individual (<70 years) was a significant predictor of low PEG longevity.[158]

There is a slight variation of 1-2 months in the suggested time frames for regular, planned changes in the literature.[16,83] It is advisable to discuss the frequency of planned tube changes with an expert depending on the tube model used.

Percutaneous gastrostomy tube changes are only possible if the internal retention device is flexible and collapsible, such as with a balloon or as a dome that is flexible enough to bend under pressure. If the internal retention device is rigid, it cannot be removed through the gastrostomy tract. It is essential to know the tube's type of internal retention device in place, and consult the manufacturer's IFU before attempting removal.[97]

The first feeding tube change is an ideal opportunity to provide education on how to proceed to the individual and significant others. A balloon gastrostomy tube can be changed by a significant other or caregiver once the tract has matured and when adequate knowledge and skills has been obtained, see Checklist 1.[41,84,119,132,159]

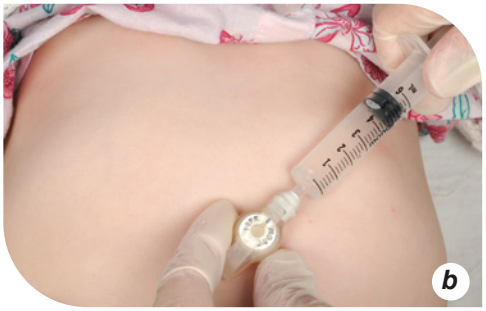
A percutaneous EFT with a soft non-inflatable retention device can be permanently removed by the nurse with the knowledge and skills to do so.[5,26,41] However, replacements of nonballoon EFTs with another nonballoon EFT, which can cause more discomfort and pain,[41] are performed by members of the medical profession. The nurse can, however, replace a nonballoon gastrostomy tube with a balloon EFT according to the protocols in place in the organization.

Checklist 1 *Planned Change of Flexible Internal Retention Device Gastrostomy Tube*

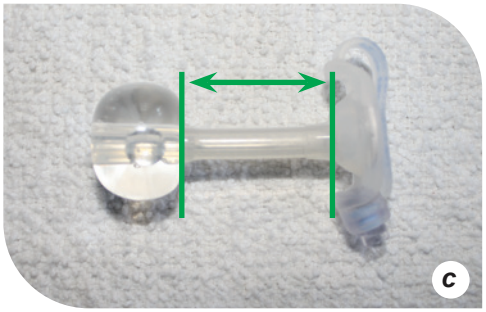
Removal

- avoid administration of enteral feeding 4 hr before the procedure, and water administration 2 hr before the procedure, only essential medication should be continued;
- perform hand hygiene and use appropriate personal protective equipment;
- ensure that there are no local signs of infection. If this is the case, the replacement tube will be considered contaminated once put in place, even if new. It will then need to be replaced once the infection has been treated and resolved;
- clean the site to remove any residue or crusts;
- if replacing a feeding tube with a balloon, check the balloon of the new tube for leaks by injecting water to ensure that there are no defects. Remove the water (see photo a); if the procedure causes anxiety, take the necessary pharmacological and non-pharmacological measures;
- make sure you have all the necessary equipment before starting;
- ask the person to lie down;
- if possible, move the external retention device away from the abdomen (does not apply to low-profile devices);
- move the tube back-and-forth to ensure that the internal retention device is not buried. If it is, discontinue the procedure and seek prompt attention of a doctor ;
- return the tube to its original position, making sure that there is no play between the internal retention device and the inner wall of the stomach;
- mark the tube at the skin level. This will be helpful in selecting a tube length that is well suited to the gastrostomy path if a low-profile device is desired;
- deflate the balloon of the existing device, if it has one (see photo b);
- grasp the tube firmly near the stoma with the dominant hand;
- cover the site and the dominant hand with a washcloth (to protect from splashing) and slowly pull the tube out using a firm, steady pull;
- simultaneously apply firm counterpressure to the abdomen with the nondominant hand;
- maintain a movement parallel to the stoma path, do not bend the tube;
- if there is significant resistance, stop, reposition the tube to its original position, reflate the balloon if necessary, and promptly consult a doctor;
- measure the length of the tube that was in the tract of the gastrostomy (see photo c);
- discard the tube according to the organization's policy and procedures; and
- clean the skin and stoma to remove gastric secretions.

a) checking the tightness of a button's balloon



b) removal of water from the balloon of a low-profile type device.



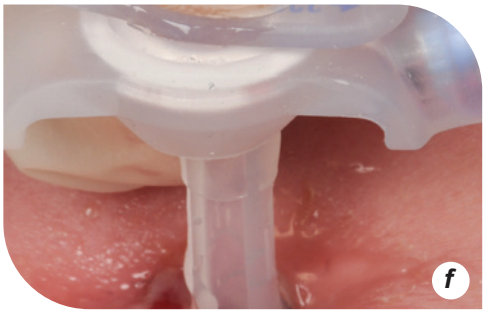
c) length measurement of the low-profile device.

Note. Many types of tubes have retractable devices (e.g., dome) that are flexible enough to collapse on themselves as they pass through the gastrostomy track.

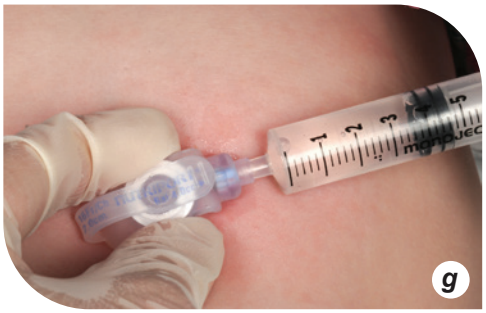
Insertion

- lubricate the end of the new device with a water-soluble lubricant, preferring the use of a single-use sachet (see photo d);
- insert the new device gently at the same angle as when the old tube was removed (see photos e and f);
- do not force it, if there is resistance, consult a health care professional immediately;
- for a standard-length tube, continue insertion to the length estimated when the old tube was removed;
- if it is a soft, collapsible internal retention device (dome), the new tube should rotate freely once it is in the stomach;
- if it is a ballooned retention device, push in about 2 cm more and use the recommended amount of sterile water to inflate the balloon (see photo g);
- if the patient complains of pain while the balloon is being inflated, stop and deflate the balloon completely. The tube may not have been pushed far enough, or there may be a false path. In the latter case, consult a doctor immediately.;
- position the external retention device to allow approximately 5 mm of clearance with the skin. Mark the new tube above the retainer for future verification; and
- verify that the distal end of the new tube is in the stomach before use.

d) lubrication of the end of the new device.



e) and f) insertion of the new device.



g) balloon of the new device inflated with the required amount of water.

Source. [3,5,97]

When replacing a feeding tube with a flexible but noninflatable internal retention device (e.g., dome), it could happen that the device breaks and detaches from the tube, causing it to remain in the stomach while the tube is pulled out.[41] The course of action will depend on the risk of bowel obstruction (e.g., bowel stricture, or history of bowel surgery), the condition of the individual, and the size of the device that will be expected to be passed with the stool.[72] If the risk of obstruction is deemed too great, the retention device will need to be removed endoscopically.

It is recommended that the position of the new gastrostomy tube be checked when it is replaced. The gold standard method for confirming the position of a replacement gastrostomy device is radiology or endoscopy.[3] Radiological method creates overexposure to radiation and remains inconvenient, time consuming, and expensive. Both radiology or endoscopy are not feasible once the individual is in the community.[84] Confirmation of replacement gastrostomy tube position in a mature stoma should ideally be done using, when possible, the four recognized bedside methods, see Checklist 2, despite the limitations of each.[21]

Air insufflation and auscultatory methods are unreliable. Although these are widely practiced methods, especially for tubes passing through the nose, their reliability is considered questionable and are not recommended.[58,160]

The reliability of tube location verification methods increases as the verification combines several of these methods.[84]

Checklist 2 *Methods for Verifying the Location and Patency of the Tube*

Location	Limitation
• Aspiration of gastric contents and verification of staining: ° gastric fluid is usually cloudy and greenish; ° intestinal fluid is usually biliary (yellowish); and ° fluid may also be the colour of enteral feeding.	• Failure to obtain gastric contents by aspiration does not always indicate that the tube is in the wrong position.[18]
• Checking the pH of the gastric contents (pH of 5.5 or less = stomach; pH of 6 and above = jejunum) using colorimetric strips with a gradation of 0.5 (see Checklist 3)	• Measuring the pH of the gastric residue is not as reliable if the individual is using a medication that decreases gastric acid secretion or is receiving continuous EF.[18]
• Assess the external length of the tube. The length should match the length noted or marked on the tube.	• The external tube length measurement does not apply to low-profile devices.[18]
Patency	**Limitation**
• Tube patency during irrigation with 30 to 50 ml (lower quantity in paediatrics) of sterile water.	• There should be no resistance or leakage around the tube. This method does not make it possible to say where the end of the tube is (stomach or intestine) but makes it possible to ensure that the end is permeable, which for example would not be the case in the case of a syndrome of the buried flange (BBS).

Source. [3,18,115]

Checklist 3 *Checking Gastric pH*

- Before performing the gastrointestinal secretion pH check, feeding should be discontinued for 15 to 20 minutes.
- Place the individual in a left-side supine position, as tolerated. This position optimizes aspiration of gastric contents.
- Before collecting gastrointestinal secretions, aspirate 10 to 30 ml (in adults) of air into a syringe and flush the tube with air to confirm that the tip is not embedded in the gastrointestinal mucosa.
- If there is no resistance during this step, gently aspirate gastrointestinal contents (adult: 5 to 10 ml; children and neonates: 0.5 to 1 ml).
- If no gastric contents are drawn into the syringe, mobilize the tube by pushing it a few cm toward the interior of the abdomen and try again (this type of mobilization is not possible for a low-profile device).
- Visually assess the contents, noting colour, consistency, and odour.
- Gastric contents usually appear cloudy and green, and small bowel secretions are often yellowish/orange.
- Gastric aspiration that is red or dark brown in colour or has the appearance of coffee grounds indicates bleeding and should be reported immediately to the treating clinician.
- Test the resulting fluid with a pH strip with a gradation of 0.5 (Figure 25).
- A pH between 1 and 4 suggests that the tube is in the stomach. A pH between 4.1 and 6 is typical of the stomach of someone taking PPI or other stomach acid-reducing medications, or who is receiving continuous feeding.
- A pH of 6 and above indicates that the tube is probably in the jejunum.
- If the pH result is outside the desired target values, an X-ray is recommended.
- If the pH is normal, flush the feeding tube with 30 ml of water in the adult, and the recommended amount depending on the age of the child.

Abbreviation. PPI = proton pump inhibitor. *Source.* [21,88,122,161]

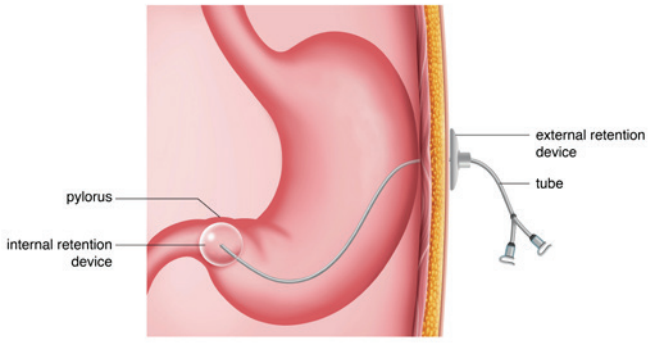
Figure 25 *Example of Colorimetric Strips for pH Measurement*

In infants and neonates, the pH test may be invalid due to gastroesophageal reflux or the buffering effect of milk.[149] In addition, neonates have a temporarily higher pH as a result of swallowing amniotic fluid, and it is important to remember that preterm infants have difficulty producing gastric acid.[161]

While the pH test of gastrointestinal aspiration is valid for predicting the position of the feeding tube's end, this method is insufficient for detecting retrograde feeding tube movement into the esophagus or at the gastroesophageal junction or anterograde migration in the pylorus, see Figure 26.[162] The pH test combined with tube length measurement is more reliable. For this reason, it is necessary to measure and mark the visible length of the tube immediately after placement. To prevent the mark from fading too quickly, mark the tube

above the external retainer when it is snugly fitted at about 5 mm from the surface of the abdomen. The mark should be made with indelible ink. If the length of the tube changes, the tube may have migrated.[71] However, it is important to validate that the individual has not recently gained weight, because if this is the case, the tube length will probably have changed without it being a migration of the tube.

Figure 26 *Migration of Feeding Tube*

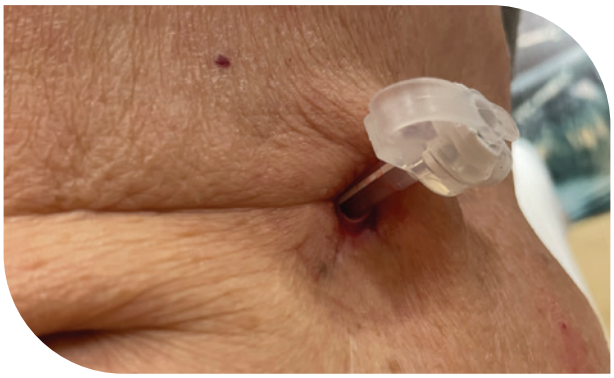


If there is any doubt about the position of the replacement tube, a radiological check is necessary. An X-ray is also recommended when there is resistance or multiple attempts are required to reinsert the tube or device.[18]

Recommendation 21: When the outer portion of the tube feels tight on the abdomen, ensure that the section inserted into the tract matches the thickness of the abdominal wall, especially when a paediatric is growing or gaining weight. Aim to maintain a 5 mm space between the skin and the tube.

Ideally the length of the stoma tract should be measured every 6 months to verify that the length of tube used is still adequate.[83,119] This is especially true for low-profile devices. Using an inappropriate length can cause buried flange syndrome when the tube is too short and therefore too tight, or a problem with balloon migration into the stomach or intestine when it is too long. Checking the length of the stoma track is especially important in growing children and when there is weight loss or gain in adults, see Figure 27.[159] It is best to always measure the length of the tube in more than one position (e.g., sitting, lying, and standing) and adjust accordingly.

Figure 27 *Too Long Low-Profile Type Feeding Device*

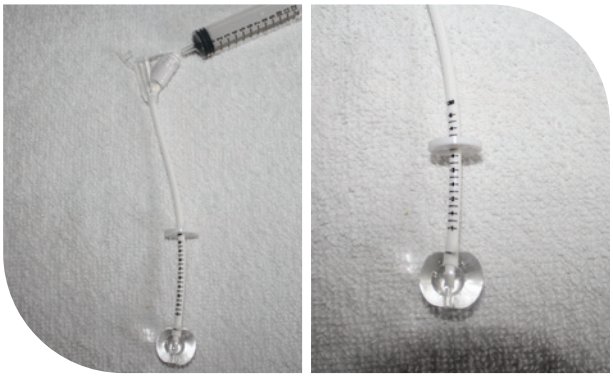


When planned feeding tube changes are scheduled, it is simple to do the verification at that time. If no planned tube changes are scheduled, bi-annual verification is desirable. For standard tubes, it is sufficient to adjust the external retention device, ensuring that approximately 5 mm of clearance is maintained between the external retention device and the skin while the internal retention device is properly adhered to the gastric or intestinal mucosa. To determine if the internal device is properly attached to the mucosa, move the tube back-and-forth. A resistance will be felt when the tube is pulled outwards indicating that the internal device is well attached to the mucosa.

When a low-profile device already in place proves too long, it's relatively simple to mark it, remove it and measure the required length. Graduated guides are available to help with the measurement, especially in the case of low-profile devices that may be too short or too long (see Figure 28). The guide is small-gauge and fitted with an inflatable balloon. It must be inserted (deflated balloon) into the fistula track and, once the estimated path length has been exceeded, the balloon can be inflated, allowing the guide to be gently pulled outwards until resistance is felt. The mobile

disc can be moved to mark the measurement, the balloon deflated, and the guide removed. The reading is taken *under* the mobile disc, and this measurement is used to select a low-profile tube of appropriate length.

Figure 28 *Graduated Guide*



Recommendation 22: May begin weekly balloon seal checks on enteral feeding tubes that have balloons after 4 weeks post insertion.

The frequency of balloon checking is usually on a weekly basis.[78,99] There are ballooned tubes that are installed in the procedure room (initial installation) and for these a delay of 6 to 12 weeks is suggested before balloon integrity checking is started.[80]

Among other things, checking balloon tightness prevents tube loss associated with an under-inflated balloon.[41,91] For a standard-length percutaneous EFT, water loss of more than 5 ml in 7 days indicates the need for tube replacement.[99] Note that the balloons of low-profile devices contain far fewer ml of water than standard-length tubes. Several factors can cause the balloon to leak; balloon porosity, the volume and type of water used to fill it, stomach pH, FE composition and tube maintenance. Saline solution can crystallize and interfere with deflation or cause the balloon to rupture.[3,99] Air should never be used to inflate the balloon since in the event of a leak, the balloon would deflate faster than with water.[99] Additionally, due to the difference in density between water and air, the same amount of air will not necessarily have the same result on balloon size as water.[97] While in an adult, balloon size has little impact on gastric volume, it does in an infant.

Recommendation 23: Change accessories and fastening systems on a regular basis and according to the manufacturer's instructions for use.

There are few recent studies and little consensus for the lifespan, change frequency, and maintenance of accessories (e.g., syringe, extension tubings).[99,100,123,125,163,164] General infection control principles, internal protocols, the clinical judgment of health care professionals and manufacturer's IFU recommendations generally guide the management of these accessories.

Because contamination in the enteral feeding system can occur due to misuse of disposable equipment, (e.g., reuse of syringes that are not made for reuse), it is important to ensure that those responsible for setting up and administering EF are aware of the need to use single-use equipment (e.g., discard syringes after one use according to manufacturer's IFU).[100]

Here are some guidelines on the frequency of equipment changes.

In all cases, accessories that show significant changes in texture (too hard or too soft), are cracked, or filled with deposits, should be changed. Extension tubing and connectors should be changed every 2 months or as manufacturer's IFU.[39]

In neonatology, change extension tubing every 3 weeks.[101]

Extension tubing can be cleaned with dish soap and water.[101] Note that dishwasher soap will produce less foam. Rinsing is essential. To dry, air can be blown in with a syringe. Irrigation equipment (e.g., syringe) should be

changed daily as the administration sets (e.g., bag and tubing).[100-102,120,123] Table 11 provides a summary of the recommended frequency of care.

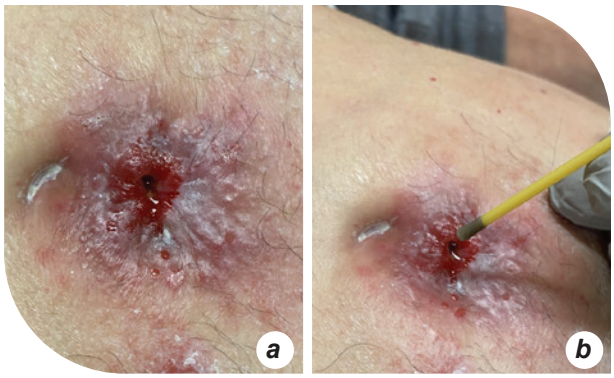
Table 8 *Summary of Suggested Minimum Care Frequencies*

Intervention	Frequency
Clean and inspect the peristomal skin	Daily
Mobilization and rotation of the gastrostomy tube	Minimum: Weekly Maximum: Daily
Mobilization of the jejunostomy or gastrojejunostomy tube	Minimum: Weekly Maximum: Daily
Oral hygiene	Daily
Replacement of the initial tube	4 to 12 weeks after insertion, depending on the individual's ability to heal, the clinical judgment of the health care professional and the protocol in place
Subsequent tube replacements	With balloon: 4-6 months Without balloon: 6-12 months Refer to manufacturer's IFU
Verification of balloon tightness if the device has one	Weekly, from 4 to 12 weeks after initial installation.
Checking the length of the tube versus the length of the path	2 times a year or as needed
Change of fixation devices	As per manufacturers, usually every week
Change of extension tubings and connectors	As per manufacturer's IFU, usually every 2 months for adults and every 3 weeks for paediatrics
Change of irrigation equipment	Daily
Change administration tubing	Daily
Reusable equipment should be washed with warm or hot water and soap and then rinsed, dried, and stored in a cool, dry, covered area.[164]	

Recommendation 24: Apply a semiocclusive dressing following the final removal of a feeding tube.

Once the tube has been permanently removed, the dressing applied to the old tube insertion site absorbs any discharge until closure, which is relatively rapid (24 to 72 hr),[35] especially when the gastrostomy is less than a year old. An old gastrostomy site may not close within the expected timeframe (sometimes several weeks or even months), and in exceptional cases may even require surgery. The daily use of silver nitrate ($AgNO_3$) in the entrance of the old gastrostomy tract can be tried beforehand to stimulate closure (see Figure 29). Physician authorization may be required. Silver nitrate will chemically debride mature tissue to reactivate the healing process.

Figure 29 *Nonspontaneously Healing Tract*



a) unclosed gastrostomy tract 3 months after tube removal, b) silver nitrate treatment to stimulate closer of the tract.

- Here are a few tips to help close a gastrostomy tract:
- remove the FT when the patient is fasting;
- cauterize the fistula tract with $AgNO_3$ as soon as the tube is permanently removed from a gastrostomy that is more than one year old;
- keep as horizontal a position as possible, and limit physical activity for 2 days;
- protect the peristomal skin with a barrier cream and an absorbent product, which should be changed as soon as soiled, and reapply the skin barrier as needed;
- recommend eating more solid foods at the beginning of the meal, and finishing with liquids;
- follow up daily and make sure the person has contact information; and
- consult a surgeon promptly if the fistula path is slow to close.

SECTION 3 — CARE: MEDICATION AND FEEDING

Recommendation 25: Close collaboration between the pharmacist, physicians, and nurses is required before administering medication via an enteral feeding tube, and throughout treatment. Similarly, the collaboration of the interprofessional team involving a dietitian is essential to determine the appropriate mode of feeding administration.

Effective interprofessional communication is closely linked to the safe administration of medication in the EF setting. The role of pharmacists is central to finding solutions in the EF setting.[104] Pharmacists are responsible for providing other members of the health care team with pharmacological information, including the physical and chemical properties of specific medications and their various formulations, as well as interpretation of published data on their stability and compatibility.

For individuals with gastrostomies who are unable to take oral medications, the need for drug therapy as well as alternative routes of administration should be considered before administering medications through the EFT. These alternatives include transdermal, sublingual, buccal, rectal, or injectable medication administration.[106]

The nursing staff as well as the individual and significant other should not navigate this specialty alone.[104]

Recommendation 26: Adhere to the contraindications, interactions, warnings, precautions and prescribed dosage of each medication and their specificities related to enteral feeding.

Close collaboration with the pharmacy team is important in all matters related to the compatibility of EF with medication. This includes contraindications, route of administration, whether to pause the feeding or not before administering the medication.[104] Inadvertent administration of a medication or formulation of the medication through the feeding tube, can result in tube blockage, reduced effectiveness of the medication, or toxicity to the individual.[27]

Most oral medications are absorbed in the small intestine, but for some, the stomach is the target of action and absorption. Therefore, if the feeding tube is placed in the small intestine, some gastric-releasing drugs may have their effects diminished because the stomach is bypassed.[106] These medications include antacids, which neutralize stomach acid, and sucralfate and bismuth, both of which form a protective barrier in the stomach.[106]

When a break in EF is required before a drug is administered, it is intended to prevent drug-nutrient interactions. The length of the preadministration feeding

break depends on the individual drug and whether the drug binds to the formula. EF must in some cases be stopped to allow the stomach or small intestine to digest the enteral formula before the drug is taken.[38] The pharmacist is the best person to suggest appropriate delays depending on the medication to be taken. Not only will this delay, when necessary, avoid interactions between the products in the enteral formula and the medication, but it will also allow for better absorption of the medication.

Recommendation 27: Consider enteral feeding as a medication. Due diligence should follow provincial administration standards.

The administration of enteral nutrition must be done in accordance with the standards of practice for medication administration. The administration of a prescribed substance involves a process that is more than just a technical act. Safe administration requires knowledge, skills, and clinical judgment that combines assessment, monitoring, and follow-up.[108]

Recommendation 28: Administer enteral formula separately from medications. Administer each medication separately. Validate with pharmacy if it can be done otherwise.

Mixing medications intended for administration through a feeding tube is not recommended, as there is a risk of physical and chemical incompatibility, tube clogging, and altered drug responses.[109]

Intermittent feeding has the advantage of administering medications between feeding periods.[104] If the medication is to be taken on an empty stomach, it should be administered at least half an hour before or 2 hr after tube feeding.[89]

Recommendation 29: Administer medication in liquid form when available.

Liquid forms of medications are preferred to ensure that the correct dose is administered and to avoid crushed tablets causing upper gastrointestinal tract irritation, or obstructing the tube.[27] However, the liquid form does not guarantee its compatibility with enteral administration, so it is necessary to check whether the available liquid dosage forms are appropriate for enteral administration.[38] Liquid medications are generally designed for use in paediatric patients. Therefore, large amounts of medication are often required to obtain the desired dose, which may result in intolerance to the excipients.

Elixirs or suspensions are generally preferred to syrups because the latter is more likely to clump when exposed to enteral formula.[106] Many liquid preparations are extremely hyperosmolar or contain large amounts of sorbitol, which increases the risk of gastrointestinal intolerance causing diarrhea.[106] Therefore, it should not be automatically assumed that a liquid formula is compatible with feeding tube administration.[106]

Recommendation 30: Use only sterile water when dilution of medications is necessary. When liquid medication is unavailable, finely crush it only if its solid form allows it before diluting it. Check with the pharmacy if this is not possible.

Crushing and diluting most solid medications prior to administration, renders the medication unapproved as it differs from its original format.[15,107]

Drugs that should not be crushed or opened include modified- or slow-release preparations, enteric-coated preparations, buccal or sublingual tablets, and hormone products.[113] Enteric-coated and extended/slow/release drugs should never be crushed because

crushing the tablet destroys the protective coating, which can lead to unstable blood levels and toxicity. Because these medications are designed to be absorbed in the gut, their presence in the stomach without the protective coating can also cause gastric irritation.[165] Typically, these drugs are accompanied by the letters ER, XR, or XL.[27]

In addition, because the protective coating cannot be ground into a fine powder, it can clog the feeding tube.[109] Capsules with beaded components or enteric-coated microgranules should not be instilled into feeding tubes due to the increased risk of obstruction.[109] In addition, drugs with carcinogenic, teratogenic, or cytotoxic properties should not be crushed due to the release of aerosolized particles that could potentially harm caregivers.[106] The more thoroughly the solid drug is crushed, the easier it is to dilute. This prevents residues from sticking to the feeding tube. Tap water, even if it is potable, should not be used to dilute or dissolve medications because it may contain contaminants (e.g., pathogenic microorganisms, pesticides, heavy metals, or pharmaceuticals). These contaminants may affect the medication during dilution. Only sterile water should be used for diluting medications.[38]

Consider the age and volume status of the individual when determining the volume of diluent (e.g., the volume of diluent should be lower for paediatric doses, using a minimum ratio of 1:1 [drug:diluent]). However, the minimum volume for adult patients without fluid restriction is 5 ml.[38]

Recommendation 31 Respect the frequency of irrigation of the feeding tube according to its use and the mode of administration of enteral nutrition. The individual's condition and age may influence the quantities and products used.

Before administering a medication, rinsing the tube with 30 ml of warm water allows to eliminate all residues of the food product that could have interactions with the administered medication. Considering that water from a water heater is not drinkable, lukewarm water must be obtained by letting boiled water cool to room temperature.

Irrigation volumes depend on the individual's age, number of medications, water requirements, water restrictions, and clinical condition see Checklist 4.[18]

To avoid drug interactions and ensure complete administration of the desired dose, it is necessary to flush the tube with 15 ml of water between each medication.[38,106] Smaller flush volumes may be required in fluid-restricted patients and paediatrics. When multiple medications are administered one after the other, irrigate the tube with 30 ml of water after the last medication is administered.[38,103,106,113]

For unused tubes, minimally daily irrigation is required. Regular irrigation of the feeding tube, whether used or not, prevents occlusions and should be taught to the individual and significant others.[15] When feeding in continuous mode, the feeding tube should be irrigated every 4-6 hr.[3,16,39,161] For other delivery modes (e.g., bolus, intermittent), irrigation is done at the beginning and end of each delivery period.[3,16,39]

Although potable water is generally adequate for tube irrigation, sterile water is recommended for premature infants, neonates, intensive care patients, jejunostomy wearers, immunosuppressed individuals, and for reconstitution of powdered enteric formulas.[38,166,167]

Checklist 4 *Type and Quantity of Water for Irrigation of the Supply Tube According to the Customer*

For tube irrigation, choose drinking water or sterile water depending on the individual's condition.

Hospital: Sterile water is recommended for irrigation in immunosuppressed individuals, paediatrics under 12 months of age and those with jejunostomies or gastrojejunostomies.

Home: For paediatrics under 12 months of age, boiled and cooled tap water may be used for irrigation (i.e., boil on the stove for three minutes then cool).

Tap water from a water supply that is considered fit for human consumption is acceptable for irrigation for most people who are not in these groups. The same is true for bottled water not going through a municipal distribution system, or water from a well fit for human consumption.

Quantity:
Adult: 15 to 30 ml
Child: 3 to 5 ml
Newborn: 1 to 3 ml

Source. [18,38]

Recommendation 32: Keep the individual in a sitting or semisitting position when the feeding tube is used and for 60 minutes after use.

Sitting or semisitting (with the head of the bed elevated 30-45°) during feeding reduces the risk of pulmonary aspiration, reflux and vomiting particularly for gastrostomies. It also facilitates digestion and gastric emptying. The literature gives no clear indications on what to do for EFTs ending in the small intestine, such as jejunostomies or gastrojejunostomies. On the other hand, the pathologies for which jejunostomies are installed are sometimes associated with a drop in sphincter tone (e.g., neurological disorders, gastric carcinoma, etc.), so they are less effective in reducing the risk of reflux. It is therefore preferable to maintain a seated or semi-seated position when using a jejunostomy.[168]

Recommendation 33: Check the location of the internal end of the feeding tube before use or irrigation.

It is recommended to check the position of the tube before each administration of medication.[38] The same is true before starting feeding administration, especially for bolus, and intermittent modes.[38] Verification of feeding tube placement is the responsibility of all who use the tube. After the initial radiology check, subsequent checks can be done by the different ways listed in Checklist 2.

Recommendation 34: Assess the individual receiving enteral feeding to identify signs of intolerance or complications, especially when initiating enteral feeding.

Changes in intestinal elimination, often diarrhea, may indicate EF intolerance.[23] Enteral formula intolerance should be distinguished from inadequate renutrition syndrome, which can cause severe complications and even death.[38] (See Complications section 4.)

Intolerance to enteral formula may manifest as an accumulation of formula in the stomach which may lead to regurgitation and aspiration of gastric contents to the airway. However, this assertion is questioned due to lack of documented direct links between high residual volume and pulmonary aspirations.[169] To assess tolerance to enteral formula, it is still common practice to perform gastric residual volume (GRV) checks every 4-8 hr in individuals who have a feeding tube with the inner end in the stomach. While checking GRV is a simple and inexpensive method, it is imprecise and can be affected by the position of the individual and the diameter of the tube.[169] The acceptable GRV is highly variable according to the literature consulted, ranging from 250 ml to 500 ml, and it is according to this threshold that the decision to temporarily stop feeding is made.[39,120,169]

The controversy surrounding the practice of measuring gastric residue is also supported by the fact that several conditions can cause slowed digestion such as: type 2 diabetes (gastroparesis), history of abdominal surgery, burns, pancreatitis, spinal cord injury, shock, electrolyte imbalances, medications (e.g., sedatives, catecholamines, opiates, anticholinergics, or vasopressors).[169] Temporary discontinuation of feeding in the presence of a certain (often inaccurate and not precise) GRV may lead to the individual's undernourishment especially if the tolerable gastric residual threshold is very low and residual volume checking is done frequently. Indeed, if the GRV threshold value is set at 250 ml, feeding should be temporarily stopped to allow time for the stomach to partially empty its contents. If this check is repeated every 4 hr, it is indeed possible that periods without feeding will accumulate and limit food intake.

In addition, frequent checking of the gastric residue increases the risk of tube blockage,[169] especially if irrigation of the feeding device is not rigorously done after each check. This is explained by the clumping of proteins caused by the contact of acidic substances with the enteral formula. Inevitably, during the verification of the GRV, it is necessary to collect via the tube the contents of the stomach composed essentially of acidic digestive juices and enteral formula. Despite the literature in favour of limiting the practice of measuring GRV, gastric residue testing is a common practice in the health care organization.[170,171] This practice, when specifically requested, should be limited to the period of EF initiation and discontinued once there are no clinical changes, 48 hr after enteral formula is administered at maximum rate.[120,169] It is also important to be clear about what to do based on the measured GRV (reinject via the tube or discard) and what the tolerated residual volume is.

In the absence of symptoms of intolerance, EF should not be withheld when the GRV is less than 500 ml.[171,172] It is important to irrigate after the gastric residual check to avoid the risk of occlusion.[39]

Recommendation 35: Apply the principles of infection control to all steps involved in administering enteral formula.

Hand hygiene is essential for all procedures surrounding feeding stoma care, handling of feeding tube for enteral formula administration, or medication. To reduce the risk of contamination, a closed delivery system may be indicated.[120,123] A closed system takes the form of a prefilled bag, which needs to be pierced with a perforator fitting at the end of an administration tube. The enteral formula of a closed system is not in contact with ambient air. An open system uses ready-to-use formulations in cans or boxes, or as a powder for dilution. These formulas are administered using syringes, for example. The system is said to be open because the formula is in contact with the ambient air during the administration procedure. The type of formula determines the number of hours the formula (and administration tubing) can be used.[120,123] Reconstituted formula is good to administer for

up to 4 hr after reconstitution.[120,123] The ready-to-administer formula should be used within 24 hr of opening the container.[120,123]

Postpyloric EF has an increased risk of gastrointestinal infection because the tube bypasses the natural microbiological defenses of the stomach. Therefore, a noncontact technique should be particularly observed when handling the feeding tube.

To avoid contamination of enteral formula, cans of commercial formula should be wiped with alcohol-impregnated wipes before opening.[125]

When feeding continuously, it is recommended that there be a break of at least 90 minutes per day to allow the gastric pH to return to normal. This is because continuous feeding increases gastric pH, thereby inhibiting its role in preventing bacterial growth.[1]

SECTION 4 – COMPLICATIONS

Percutaneous enteral feeding tubes can cause a variety of complications such as: aspiration pneumonia, bleeding, intestinal perforation, peristomal skin infection, tube breakdown (more common with silicone versus polyurethane tubes), BBS, gastric or skin ulceration, GI tract obstruction, tube displacement, and tube occlusion.[3,24]

These complications can, depending on the literature, be classified as minor or major complications or early or late complications. The major complications presented here are intended to increase clinicians' understanding of them and attempt to provide pathways to prevent and treat them.

Recommendation 36: Identify the cause of the complication, treat it, and implement measures to prevent recurrence.

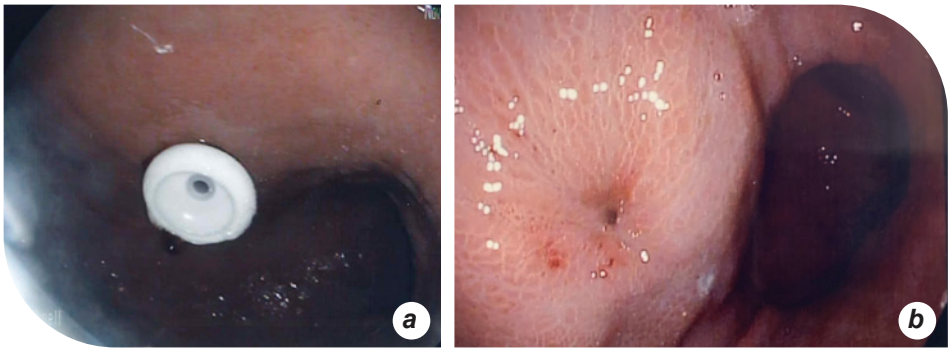
There are several recommendations made in the routine care section to prevent complications. These recommendations will not be repeated here, but rather explained in the rationale section. The recommendations in this section indicate interventions when complications arise.

Buried Bumper Syndrome

Recommendation 37: Be aware of the signs and symptoms of the buried bumper syndrome for optimal management.

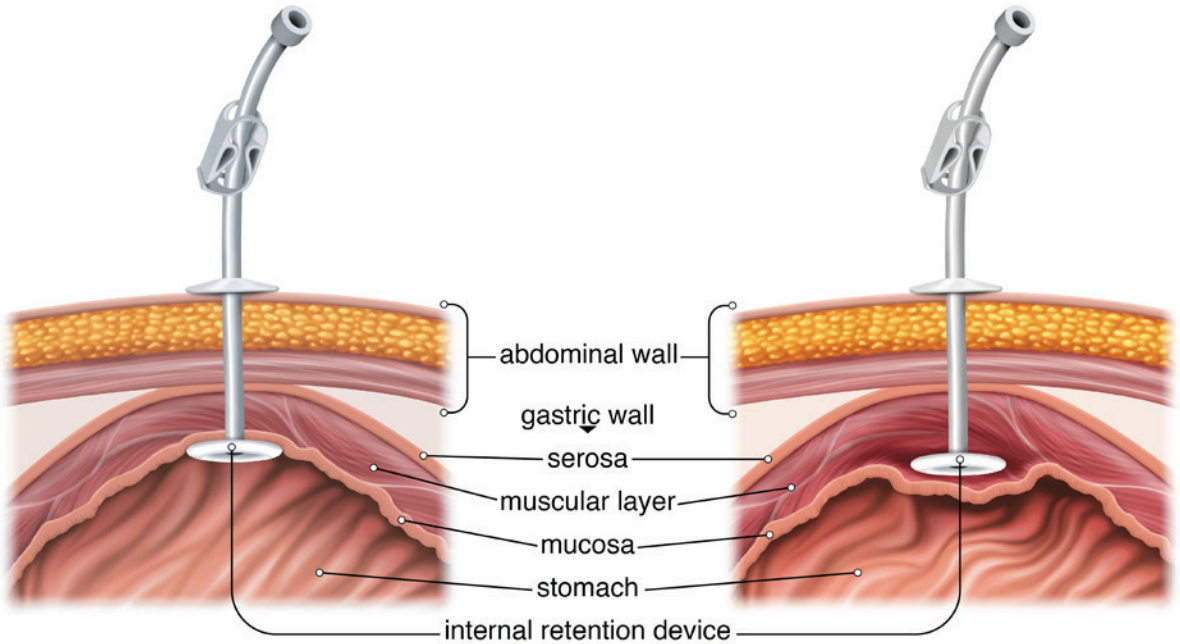
BBS occurs when the internal retention device migrates within the gastric wall to the point of becoming completely covered, blocked, and immobilized by the mucosa of the gastric wall (Figures 30 and 31).

Figure 30 *Buried Bumper Syndrome*



a) Internal retention device clearly visible during installation, b) 6 weeks postinstallation, internal retention device completely buried.

Figure 31 *Internal Retention Disc in Buried Bumper Syndrome*



It is important to recognize this syndrome, which is usually considered a late complication, but can still present after as little as 3 weeks after the installation procedure, see to Table 9.[63]

Table 9 *Signs and Symptoms of BBS*

Signs and symptoms of BBS may include:

- erythema;
- inability to advance the tube in the stomach;
- inability to turn the tube;
- internal device palpable from the outside;
- leakage of administered fluids and/or gastric fluid;
- localized infection;
- pain; and
- partial or complete loss of patency.

Note. Not all signs/symptoms must be present.

Risk factors for the development of BBS are an overly tight fit of the external retention device, or a condition that changes this fit (e.g., application of a thick absorptive dressing without readjusting the external retention device to allow for a gap).[115]

BBS is caused by excessive compression of the tissues between the internal retainer, which is in the stomach, and the external retainer, which is outside the individual's abdomen, suggesting that the external retainer is too tight. Indeed, this is the rationale for regular checking and adjustment of external retention devices.[126] In addition, mobilizing the tube with the proper technique is critical to preventing it, see Postoperative Care section.[63]

If BBS is left untreated, other complications with serious consequences for the individual can occur, including gastrointestinal bleeding, perforation, peritonitis, abdominal wall abscess, and infection.[126]

Recommendation 38: Investigate all cases where buried bumper syndrome is suspected.

To treat BBS, surgical dissection and removal of the in situ feeding device is often required, with surgical closure of the stoma tract and insertion of a new EFT in a new site.[3]

Tube Occlusion

Feeding tube occlusion can be chemical or mechanical.[30,114,117,173] It is essential to attempt to determine its cause.

Chemical occlusions can be caused by:
- inadequate irrigation;
- too frequent measurement of gastric residue;
- tube material (more common with silicone);[106,173]
- calorie-dense or fibre-dense nutritional solution;
- viscous medications; and
- biofilm caused by migration of enteric bacteria into the tube.

Percutaneous feeding tubes are at risk for chemical blockage due to contact between acidic gastric juices and enteral formula.[71,124] Indeed, acidity causes protein agglutination, which leads to the formation of deposits in the tube and often its occlusion. Similarly, the risk of blockage increases when five or more different drugs are administered through the tube over more than 10 days.[105,117]

Prevention of chemical occlusions relies primarily on adherence to routine care recommendations relating specifically to medication administration and adherence to irrigation frequency, see Routine Care recommendations.[3]

Mechanical occlusions can be caused by:
- an accumulation of residue from the administered products;
- tube displacement;
- an improperly inflated balloon;
- a defective tube component; and
- a kink in the end of the tube.[112]

Also, the smaller the tube diameter, the higher the risk of blockages, which explains why PEJs are at higher risk of blockage than PEGs.[7,38,105,117,119]

Recommendation 39: Apply the steps of the feeding tube unclogging procedure in cases of occlusion.

There are two main steps to unblocking a feeding tube. The first step is to irrigate the tube with 15 to 30 ml of warm water and then suck in the same water in a back-and-forth motion, see Checklist 5. In paediatrics and neonatology, it is recommended to use the minimum amount of water necessary to clean the tube. During this technique, it is advisable to compress and roll the tube gently between the fingers on the different parts of the tube that seem blocked.

Checklist 5 *Unclogging a Tube with Lukewarm Water*

- Do not use hot water straight from the tap. Heat drinking water or sterile water in a water bath (depending on the individual's condition).
- Draw up in a syringe:
  - ADULT: of 30 ml, 15 to 30 ml of lukewarm water; and
  - CHILD: of 10 ml, 3 to 5 ml of lukewarm water.
- Bend or clamp the tube or the extension. For the low-profile device, open the cap or open the device and insert the extension tubing. Clamp.
- Clean the tube's tip.
- Screw the syringe to the tube or extension and replace straight the tube or release the clamp.
- Administer the volume of lukewarm water withdrawn and attempt to unblock by gently aspirating the lukewarm water just instilled back-and-forth, avoiding aspirating gastric fluid and without using excessive force.
- Re-administer the aspirated water and leave it for about 30 minutes, repeating the back-and-forth technique a few times during the rest period.
- Repeat the procedure with a new quantity of lukewarm water.
- If effective: rinse the tube with enough luck water (60 ml in adults, however there are no specific data for children) to dislodge the residues.
- If ineffective, try the permeabilizing agent.

Source. [3,22,38,84,114]

Warm water can sometimes dislodge the deposits clogged in the tube. Note that this warm water should not come from the tap, as the risks of contaminating the water contained in a water heater are too great.

The turbulence created by the back-and-forth movement with a syringe can also facilitate the evacuation of the deposits causing the occlusion of the tube. Using a small syringe of 3 to 5 ml increases pressure and helps dislodge deposits.[83,119] Excessive force should be avoided, however, as there is a risk of tube rupture.

The use of acidic products such as cranberry juice or sweetened effervescent beverages should not be used to unblock a feeding tube. Indeed, these practices are not based on scientific evidence, remain anecdotal, and may exacerbate the problem by creating protein precipitates in the tube.[38] It is to avoid this interaction that acidic or sugar-containing irrigation solutions (e.g., soft drinks) should not be used to unblock a tube. High sugar content increases the viscosity of a liquid, which, if present, increases its adhesion to the walls. In addition, migration of enteric bacteria into the feeding tube can lead to the development of a biofilm, which will tend to cause occlusions.[173] Many health care organization and prescribers have opted to administer permeabilizing agents containing digestive enzymes where other treatment options have been ineffective. While this is well described in the literature, NSWOCC does not recommend pharmaceutical preparations outside of their licensed indications. Nurses should follow the protocol and procedures of their health care organization and refer individual patients to prescribers.

It is also possible, depending on the knowledge and skills of the health care professional, to gently clean the tube with a cytology brush or a brush designed for this purpose. Even with the skill to do so, the use of a brush to clean the tube should be done very carefully as there is a risk of stomach perforation.[35,95,112,116] In fact, this technique

is more commonly available in the clinic. To prevent perforation when using the brush, insert the brush only to a length equivalent to the length of the external tube.†

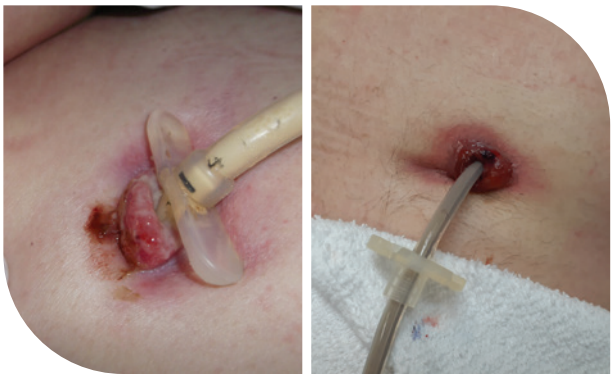
Note that if the occlusion may be associated with a fungal infection, the feeding tube will need to be changed. Refer to Infection part of the Complication section.[3]

Bleeding and Hypergranulation

Significant bleeding during or within hours of percutaneous feeding tube placement is uncommon; the reported incidence is approximately 2.5%.[61,63] Most bleeding is caused by trauma to superficial blood vessels at the site of percutaneous feeding tube insertion in association with the use of a trocar, or needle.[61] Occasionally, a return to the procedure room is required, but this remains rare.

Hypergranulation, sometimes referred to as overgranulation, hypertrophic granulation, granulation tissue hyperplasia, granuloma, ectopic granulation tissue, or budding,[89,95,133] is excessive proliferation of red/pink coloured wet granulation tissue that develops around and beyond the insertion site, noted in Figure 32.[83,137,159]

Figure 32 *Hypergranulation at the Insertion Site of a Feeding Tube*



Hypergranulation is the most common complication of percutaneous feeding tubes. It is documented in 44-68% of patients.[7,130,174] It is often described as spongy, soft, friable, or rarely painful tissue.[13,16,89,127,175] This excess tissue interferes with the healing of the insertion site,[136] can cause bleeding, pain, and increased discharge.[16,127,128,174]

In general, hypergranulation occurs at the site of a wound (e.g., surgical incision) in the presence of frictional forces (e.g., tube too mobile at the insertion site leading to excessive movements), due to pressure at the wound site, or high humidity.[16,63] For example, increased abdominal pressure caused by coughing or constipation can cause tube movement, and thus, hypergranulation.[176]

The use of overly occlusive dressings (e.g., hydrocolloid) and a prolonged inflammatory process (often in the presence of a foreign body) can also cause hypergranulation.[3,7,127,176]

The prolongation of the inflammatory process delays the synthesis of collagen, which makes the granulation tissue more friable,[176] and explains the associated bleeding. Certain diseases (e.g., diabetes, cancer, and anemia), as well as malnutrition, are factors that increase the risk of developing hypergranulation tissue,[176] because they interfere with the healing process. Therefore, prevention relies heavily on the ability to keep the site dry and avoid tube rubbing and movement by using a fixation device that holds the tube close to the skin and stabilizes.[3,16,76,83,115,127,129-131,137,159,177]

Furthermore, during hygiene care, the use of a soft cloth that does not leave lint will decrease the risk of inflammatory reaction due to the presence of foreign bodies.[3,7]

It is also for this reason that 2 weeks after the procedure, if sutures, whether absorbable or not, are still present, it is advisable to obtain a medical prescription for their removal. This will prevent the development of an inflammatory

process leading to hypergranulation.

Recommendation 40: Chemically cauterize hypergranulation buds 2-3 times/week until resolution.

The literature review revealed no high-level evidence-based treatments for hypergranulation,[7] yet it is established that the use of an antibiotic to treat hypergranulation is not recommended.[76]

The quickest and easiest way to treat hypergranulation is using silver nitrate shown in Figure 33.[76,112]

Figure 33 *Silver Nitrate Sticks*

It is important to protect the surrounding skin with petroleum jelly or barrier cream to avoid silver nitrate spills on healthy skin,[112,130,177] but in itself this spill is not dangerous. It is not necessary to moisten the rods beforehand. Because the hypertrophic granulation tissues are already moist, the silver nitrate sticks automatically activate upon contact. After the cautery treatment, avoid wetting the site within 24 hr, as the silver nitrate continues its effect and wetting the site would decrease its effectiveness.[112,130]

If treating hypergranulation with silver nitrate sticks causes pain, a topical analgesic cream can be applied to the affected area before treatment.[†] After cauterization, it is suggested that a semiocclusive absorbent dressing be applied to promote drying of the site through the absorbent properties of the product.[112]

The use of topical corticosteroid on hypergranulation tissue is another method to treat hypergranulation. Its main advantage is that it generally does not cause pain, see Table 10. Its effectiveness is based on its anti-inflammatory action, which curbs the overproduction of granulation.

Table 10 *Topical Medium Potency Corticosteroids for the Treatment of Hypergranulation*

General rule: For the same molecule, the ointment is a more powerful class than its equivalent in cream	
Presentation	**Examples of molecule**
Foam	Betamethasone Valerate 0.12%
Cream	Amcinonide 0.1% Desoximetasone 0.05% Mometasone Fuorate 0.1% Triamcinolone Acetonide 0.1% Betamethasone Valerate 0.1% Betamethasone Valerate 0.05% Hydrocortisone Valerate 0.2%
Ointment	Triamcinolone Acetonide 0.1% Betamethasone Valerate 0.2% Hydrocortisone Valerate 0.05%
Gel/lotion	Amcinonide 0.1%, lotion Betamethasone Dipropionate 0.05%, lotion Mometasone Furoate 0.1%, lotion Betamethasone Valerate 0.1%, lotion

Note. Thanks to Dr. Sara-Élizabeth Jean, dermatologist, for her advice.

Some authors also suggest a third option for treating hypergranulation, which is the application of hypertonic dressing.[35,130,178]

Finally, no evidence has been found to support the use of ligation/strangulation using a wire/elastic to necrotize circumferential hypergranulation when standard treatments fail. However, this technique performed under medical supervision and reported by a member of the expert panel was found to be effective, quick, and painless.

Leakage/irritation/dermatitis

These complications can occur quickly, within days of installation.[15,22] It is important to notify and consult with the clinical resource (e.g., NSWOC, nurse practitioner [NP], or physician) when leakage occurs, as it can quickly lead to loss of peristomal skin integrity or be a sign of another underlying problem.

Leakage is more common in patients who are immunosuppressed, have experienced weight loss, are malnourished, have poorly controlled diabetes, or have health conditions that slow healing. If leakage occurs, assessing its source, the quality of the discharge, the abdomen and the potential presence of another underlying complication will help identify the cause.

Gastric fluid has a pH of approximately 3. As this corrosive fluid moves up on the outside of the tube, it stagnates on the skin, which has a pH of 4.5 to 5.5. This not only causes maceration, but also a pH imbalance that alters the skin's natural protective barrier. Skin that is too basic (high pH) is at risk for infection, skin that is too acidic (low pH) becomes irritated, red, and painful.[179]

There are many reasons for the presence of discharge: an enlarged stoma, the presence of hypergranulation, a blocked tube, or leakage of gastric fluid often mixed with enteral formula. The assessment should therefore not only be concerned with the nature of the fluid but also the environment around the feeding tube.

When the assessment reveals the presence of underlying infection/abscess, BBS, or hypergranulation, it is necessary to treat this complication according to the recommendations that apply to it. Refer to the recommendations that apply.

Recommendation 41: If the leak is gastric fluid, administer proton pump inhibitors to decrease gastric fluid secretion. A prescription is required.

It is not always easy to distinguish formula leakage from purulent exudate because both may have approximately the same colour. The combination of physical examination (e.g., signs of infection, or skin integrity at the site), microbiological culture, and urine dipstick test for bilirubin can differentiate gastric content leakage versus purulent exudate / serous fluid.[133]

In the presence of leaking gastric secretion, administration of PPIs decreases the amount of gastric acid secretion and thus, decreasing the leakage of it.[15,16,29,71,83,117,122,127,132,134,180]

Recommendation 42: Assess the need for decompression by checking the gastric residual volume. This should be the exception. If aerophagia is present, there will not be significant gastric residual volume, but decompression may be necessary.

Abdominal assessment should not be overlooked in the context of a leak, as the presence of distension could link the leak to increased intragastric pressure (gastroparesis, excessive EF volume, or flow rate) or increased abdominal pressure (e.g., constipation, occlusion, baby crying, or mechanical ventilation in positive pressure).

The verification of the GRV allows to make sure that there is no overload in the stomach, which could for example explain a reflux of gastric contents via the insertion site.

However, checking GRVs should remain an exceptional intervention in response, for example, to the presence of leaks. This check should not be instituted routinely as discuss previously.[181]

When abdominal distension can explain the reason for the leak, it is advisable to ensure that the individual's position during EF (30-45°) is adhered to and to use the right-side lateral position if necessary. This is because the right lateral position promotes gastric emptying and motility.[182,183]

Other avenues of solution when leakage is associated with abdominal distension are administration of prokinetics and reduction of EF rate. If this is still ineffective, reduce the amount of enteral formula and increase the frequency of boluses or feeding cycles.

Finally, it is also possible to convert a gastrostomy to a gastrojejunostomy (via an existing gastrostomy) for jejunal feeding, potentially combined with gastric drainage.[25,29,132]

Recommendation 43: Check the integrity and function of the tube/ button and change it if necessary.

If tube or button malfunctions are present, consult the manufacturer's IFU which may present solutions specific to their products.

If the leak is related to a hardware malfunction and the tube has a balloon, check the amount of water in the balloon. If the amount of water is similar to that initially instilled in the balloon, the volume of water instilled can be increased by 1 to 2 ml to allow for better contact with the mucosa of the gastric wall. If the amount of water is less, discard the removed water and instill the amount of water that was instilled when the tube was first installed.[184] If this situation recurs, consider changing the tube. In general, for standard-length balloon tubes, the tube should be changed when a water loss of more than 5 ml in 7 days is observed.[99] Bear in mind that this marker does not apply to the low-profile device, whose balloons hold only 5-6 ml.

When evaluating a standard feeding tube, ensure that the internal retention device is securely pressed to the stomach wall.[136] To do this, gently pull on the tube until resistance is felt, verify that the mark determining the external length of the tube is still valid, and place the external retention device so that the tube remains in that position.

Tube length is adequate if it matches the length of the stoma track. This is especially important if there has been a change in weight.[29,76,83,119] Commercial guides are available to assist in taking the measurement. Refer to Routine Care section.

Recommendation 44: Using a larger feeding tube is a last resort, reserved for health care professionals when all other options have been considered and is not a substitute for proper tube stabilization at the risk of recurrence of the leakage problem.

If the stoma has enlarged, ensure that the tube has no lateral movement and that the tube exits at 90° to the insertion site. To prevent stoma enlargement leading to leakage, it is important to follow all recommendations for tube adjustment and attachment. Refer to Routine Care recommendations.

Replacing the tube with a larger diameter tube does not solve the leakage problem. It widens and deforms the stoma further, which does not promote tissue healing and worsens the leakage.[28,83]

It is also suggested to cauterize with silver nitrate the entrance and interior (1-2 cm) of the gastrostomy when the stoma has enlarged.[130,136] Cauterization in the enlarged stoma is intended to stimulate the healing process which narrows the opening. Cauterization does not damage the tube,

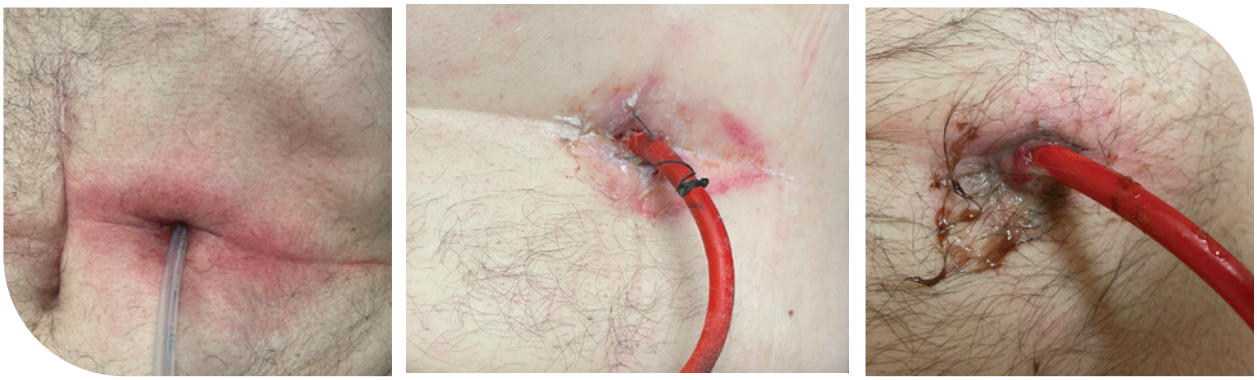
but may stain it, which does not affect its function.[136]

In cases of stoma enlargement and when the stoma is mature (minimally 4 weeks post placement up to 12 weeks when healing is slowed), the tube can be removed for 24-48 hr to allow for spontaneous partial tract closure. It is advisable to leave a guidewire in place to maintain patency of the tract until a replacement gastrostomy tube is inserted.[63,111] A smaller diameter replacement tube is also an option,[119] while partial healing occurs.[83] This option should be considered only after discussion with the interprofessional team including mainly the gastroenterologist, radiologist or surgeon and requires close monitoring. Also, this technique works well only for patients with a gastrostomy tract that has begun to leak one month or more after initial insertion.[111] It does not work as well for individuals with early leakage, who typically experience poor wound healing associated with other comorbidities.[111] The individual may need to be fed via GJ-tube or remain fasting with admission to the hospital for total parenteral nutrition to decrease gastric leakage and promote healing of the enlarged stoma.[83]

Recommendation 45: If there is evidence of contact dermatitis, best practices for its management apply while respecting the approximately 5 mm distance from the external retention device and maintaining the 90° angle of the tube to the abdomen.

Contact dermatitis clinically presents as redness/erythema, irritation, pain, burning, eczematous scaling, deepidermalization, erosion and even ulceration, see Figure 34.

Figure 34 *Examples of Contact Dermatitis*



To prevent irritation and contact dermatitis in the presence of leaks, it is advisable to keep the skin dry and clean. Refer to Routine Care recommendations.

The use of a low temperature dryer can dry the site well,[31] but it is important not to use hot air to avoid thermal damage to either the tube or the skin.

During routine care, clean gently, use finely woven cloths that do not leave lint (e.g., reusable, or washable baby wipes), and avoid rubbing.

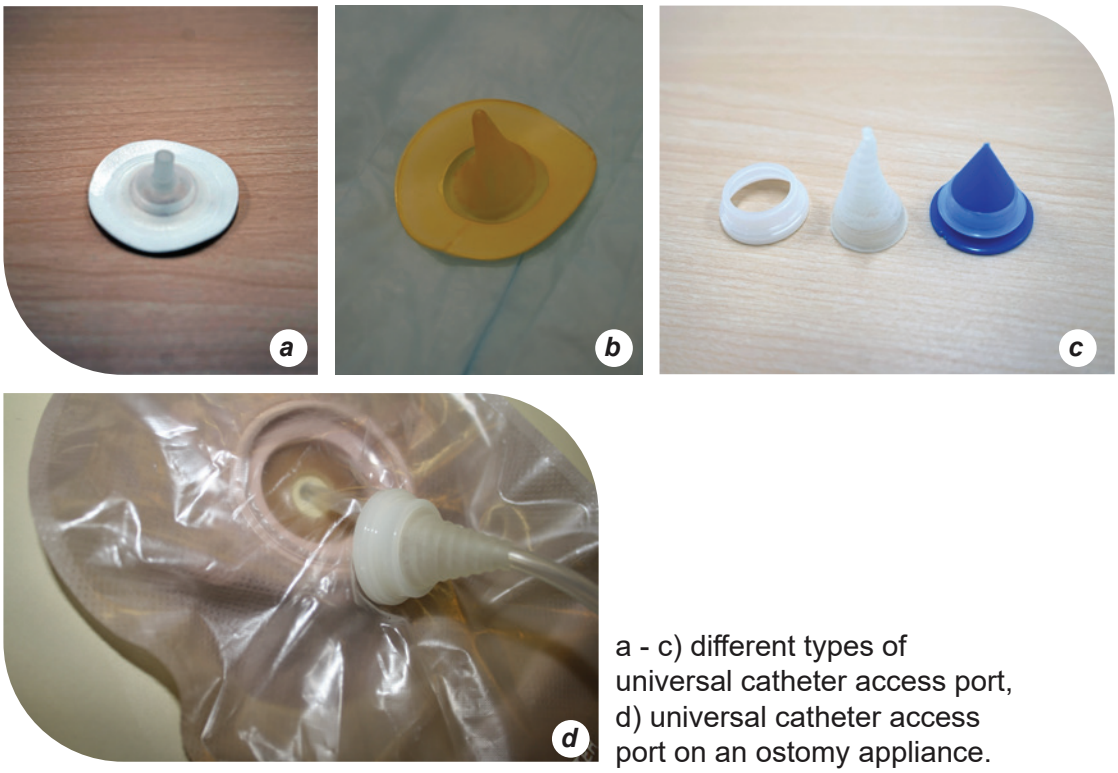
To protect the peristomal skin during leakage, a zinc oxide skin barrier or alcohol-free skin protectant can be applied.[15,25,31,41,111,135-137,159] A hydrocellular foam dressing is preferable to cotton gauze as it keeps the discharge away from the skin due to its vertical absorption capacity.[15,16] A wide variety of hydrocellular foam dressings are available, but it's important to choose those that don't form a gel when they come into contact with discharge (see above). However, it is important when using it to maintain the distance of approximately 5 mm between the external retainer device and the skin to avoid any excessive pressure. Also,

depending on the viscosity of the discharge some hydrocellular foams may perform better than others.

When the epidermis is broken, hydrophilic paste, which has the advantage of holding on to wet surfaces, may be an option to consider.† The application of cortisone cream should be limited to a short period and cannot be used for preventive purposes. It should be reserved for use in the context of acute inflammation.

A universal catheter access port shown in Figure 35 allows for an appliance that will divert the leakage to a collection bag to allow the skin to heal, while maintaining the EF through the tube. However, it is important to identify what is causing the leakage and to correct, as the appliance itself does not solve the problem. It's important to understand that the use of an access port remains a short-term, temporary option, with the aim of putting in place what's needed to solve the problem.

Figure 35 *Universal Catheter Access Port Examples*



a - c) different types of universal catheter access port, d) universal catheter access port on an ostomy appliance.

Recommendation 46: Only if the leakage problem persists the interprofessional team may consider removing the tube and inserting a new feeding tube at a new site.

As a last resort, when nothing else works, creation of a new feeding stoma is sometimes necessary.[28] This decision should be made by the interprofessional team in conjunction with the individual and significant others. Temporary insertion of a nasogastric or nasoenteric tube may be necessary for maintenance of feeding.

Infection

Infection is a complication that can be both superficial and deep. It can be located at the skin level or at the level of the stoma path. It can even occur in deep structures, such as the abdominal cavity (e.g., peritonitis) or rapidly evolve into necrotizing fasciitis. Infection occurs in approximately 30% of individuals with a PEG feeding tube.[185] It is identified by discharge, redness, or pain around the stoma. The percentage of reported skin complications varies greatly in the literature consulted.

At the outset, it is important to understand

that all insertion sites are colonized with microorganisms. When the microbial load is significant at the skin level, microorganisms can migrate into the stoma tract and create an infection. It is also important not to confuse postoperative inflammation (up to 4 days postprocedure) with infection. The risk of infection is lower in those who receive a prophylactic dose of antibiotic 30 minutes before the procedure.[151] Refer to preoperative recommendations. On the other hand, fungal infection, which is otherwise superficial, is much more common than bacterial infection, which is usually deep-seated.

Recommendation 47: If there is clinical evidence of infection at the tube insertion site, perform a wound culture only if systemic antibiotic therapy is being considered.

Note. Depending on the province or territory in which you practice, nurses may be able to perform wound cultures without a doctor's prescription. Refer to your provincial or territorial legislation.

Signs of infection at the site of tube insertion can be seen by clinical signs:

- edema;
- erythema over 2 cm around the site;
- induration;
- odour;
- pain when handling the tube;
- purulent discharge; and
- warmth.

The terms infection and irritation are often confused by health care providers and there is a wide variation in the use and definitions of these terms, making it difficult to correctly identify the complication and determine treatment based on the exact cause. In addition, the interpretation of data presented in the literature is often ambiguous.

The diagnosis of wound infection is made based on the assessment of signs and symptoms.[35] If present, the physician should be informed and wound culture ordered **if and only if** signs of infection are observed.[135,186] It should not be used to make the diagnosis of infection. Wound culture is indicated for confirmed infection for which it is necessary to specify the antibiogram for optimal systemic treatment.[133]

The colour of the discharge does not determine whether there is an infection. This is because gastric fluid can be different colours, plus enteral formula leakage can also affect the colour of the discharge to the point that colour is not a useful observation in this setting.

Chang et al. (2014) describes the use of urine testing sticks to detect the presence of bilirubin in site discharges, which can be used to differentiate between an infection and another complication.[133] In effect, this differentiates exudate from gastric fluid.

If gastric fluid is present at the gastrostomy site, it may be appropriate to add a PPI to decrease its production and discharge.

Patients with a history of neoplasia may develop skin changes at the stoma site. These may be mistaken for signs of infection when in fact they are neoplastic migration and implantation at the site of tube insertion.[176,180] Vigilance should be exercised when skin changes are observed and to consult a doctor/NP/NSWOC when there is no improvement in 4 weeks despite the application of best practices.

Infection control is a cross-cutting process and should be applied as much during immediate postoperative care as during routine care or special care for complications. This in turn helps to decrease the risk of more serious infectious complications such as necrotizing fasciitis.[9,25,26,31,63,93,111,132] Necrotizing fasciitis is rare, but fatal in 50-80% of cases and should therefore be treated with urgency.[63] Its treatment relies mainly on surgical sharp debridement as well as broad spectrum

intravenous antibiotic therapy.[9,26,63,95,111,133]

When a suspected risk of feeding tube infection is present in an oncological context, it is recommended to install the feeding tube prior to treatment of malignancy. This was demonstrated in a study conducted in India in the context of oncology treatments.[185] This study showed that individuals who received chemotherapy or radiation therapy prior to feeding tube placement had a higher incidence of peristomal infections (p = .00), with *Pseudomonas* and *Klebsiella* being the most implicated microorganisms.[185] As a result, the investigators suggested elective installation of gastrostomy before initiation of chemotherapy/ radiotherapy in patients with oropharyngeal malignancies.

Details in procedural technique also help to reduce risk. For example, during the initial placement procedure, an incision only 1-2 mm wider than the tube can prevent the upwelling of microorganisms and gastric secretions, helping to reduce the breakdown of skin integrity and subsequent infection. Methods of installing a gastrostomy using a technique that avoids passage through the nasopharynx can avoid contamination by nasopharyngeal microorganisms, including MRSA.[180] Refer to Preoperative Care recommendations.

Infection control is an important teaching point for patients / significant others who are seeking to become self-sufficient in their routine care. For example, hand hygiene is a must for anyone handling EF devices.

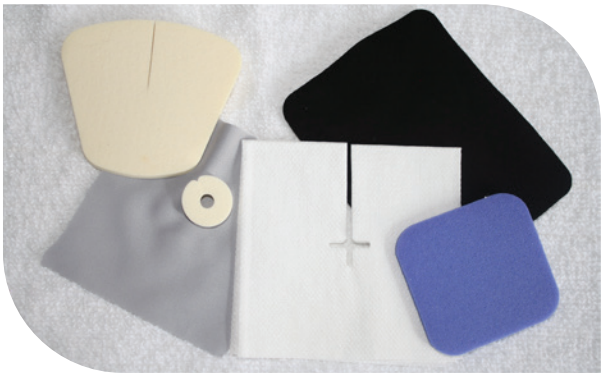
Particular attention should be paid to those with diabetes, malnourished, or immunocompromised, who are at increased risk of developing an infection.[63,111,151] Infection can occur in all individuals, but at-risk populations are more predisposed to it.[63,111,151]

Recommendation 48: Prefer the use of topical antimicrobial products such as wound cleansing solutions or dressings. Topical antibiotics are not recommended.

Antimicrobial cleansing solutions based on hypochlorous acid, chlorhexidine, or povidone-iodine are usually preferred in the context of local skin infections. The use of topical antibiotic creams is not recommended because, as with any antibiotic, it is necessary to ensure that the cause is bacterial before using it.

Topical products with antimicrobial properties often used in wound care may be useful when it is necessary to treat a local infection at the site of a feeding stoma. Dressings containing silver, polyhexamethylene biguanide (PHMB), methylene blue/gentian violet, and iodine may be suitable for use around a feeding tube (Figure 36). However, it is important to remember the importance of always maintaining the clearance of approximately 5 mm from the external retention device. The use of an antimicrobial textile is an interesting option in this context since it has a negligible impact on the level of clearance, which must be maintained (Figure 37). The important thing is to change it if it gets wet or dirty. Few antimicrobial dressings are shaped for direct use around a tube and if they are, they are rarely semiocclusive.

Figure 36 *Examples of Antimicrobial Products*



The antimicrobial agents vary according to the colour of the product a) white and cream: PHMB, b) gray: silver, c) blue: methylene blue and gentian violet, d) black: iodine.

Figure 37 *Antimicrobial Textile Placed Under an External Retention Device*

Recommendation 49: Know the signs and symptoms of fungal infection so you can identify and treat it if it develops at the tube insertion site.

Erythema with satellite lesions is the classic sign of fungal infection.

If clinical signs of fungal infection are present, twice daily application of an antifungal product is recommended.[112] A dressing is then not necessary unless there is concomitant discharge. Application of the antifungal product should continue for 2 weeks after resolution of symptoms.[112] Topical antifungals are available in powder and cream form.[16] The use of an antimicrobial textile is an attractive option as it avoids the use of cream (see Figure 37).

Tubes made of silicone are less prone to fungal contamination than those made of polyurethane.[93] This contamination is not without consequences. Fungal growth leads to tube fragility, cracking, and obstruction.[24] When a fungal infection is present it is important to determine the cause of the infection so that it can be eliminated. Since the cause is often related to the presence of moisture (e.g., leakage, or incomplete drying during hygiene care), it is usually easy to correct the situation, as this will not only treat the fungal infection but also prevent its recurrence by maintaining the region dry.

Recommendation 50: If a deep infection is present, the tube in place is considered contaminated and should be removed. A new temporary tube should be inserted, and the infection treated.

A contaminated tube must be removed because antibiotics are not effective on the material. Removal of the contaminated tube and reinstallation of a new tube once antibiotic treatment is well underway is cited in the literature. However, a temporary tube (e.g., balloon urinary catheter or a standard EFT tube to replace a low-profile device) should be placed in the tract to keep it permeable (see recommendations for managing leakage when the stoma is too large). At the start of antibiotic therapy, the temporary tube is at high risk of becoming contaminated, so it should be replaced once therapy is well underway.

Accidental Removal / Unplanned Replacement

Recommendation 51: Act promptly and refer to an experienced health care professional when accidental removal of a feeding tube that has been in place for less than 4 weeks.

Management of accidental removal of a feeding tube will vary depending on the age of the feeding stoma (see Recommendation 52). Accidental feeding tube removal is a common reason for many emergency department visits. A rate of 12.8% is reported.[28]

When inserting a replacement tube in a situation of unplanned removal of a tube less than 4-12 weeks after initial installation, prompt consultation with medical specialist is suggested. The insertion of a temporary tube to maintain the permeable and open route remains a very delicate technique and a high risk of false route is associated with it. Even the use of a smaller diameter tube in order to prevent its formation remains controversial and cannot in any case allow

enteral administration,[98] as verification of the positioning in the clinic will be necessary.

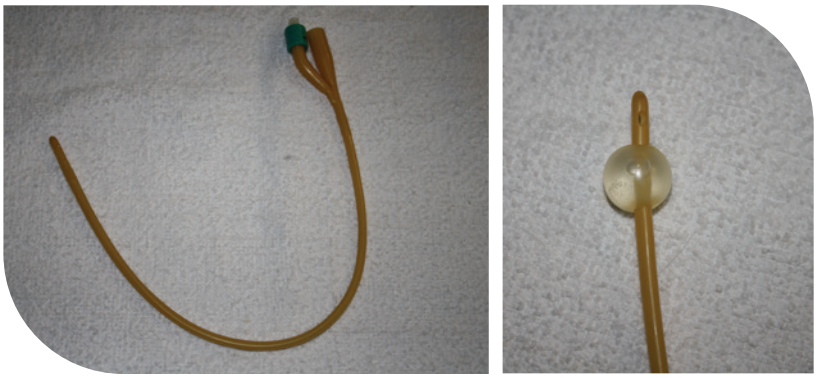
Recommendation 52: Reinstall an equivalent size tube within 4 hr of the accidental removal of a feeding tube that has been in place for more than 4 weeks.

When the gastrostomy or jejunostomy is mature (4 to 12 weeks or more after initial installation), it is possible to directly replace the torn/tapped tube with a tube of the same size if available.[15,28,98] This replacement is not possible for gastrojejunostomies. It is always advisable to keep a replacement tube at the bedside of the individual with a gastrostomy. Verification of positioning should be done according to the recommended methods, see Checklist 2.

The tract, even if mature, closes relatively quickly once the device is removed. The literature reports varying times of 2-6 hr as the time to insert a replacement tube,[97] the average and most frequently encountered time in the articles consulted, however, was 4 hr in an unplanned removal setting.[70,138]

The balloon urinary catheter should only be used to maintain the stoma opening until a replacement tube is available. In the case of a gastrostomy, the urinary catheter balloon should be inflated once the catheter has been inserted into the feeding stoma (see Figure 38). However, in the case of a jejunostomy, the balloon should not be inflated, and an external fixator or stabilizer installed.

Figure 38 *Balloon Urinary Catheter*



Balloon urinary catheters do not have an external retention disc, which increases the risk of migration and obstruction, see Figure 26.[18,57,73] Indeed, the distal end of the balloon urinary catheter is partially closed, the distal eyelets are relatively small, so they are at risk of obstruction. In addition, since the standard balloon urinary catheter is nearly 40 cm long, the migration of the catheter may be significant, deep and could create a blockage (e.g., balloon lodged in the pylorus) or an ulceration of the mucosa. The urinary balloon catheter *cannot* be used to administer enteral nutrition or medication on a regular or prolonged basis. If nothing else, it allows care and treatment to continue until a replacement tube is available. External fixation with a urinary catheter attachment device is strongly recommended, shown in Figure 39.

Steps should also be taken to reduce the risk of inadvertent withdrawals in at-risk individuals. The use of abdominal bands or elastic bandages to restrict access to the EF device, anchoring devices during initial gastrostomy placement, selection of an

Figure 39 *Urinary Catheter Fixation Device*

appropriate gastrostomy site, and use of a low-profile gastrostomy device with detachable extension are methods to reduce the risk of inadvertent tube removal.[24] In paediatrics a one-piece undergarment can isolate the device.[135]

Gastrointestinal Symptoms

Enteral food intolerance is described as one or more gastrointestinal symptoms that may interfere with the administration of EF. The following gastrointestinal symptoms are possible signs of feeding intolerance: nausea (with or without vomiting), reflux, diarrhea, constipation, and abdominal distension. This intolerance should be distinguished from refeeding syndrome, also called renutrition syndrome or inadequate renutrition syndrome. People who have recently suffered from anorexia or starvation, elderly people who live alone, individuals with diabetes with poor glycemic control, those with cancer or inflammatory bowel diseases, individuals with chronic infection, premature babies, and low weight babies, are at risk of the inappropriate renutrition syndrome.[38] It is therefore a complication occurring in undernourished individuals when energy intakes are reintroduced via the oral, enteral, or parenteral routes. The metabolic (hydroelectrolytic) imbalances of the refeeding syndrome lead to various complications affecting multiple organs (e.g., kidneys, heart, or brain) and can be fatal.[187]

Enteral food intolerance affects the quality of life of the individual and often results in the reduction of food administered, potentially leading to nutritional deficits, dehydration, and malnutrition.[188] This phenomenon is well described by the literature in the intensive care unit setting. In 2017, Hopkins et al. documented the phenomenon of enteral food intolerance in other care settings.[188] This found that in Canada between 35% and 66% of individuals with EFT had gastrointestinal symptom(s), with diarrhea being the most frequently reported.

Recommendation 53: Consider medical, nutritional, or medication reconciliation consultation depending on the gastrointestinal symptom present.

Collaboration with the nutritional service is usually recommended and often facilitates identification of the cause and improves outcomes for the individual.

The dietitian should be consulted about rearranging eating schedules. They can also suggest increased fibre and the use of emollient products as needed.[136] Their involvement will also ensure that comorbidities (e.g., undernutrition, or hyperglycemia) are optimally managed.[15,25,63,111]

Recommendation 54: Discontinue tube feeding if intestinal obstruction or ileus is suspected.

If abdominal distension is present and bowel sounds are not present on auscultation, ileus may be suspected, then it is recommended to discontinue administration via the feeding tube.[189] A medical consultation is usually mandatory.

The main preventive measures for GI symptoms, especially when initiating EF, can be guided by the recommendations of the dietitian. A series of measures are presented in Table 11 to provide guidance to health care professionals who give care to individuals with feeding tubes and significant others. Assessment and correction of electrolyte and vitamin deficiencies should preferably be initiated before starting EF. In addition, when initiating EF, administration should be slow and progressive (quantity and rate). In addition, many care settings include a specific a precise blood test protocol at the outset to ensure that electrolyte adjustments can be made if necessary.

Table 11 *Interventions to Correct Gastrointestinal Symptoms*

Diarrhea:

- try to identify the cause: infection, fecal impaction / constipation, medication, enteral feeding;
- stool culture if infection is suspected;
- avoid dehydration and maintain adequate hydration;
- if possible, identify sorbitol content of pharmaceutical preparations;
- ensure enteral formula is at room temperature before administering. If enteral formula is stored in the refrigerator, measure the required volume and allow to stand for 30 minutes before use; and
- consider making adjustments to enteral feeding regimen (e.g., speed and rate of administration, concentration of product administered, and fibre content) in collaboration with nutrition service.

Constipation:

- try to identify the cause: insufficient hydration, change in daily routine (e.g., inactivity, or lack of privacy), medication, comorbidities (e.g., hypothyroidism, hypokalemia, motility disorder, or neuromotor impairment), and gastrointestinal obstruction;
- ensure that the individual is well hydrated;
- consider addition of stool softeners, other appropriate laxatives, or prokinetic agents; and
- consider establishing a bowel evacuation program.

Nausea and vomiting:

- try to identify the cause: infection, intolerance of the current enteral diet, enteral formula too cold during administration, increased intra-abdominal pressure due to constipation, side effects of medication or treatments, improper positioning of the person during feeding, stress and anxiety about enteral feeding;
- consider adjusting enteral feeding (e.g., speed and rate of administration, concentration of product administered, or fibre content);
- consider adding prokinetics or antiemetics;
- ensure enteral formula is at room temperature prior to administration. If the formula is stored in the refrigerator, measure the required volume and let stand for 30 minutes before use;
- ensure that the individual is sitting with the head elevated 30-45° during feeding and 60 minutes after feeding is completed. Consider placing the individual on their right side to facilitate gastric emptying; and
- provide a calm environment and teach relaxation techniques. Encourage support from significant others.

Note. This is not an exhaustive list.[18]

As discussed earlier in this document, some health care organizations use measurement of GRVs during the first 48 hr after feeding initiation to assess tolerance to EF. However, there is limited evidence in favour of testing GRVs in individuals with percutaneous feeding tubes.[181]

If signs of intolerance are present (e.g., significant abdominal pain, abdominal distension, nausea, and vomiting), administration via the feeding tube should be adjusted in collaboration with the professionals from nutrition service. If signs persist, it may be necessary to discontinue the EF and a medical examination is often required.

Diarrhea is a common complication of EF and occurs in 15-40% of patients depending on the criteria used to define diarrhea.[102] Because *Clostridium difficile* is significantly more common in those receiving EF (20% vs. 8%, $p = .03$) than in those receiving oral feeding, it is important to rule out this possibility before changing enteral formula.[102] It is possible that long periods of continuous EF may maintain gastric pH at levels too high for good control of bacterial growth.[1]

Caution is recommended when prescribing large volumes of certain liquid medications containing sweeteners and sorbitol due to their laxative effect.[18] Diluting hyperosmolar liquid medication with 10 to 30 ml of sterile water before administration through the feeding tube may help prevent intestinal intolerance. More water may be needed when diluting medications that are either highly hypertonic or need to be administered directly into the small intestine.[106]

Gastroesophageal reflux may also cause vomiting that is not associated with the EF technique. To decrease reflux, the addition or optimization of PPI medication should be considered. The use of prokinetics may also be helpful. Finally, it may be necessary to consider postpyloric EF. Because some medical conditions cause saliva accumulation and regurgitation, the strategies discussed are essentially useless and a medical consultation should be arranged.

GLOSSARY

buried bumper syndrome–a complication associated with the migration of the internal retention device into the mucosa of the stomach or intestine which, in severe cases, proliferates and completely covers the internal retention device.

enteral feeding–feeding by administering a nutrient solution directly into the stomach or intestine through a tube.

enteral feeding tube–a tube used for enteral feeding. They are available in several models that vary in length, size, and materials.

gastrointestinal–the system responsible for the digestion of food, mainly the stomach and intestine, which begins in the oral cavity and ends at the anal sphincter.

Nurses Specialized in Wound, Ostomy and Continence Canada–the Canadian association of wound, ostomy, and continence nurses.

percutaneous endoscopic gastrojejunostomy–an enteral feeding tube passing directly from the surface of the abdomen to the stomach and extending to the first part of the small intestine, called the jejunum. This tube is installed through an endoscopic procedure.

percutaneous endoscopic gastrostomy–an enteral feeding tube passing directly from the surface of the abdomen to the stomach and installed by an endoscopic procedure.

percutaneous endoscopic jejunostomy–an enteral feeding tube passing directly from the surface of the abdomen into the jejunum of the small intestine and installed through an endoscopic procedure.

Wound, Ostomy and Continence Nurse–a nurse who has completed specific training in a recognized program that includes three specific components: wound care, ostomy care and continence care.

ABBREVIATIONS

BBS	buried bumper syndrome
EF	enteral feeding
EFT	enteral feeding tube
GRV	gastric residual volume
IFU	instructions for use
NP	nurse practitioner
NSWOC	Nurses Specialized in Wound, Ostomy, and Continence
NSWOCC	Nurses Specialized in Wound, Ostomy and Continence Canada
PEG	percutaneous endoscopic gastrostomy
PEJ	percutaneous endoscopic jejunostomy
PPI	proton pump inhibitors
TPN	total parenteral nutrition

APPENDIX 1 - INTERPRETATION OF EVIDENCE OF RECOMMENDATIONS

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Ia	Evidence obtained from meta-analysis or systematic review of randomized controlled trials and/or synthesis of multiple studies primarily of *quantitative* research.
Ib	Evidence obtained from at least one randomized controlled trial.
IIa	Evidence obtained from at least one well-designed controlled study without randomization.
IIb	Evidence obtained from at least one other type of well-designed quasi-experimental study without randomization.
III	Synthesis of multiple studies primarily by *qualitative* research.
IV	Evidence obtained from well-designed non-experimental observational studies, such as analytical studies, or descriptive studies and/or qualitative studies.
V	Evidence obtained from expert opinion or committee reports, and/or clinical experiences of respected authorities.

REFERENCES

1. McLaren S, Arbuckle C. Providing optimal nursing care for patients undergoing enteral feeding. Nurs Stand. 2020 Feb;35(3):60-5.
2. D'Cruz JR, Cascella M. Feeding jejunostomy tube. StatPearls Publishing. 2022 Feb 5. 8 p. https://www.ncbi.nlm.nih.gov/books/NBK562278/
3. Roveron G, Antonini M, Barbierato M, Calandrino V, Canese G, Chiurazzi LF, Coniglio G, Gentini G, Marchetti M, Minucci A, Nembrini L, Neri V, Trovato P, Ferrara F. Clinical practice guidelines for the nursing management of percutaneous endoscopic gastrostomy and jejunostomy (PEG/PEJ) in adult patients: an executive summary. J Wound Ostomy Continence Nurs. 2018 Jul-Aug;45(4):326-34. https://doi.org/10.1097/WON.0000000000000442
4. Thomas DR. Enteral tube nutrition [Internet]. Rahway (US): Merck manual: professional version; 2022 Apr [modified 2022 Sep]. https://www.merckmanuals.com/en-ca/professional/nutritional-disorders/nutritional-support/enteral-tube-nutrition
5. Woten M. Percutaneous endoscopic gastrostomy (PEG) tube removal: assisting with. Pravikoff D, editor. EBSCO Information Services. 2017 May 12. 9 p.
6. Thomas DR. Total parenteral nutrition (TPN) [Internet]. Rahway (US): Merck manual: professional version; 2022 Apr [modified 2022 Sep]. https://www.merckmanuals.com/en-ca/professional/nutritional-disorders/nutritional-support/total-parenteral-nutrition-tpn
7. Blumenstein I, Shastri YM, Stein J. Gastroenteric tube feeding: techniques, problems and solutions. World J Gastroenterol. 2014 Jul 14;20(26):8505-24. https://doi.org/10.3748/wjg.v20.i26.8505
8. Fugere TL, Pescatore MT. Enteral feeding best practice updates for the medical-surgical environment. Med-Surg Matters. 2018 Jan;27(1):10-12.
9. Hucl T, Spicak J. Complications of percutaneous endoscopic gastrostomy. Best Pract Res Clin Gastroenterol. 2016 Oct;30(5):769-81. https://doi.org/10.1016/j.bpg.2016.10.002
10. Vudayagiri L, Hoilat GJ, Gemma R. Percutaneous endoscopic gastrostomy tube [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Nov 7. 5 p. https://www.ncbi.nlm.nih.gov/books/NBK535371/
11. White SW. A multidisciplinary PEG service and the nurse specialist. Nurs Times. 2000 Dec 7;96(49):6-9. https://www.nursingtimes.net/clinical-archive/nutrition/a-multidisciplinary-peg-service-and-the-nurse-specialist-07-12-2000/
12. Conroy T. The prevention and management of complications associated with established percutaneous gastrostomy tubes in adults: a systematic review. JBI Libr. Syst. Rev. 2009;7(1):1-37. https://doi.org/10.11124/01938924-200907010-00001
13. Scott R, Bowling TE. Enteral tube feeding in adults. J R Coll Physicians Edinb. 2015;45(1):49-54. https://doi.org/10.4997/JRCPE.2015.112
14. Arvanitakis M, Ockenga J, Bezmarevic M, Gianotti L, Krznarić Ž, Lobo DN, Löser C, Madl C, Meier R, Phillips M, Rasmussen HH, Van Hooft JE, Bischoff SC. ESPEN guideline on clinical nutrition in acute and chronic pancreatitis. Clin Nutr. 2020 Mar;39(3):612-31. https://doi.org/10.1016/j.clnu.2020.01.004
15. Bischoff SC, Austin P, Boeykens K, Chourdakis M, Cuerda C, Jonkers-Schuitema C, Lichota M, Nyulasi I, Schneider SM, Stanga Z, Pironi L. ESPEN practical guideline: home enteral nutrition. Clin Nutr. 2022 Feb;41(2):468-88. https://www.clinicalnutritionjournal.com/article/S0261-5614(21)00497-0/fulltext
16. Lord LM. Enteral access devices: types, function, care, and challenges. Nutr Clin Pract. 2018 Feb;33(1):16-38. https://doi.org/10.1002/ncp.10019
17. Farrag K, Shastri YM, Beilenhoff U, Aksan A, Stein J. Percutaneous endoscopic gastrostomy (PEG): a practical approach for long term management. BMJ Clin Res Ed. 2019 Jan 26;364(8184):Article k5311. https://doi.org/10.1136/bmj.k5311
18. Agency for Clinical Innovation; Gastroenterological Nurses College of Australia. A clinician's guide: caring for people with gastrostomy tubes and devices from pre-insertion to ongoing care and removal. Version 1.2. 2015 Mar. 95 p. https://aci.health.nsw.gov.au/__data/assets/pdf_file/0017/251063/ACI-Clinicians-guide-caring-people-gastrostomy-tubes-devices.pdf
19. Hannah E, John RM. Everything the nurse practitioner should know about pediatric feeding tubes. J Am Assoc Nurse Pract. 2013 Nov;25(11):567-77. https://doi.org/10.1002/2327-6924.12075

20. Heuschkel RB, Gottrand F, Devarajan K, Poole H, Callan J, Dias JA, Karkelis S, Papadopoulou A, Husby S, Ruemmele F, Schäppi MG, Wilschanski M, Lionetti P, Orel R, Tovar J, Thapar N, Vandenplas Y. ESPGHAN position paper on management of percutaneous endoscopic gastrostomy in children and adolescents. J Pediatr Gastroenterol Nutr. 2015 Jan;60(1):131-41. https://doi.org/10.1097/MPG.0000000000000501
21. Caple C, Walsh K. Feeding tube placement: verifying. Pravikoff D, editor. EBSCO Information Services. 2018 Jul 6. 15 p.
22. Anderson L. Enteral feeding tubes: an overview of nursing care. Br J Nurs. 2019 Jun 27;28(12):748-54. https://doi.org/10.12968/bjon.2019.28.12.748
23. Schub T, DeVesty G. Enteral nutrition: an overview. Pravikoff D, editor. EBSCO Information Services. 2019 Oct 25. 26 p.
24. Rajan A, Wangrattanapranee P, Kessler J, Kidambi TD, Tabibian JH. Gastrostomy tubes: fundamentals, periprocedural considerations, and best practices. World J Gastrointest Surg. 2022 Apr 27;14(4):286-303. https://doi.org/10.4240/wjgs.v14.i4.286
25. Boeykens K, Duysburgh I, Verlinden W. Prevention and management of minor complications in percutaneous endoscopic gastrostomy. BMJ Open Gastroenterol. 2022;9(1):e000975. https://doi.org/10.1136/bmjgast-2022-000975
26. Friginal-Ruiz AB, Lucendo AJ. Percutaneous endoscopic gastrostomy: a practical overview on its indications, placement conditions, management, and nursing care. Gastroenterol Nurs. 2015 Sep-Oct; 38(5):354-68. https://doi.org/10.1097/SGA.0000000000000150
27. Golik S, Vallarta J. Pediatric G-tube medication administration. J Pediatr Surg Nurs. 2021 Apr-Jun;10(2):52-4. https://doi.org/10.1097/JPS.0000000000000311
28. Molina Villalba C, Vázquez Rodríguez JA, Gallardo Sánchez F. Percutaneous endoscopic gastrostomy: indications, care and complications. Med Clin. 2019 Mar 15;152(6):229-36. https://doi.org/10.1016/j.medcli.2018.09.008
29. Itkin M, DeLegge MH, Fang JC, McClave SA, Kundu S, d'Othee BJ, Martinez-Salazar GM, Sacks D, Swan TL, Towbin RB, Walker TG, Wojak JC, Zuckerman DA, Cardella JF. Multidisciplinary practical guidelines for gastrointestinal access for enteral nutrition and decompression from the Society of Interventional Radiology and American Gastroenterological Association (AGA) Institute, with endorsement by Canadian Interventional Radiological Association (CIRA) and Cardiovascular and Interventional Radiological Society of Europe (CIRSE). Gastroenterol. 2011 Aug;141(2):742-65. https://doi.org/10.1053/j.gastro.2011.06.001
30. Rahnemai-Azar AA, Rahnemaiazar AA, Naghshizadian R, Kurtz A, Farkas DT. Percutaneous endoscopic gastrostomy: indications, technique, complications and management. World J Gastroenterol. 2014 Jun 28;20(24):7739-51. https://doi.org/10.3748/wjg.v20.i24.7739
31. Lepore M, Marks D, Harbord MW. Percutaneous gastrostomy: troubleshooting complications. Br J Hosp Med. 2016 Jun 2;77(6):C86-C90. https://doi.org/10.12968/hmed.2016.77.6.C86
32. Hitawala AA, Mousa OY. Percutaneous gastrostomy and jejunostomy. Treasure Island (FL): StatPearls Publishing; 2022 Jun 5. https://www.ncbi.nlm.nih.gov/books/NBK559215/
33. Berman L, Hronek C, Raval MV, Browne ML, Snyder CL, Heiss KF, Rangel SJ, Goldin AB, Rothstein DH. Pediatric gastrostomy tube placement: lessons learned from high-performing institutions through structured interviews. Pediatr Qual Saf. 2017 Mar-Apr;2(2):e016. https://doi.org/10.1097/pq9.0000000000000016
34. Bakewell C, Corlett C, Sharrard A, Howarth LJ, Lee ACH. Current trends in paediatric enteral tube feeding. J Paediatr Child Health. 2021 Aug 1;31(8):308-15. https://www.clinicalkey.com.au/#!/content/journal/1-s2.0-S1751722221000780
35. DeLegge MH. Gastrostomy tubes: placement and routine care. UpToDate. 2022 Jan 25. 22 p. https://www.uptodate.com/contents/gastrostomy-tubes-placement-and-routine-care
36. Tournier L, Pachev A, de Margerie-Mellon C, Bouda D, Amouyal G, de Bazelaire C, de Kerviler E. Percutaneous gastrostomy. JIDI. 2021 Apr;4(2):104-7. http://doi.org/10.1016/j.jidi.2020.10.003
37. Sandberg F, Viktorsdóttir MB, Salö M, Stenström P, Arnbjörnsson E. Comparison of major complications in children after laparoscopy-assisted gastrostomy and percutaneous endoscopic gastrostomy placement: a meta-analysis. Pediatr Surg Int. 2018 Dec;34(12):1321-27. https://doi.org/10.1007/s00383-018-4358-6
38. Boullata JI, Carrera AL, Harvey L, Escuro AA, Hudson L, Mays A, McGinnis C, Wessel JJ, Bajpai S, Beebe ML, Kinn TJ, Klang MG, Lord L, Martin K, Pompeii-Wolfe C, Sullivan J, Wood A, Malone A, Guenter P; ASPEN Safe Practices for Enteral Nutrition Therapy Task Force; American Society for Parenteral and Enteral Nutrition. ASPEN safe practices for enteral nutrition therapy. JPEN J Parenter Enteral Nutr. 2017 Jan;41(1):15-103. https://doi.org/10.1177/0148607116673053
39. Online Care Procedures. Reference framework for enteral feeding administration [Internet]. Sherbrooke (QC): Centre d'expertise en santé de Sherbrooke; 2022 [cited 2023 Apr 21]. Requires account to access.
40. Goodin HJ, Ryan-Wenger NA, Mullet J. Pediatric medical line safety: the prevalence and severity of medical line entanglements. J Pediatr Nurs. 2012 Dec;27(6):725-33. https://doi.org/10.1016/j.pedn.2011.08.003
41. Kinikini M, Fang JC. PEG or PEG button replacement: willy-nilly or evidence-based? Pract Gastroenterol. 2021 Nov:10-13, 21-3. https://med.virginia.edu/ginutrition/wp-content/uploads/sites/199/2021/11/November-2021-PEG-Replacement.pdf
42. Kozarek RA, Payne M, Barkin J, Goff J, Gostout C. Prospective multicenter evaluation of an initially placed button gastrostomy. Gastrointest Endosc. 1995 Feb;41(2):105-8.
43. Caple C, Walsh K. Enteral feeding, pump-assisted: performing. Pravikoff D, editor. EBSCO Information Services. 2017 May 26. 25 p.
44. Neuville S, Lannoy D, Delatre C, Bouchoud L. Administration of oral medicines for patient with enteral nutrition. Nutr Clin et Metab. 2013 Dec;27(4):255-62. https://doi.org/10.1016/j.nupar.2013.09.009
45. Brotherton A, Abbott J, Hurley M, Aggett PJ. Home enteral tube feeding in children following percutaneous endoscopic gastrostomy: perceptions of parents, paediatric dietitians and paediatric nurses. J Hum Nutr Diet. 2007 Oct;20(5):431-9. https://doi.org/10.1111/j.1365-277X.2007.00811.x

46. Doosti-Irani M, Goojani FH, Vardanjani LR, Noorian K. Care without sufficient knowledge of people with home enteral tube feeding: a qualitative study. Gastrointest Nurs. 2021 Dec 2;19(10):26-34. https://doi.org/10.12968/gasn.2021.19.10.26
47. Suluhan D, Yildiz D, Surer I, Fidanci Eren B, Balamtekin N. Effect of gastrostomy tube feeding education on parents of children with gastrostomy. Nutr Clin Pract. 2021 Dec;36(6):1220-9. https://doi.org/10.1002/ncp.10586
48. Kirk L, Shelley A, Battles M, Latty C. Educating parents on gastrostomy devices: necessary components to achieve success. J Pediatr Nurs. 2014 Sep;29(5):457-65. https://doi.org/10.1016/j.pedn.2014.05.002
49. Kalaldeh MA. The influence of implementing nurse-led enteral nutrition guidelines on care delivery in the critically ill: a cohort study. Gastrointest Nurs. 2017 Jul;15(6):34-42. https://doi.org/10.12968/gasn.2017.15.6.34
50. Kurien M, White S, Simpson G, Grant J, Sanders DS, McAlindon ME. Managing patients with gastrostomy tubes in the community: can a dedicated enteral feed dietetic service reduce hospital readmissions? Eur J Clin Nutr. 2012 Jun;66(6):757-60. https://doi.org/10.1038/ejcn.2012.19
51. Singh H, Morrison M, McIltrot K. Education following pediatric gastrostomy tube placement: an integrative review. Pediatr Nurs. 2021 Nov-Dec;61:387-93. https://doi.org/10.1016/j.pedn.2021.09.015
52. Schweitzer M, Aucoin J, Docherty SL, Rice HE, Thompson J, Sullivan DT. Evaluation of a discharge education protocol for pediatric patients with gastrostomy tubes. J Pediatr Health Care. 2014 Sep;28(5):420-8. https://doi.org/10.1016/j.pedhc.2014.01.002
53. Registered Nurses' Association of Ontario. Adult asthma care: promoting control of asthma. 2nd ed. Toronto: Registered Nurses' Association of Ontario, 2017 May. https://rnao.ca/bpg/guidelines/adult-asthma-care
54. Durfee SM, Adams SC, Arthur E, Corrigan ML, Hammond K, Kovacevich DS, McNamara K, Pasquale JA; Home and Alternate Site Care Standards Task Force; American Society for Parenteral and Enteral Nutrition. A.S.P.E.N. Standards for Nutrition Support: home and alternate site care. Nutr Clin Pract. 2014 Aug;29(4):542-55. https://doi.org/10.1177/0884533614539017
55. Haywood S. PEG feeding tube placement and aftercare. Nurs Times. 2012 Oct;108(42):20-2.
56. Majka AJ, Wang Z, Schmitz KR, Niesen CR, Larsen RA, Kinsey GC, Murad AL, Prokop LJ, Murad MH. Care coordination to enhance management of long-term enteral tube feeding: a systematic review and meta-analysis. JPEN J Parenter Enteral Nutr. 2014 Jan;38(1):40-52. https://doi.org/10.1177/0148607113482000
57. Stroud M, Duncan H, Nightingale J. Guidelines for enteral feeding in adult hospital patients. Gut. 2003 Dec;52(Suppl 7):vii1-vii12. https://doi.org/10.1136/gut.52.suppl_7.vii1
58. Collins K, Gaffney L, Tan J, Roberts S, Nyulasi I. Gastrostomy guidelines: a rapid review. Glebe, AU: SaxInstitute; 2013 Jul. 84 p. https://www.saxinstitute.org.au/wp-content/uploads/Gastrostomy-guidelines-a-rapid-review.pdf
59. Angus F, Burakoff R. The percutaneous endoscopic gastrostomy tube: medical and ethical issues in placement. Am J Gastroenterol. 2003 Feb;98(2):272-7. https://doi.org/10.1016/S0002-9270(02)05935-X
60. Lucendo AJ, Friginal-Ruiz AB. Percutaneous endoscopic gastrostomy: an update on its indications, management, complications, and care. Rev. Esp. Enferm. Dig. 2014 Dec;106(8): 529-39.
61. Boeykens K, Duysburgh I. Prevention and management of major complications in percutaneous endoscopic gastrostomy. BMJ Open Gastroenterol. 2021;8(1):e000628. https://doi.org/10.1136/bmjgast-2021-000628
62. Löser C, Aschl G, Hébuterne X, Mathus-Vliegen EMH, Muscaritoli M, Niv Y, Rollins H, Singer P, Skelly RH. ESPEN guidelines on artificial enteral nutrition: percutaneous endoscopic gastrostomy (PEG). Clin Nutr. 2005 Oct;24(5):848-61. https://doi.org/10.1016/j.clnu.2005.06.013
63. Zouk AN, Batra H. Managing complications of percutaneous tracheostomy and gastrostomy. J Thorac Dis. 2021 Aug 25;13(8):5314-30. https://doi.org/10.21037/jtd-19-3716
64. Emmons D. Reducing outpatient gastrostomy tube complications. Nutr Clin Pract. 2022 Apr;37(2):351-60. https://doi.org/10.1002/ncp.10686
65. Ono H, Ito S, Yamazaki Y, Otaki Y, Otaki H. Effects of gastric acidity on peristomal infection after percutaneous endoscopic gastrostomy placement. J Hosp Infect. 2010; 76(1):42-45. https://doi.org/10.1016/j.jhin.2010.04.011
66. Veiga TMA, Carvalho PEP, Machado FSL, Porto GV, Raymundo LF, Simões e Silva AC. Antibiotic prophylaxis for percutaneous endoscopic gastrostomy in pediatric patients: a meta-analysis. Pediatr Surg Int. 2023;39:Article 63. https://doi.org/10.1007/s00383-022-05355-0
67. Agre P, Brown P, Stone K. Tube feeding: troubleshooting guide. Oley Foundation. 2022 May. 9 p. https://cdn.ymaws.com/oley.org/resource/resmgr/docs/tf_troubleshooting_guide_19.pdf
68. Catangui EJ, Mejia C, Amorim A. Development and implementation of a percutaneous endoscopic gastrostomy (PEG) nursing care plan. Br J Neurosci Nurs. 2013 Dec 1;9(6):286-90. https://doi.org/10.12968/bjnn.2013.9.6.286
69. Dynamic Health. Administering nutrition and medication with a gastrostomy feeding button. EBSCO Information Services. 2022. 9 p. https://www.dynahealth.com/nursing-skills/administering-nutrition-and-medication-with-a-gastrostomy-feeding-button Requires account to access.
70. Online Care Procedures. Reference framework on care and monitoring of a gastrostomy, a jejunostomy or a gastrojejunostomy [Internet]. Sherbrooke (QC): Centre d'expertise en santé de Sherbrooke; 2022 [cited 2023 Apr 21]. Requires account to access.
71. Dynamic Health. Preventing enteral nutrition complications. EBSCO Information Services. 2022. 14 p. https://www.dynahealth.com/nursing-skills/preventing-enteral-nutrition-complications Requires account to access.
72. Gkolfakis P, Arvanitakis M, Despott EJ, Ballarin A, Beyna T, Boeykens K, Elbe P, Gisbertz I, Hoyois A, Mosteanu O, Sanders DS, Schmidt PT, Schneider SM, van Hooft JE. Endoscopic management of enteral tubes in adult patients - Part 2: peri- and post-procedural management. European Society of Gastrointestinal Endoscopy (ESGE) Guideline. Endoscopy. 2021 Feb;53(2):178-95. https://doi.org/10.1055/a-1331-8080

73. McClave SA, Neff RL. Care and long-term maintenance of percutaneous endoscopic gastrostomy tubes. JPEN J Parenter Enteral Nutr. 2006 Jan;30(1S):S27-S38. https://doi.org/10.1177/01486071060300S1S27
74. Mills K, Odiaga J, Karjoo S, McClenathan D, Wilsey M. Quality improvement initiative: the administration of early nutrition following percutaneous endoscopic gastrostomy tube placement in children. Gastroenterol Nurs. 2020 Jan-Feb;43(1):E5-E8. https://doi.org/10.1097/SGA.0000000000000371
75. Shellnutt C. The evidence on feeding initiation after percutaneous endoscopic gastrostomy tube placement. Gastroenterol Nurs. 2019 Sep-Oct;42(5):420-7. https://doi.org/10.1097/SGA.0000000000000393
76. Best C. Percutaneous endoscopic gastrostomy feeding in the adult patient. Br J Nurs. 2009 Jun 1;18(12):724-29. https://doi.org/10.12968/bjon.2009.18.12.42885
77. Cyrany J, Rejchrt S, Kopacova M, Bures J. Buried bumper syndrome: a complication of percutaneous endoscopic gastrostomy. World J Gastroenterol. 2016 Jan 14;22(2):618-27. https://doi.org/10.3748/wjg.v22.i2.618
78. Online Care Procedures. Caring for the peristomal skin of a gastrostomy, a jejunostomy or a gastrojejunostomy [Internet]. Sherbrooke (QC): Centre d'expertise en santé de Sherbrooke; 2022 [cited 2023 Apr 21]. Requires account to access.
79. Toussaint E, Van Gossum A, Ballarin A, Arvanitakis M. Enteral access in adults. Clin Nutr. 2015 Jun;34(3):350-8. http://doi.org/10.1016/j.clnu.2014.10.009
80. BC Children's Hospital; Sunny Hill Health Centre for Children; BC Women's Hospital and Health Centre. Enteral feeding: feeding devices: quickguide and careplan. 2016 Mar. 12 p. http://policyandorders.cw.bc.ca/resource-gallery/Documents/BC%20Women's%20Hospital%20-%20Neonatal%20Program%20Archive/NN.08.08%20Enteral%20Feeding%20Feeding%20Devices%20Quickguide%20and%20Careplan.pdf
81. Ditchburn L. The principles of PEG feeding in the community. Nurs Times. 2006 May 30;102(22):43-45.
82. Harris CL, Kuhnke J, Haley J, Cross K, Somayaji R, Dubois J, Bishop R, Lewis K. Best practice recommendations for the prevention and management of surgical wound complications. In: Orsted HL, Rosenthal S editors. Foundations of best practice for skin and wound management. 2017. 66 p. https://bit.ly/41flU4S
83. Soscia J, Friedman JN. A guide to the management of common gastrostomy and gastrojejunostomy tube problems. Paediatr Child Health. 2011 May;16(5):281–87. https://doi.org/10.1093/pch/16.5.281
84. Spratling R, Chambers R, Lawrence P, Faulkner MS. Best practices with use of feeding tubes for children at home. Pediatr Nurs. 2021 Jan-Feb;47(1):7-10. http://www.pediatricnursing.net/issues/21janfeb/abstr1.html
85. Dynamic Health. Educating patients about home care for enteral nutrition: nutrition. EBSCO Information Services. 2022. 12 p. https://www.dynahealth.com/health-profession/educating-patients-about-home-care-for-enteral-nutrition-nutrition Requires account to access.
86. Patel R, Mutalib M, Pradhan A, Wright H, Upadhyaya M. Nurse-led service for children with gastrostomies: a 2-year review. Br J Nurs. 2021 Apr 22;30(8):462-6. https://doi.org/10.12968/bjon.2021.30.8.462
87. Bischoff SC, Austin P, Boeykens K, Chourdakis M, Cuerda C, Jonkers-Schuitema C, Lichota M, Nyulasi I, Schneider SM, Stanga Z, Pironi L. ESPEN guideline on home enteral nutrition. Clin Nutr. 2020 Jan;39(1):5-22. https://www.clinicalnutritionjournal.com/article/S0261-5614(19)30198-0/fulltext
88. Dynamic Health. Providing gastrostomy tube care. EBSCO Information Services. 2022. 9 p. https://www.dynahealth.com/nursing-skills/providing-gastrostomy-tube-care Requires account to access.
89. JBI. Percutaneous endoscopic gastrostomy (PEG) post-operative care [recommended practice]. JBI EBP Database. 2022:Article JBI-RP-4362-2 3 p.
90. Moola S, Mbinji M. Percutaneous endoscopic gastrostomy: post-operative care [evidence summary]. JBI EBP Database. 2022:Article JBI-ES-2317-2. 2 p.
91. National Institute for Health and Care Excellence (UK). Nutrition support for adults: oral nutrition support, enteral tube feeding and parenteral nutrition. 2006 Feb 22 [updated 2017 Aug 4; cited 2023 Apr 20]. https://www.nice.org.uk/guidance/cg32
92. Schub T. Gastric feeding tube: using and caring for the patient with
-- Interactive. Pravikoff D, editor. EBSCO Information Services. 2017
Dec 8. 5 p.
93. Spruce P, Warriner L, Keast D, Kennedy A. Exit site wounds made easy. Wounds International. 2012;3(2). 6 p.
94. Registered Nurses' Association of Ontario. Oral health: nursing assessment and interventions. Toronto (CA). Registered Nurses' Association of Ontario. 2008 Dec. 99 p. https://rnao.ca/sites/rnao-ca/files/Oral_Health_-_Nursing_Assessment_and_Interventions.pdf
95. Dhooge M, Gaudric M. Non-surgical enteral nutrition access: gastrostomy and jejunostomy, technique and results. J de Chir Visc. 2013 Jun;150(3)Suppl:S19-S27. https://doi.org/10.1016/j.jchirv.2013.01.016
96. Dynamic Health. Replacing a gastrostomy feeding button in adults. EBSCO Information Services. 2022. 8 p. https://www.dynahealth.com/nursing-skills/replacing-a-gastrostomy-feeding-button-in-adults Requires account to access.
97. Heering H, Schub T. Gastrostomy tube: replacing. Pravikoff D, editor. EBSCO Information Services. 2017. 12 p.
98. Online Care Procedures. Insertion and removal of a gastrostomy tube or button [Internet]. Sherbrooke (QC): Centre d'expertise en santé de Sherbrooke; 2022 [cited 2023 Apr 21]. Requires account to access.
99. Tracey DL, Patterson GE. Care of the gastrostomy tube in the home. Home Healthc Nurse. 2006 Jun;24(6):381-6. http://doi.org/10.1097/00004045-200606000-00009
100. Best C. Enteral tube feeding and infection control: how safe is ourpractice? Br J Nurs. 2008 Sep 1;17(16):1036-41. https://doi.org/10.12968/bjon.2008.17.16.31069

101. Dussiaume, I. Alimentation entérale via sonde d'alimentation au niveau cutané. Montreal: Université de Montréal, CHU Sainte-Justine; 2021 May. 3 p. Technique de soins infirmiers# 3.6.
102. Simons S, Remington R. The percutaneous endoscopic gastrostomy tube: a nurse's guide to PEG tubes. Medsurg Nurs. 2013 Mar-Apr:22(2):77-83.
103. Lockwood C, Queiroz A. Percutaneous endoscopic gastronomy (PEG) tube: administration of enteral feed [evidence summary]. JBI EBP Database. 2022:Article JBI-ES-1912-2. 3 p.
104. Owaya A. Enteral tubes: administration of medication [evidence summary]. JBI EBP Database. 2022:Article JBI-ES-1685-6. 2 p.
105. Tillott H, Barrett D, Ruan J, Li V, Merrick S, Steed H, Morrissey H, Ball PA. Survey of nurses' knowledge and practice regarding medication administration using enteral tubes. J Clin Nurs. 2020 Dec;29(23-24):4614- 22. https://doi.org/10.1111/jocn.15498
106. Williams NT. Medication administration through enteral feeding tubes. Am J Health Syst Pharm. 2008 Dec 15;65(24):2347-57. https://doi.org/10.2146/ajhp080155
107. Wright D, Griffith R, Merriman H, Smithard D, Smyth J, Welsh N. Medication management of patients with nasogastric (NG), percutaneous endoscopic gastrostomy (PEG), or other enteral feeding tubes. Medscape UK; 2019 Jan. 12 p. https://www.medscape.co.uk/viewarticle/medication-management-patients-nasogastric-ng-percutaneous-2022a10025jw
108. Ordre des infirmières et infirmiers du Québec. Administration sécuritaire des médicaments: norme d'exercice. Montréal (QC): Ordre des infirmières et infirmiers du Québec; 2020. 30 p. https://www.oiiq.org/documents/20147/237836/4522-norme-adm-medicaments-web.pdf
109. Boullata JI. Drug administration through an enteral feeding ube. Am J Nurs. 2009 Oct;109(10): 34-42. https://doi.org/10.1097/01NAJ.0000361488.45094.28
110. Phillips NM, Nay R. Nursing administration of medication via enteral tubes in adults: a systematic review. JBI Libr Syst Rev. 2007;5(6):344-406. https://doi.org/10.11124/01938924-200705060-00001
111. DeLegge MH. Gastrostomy tubes: complications and their management. UpToDate. 2022 Nov 11. 21 p. https://www.uptodate.com/contents/gastrostomy-tubes-complications-and-their-management
112. Forest-Lalande L. The management of feeding gastrostomies. Gastrointest Nurs. 2012 Apr 1;10(3):28-35. https://doi.org/10.12968/gasn.2012.10.3.28
113. JBI. Percutaneous endoscopic gastrostomy (PEG): medication administration in aged care [recommended practice]. JBI EBP Database. 2022:Article JBI-RP-4226-3 2 p.
114. Online Care Procedures. Restoring patency to an enteral feeding tube or button [Internet]. Sherbrooke (QC): Centre d'expertise en santé de Sherbrooke; 2022 [cited 2023 Apr 21]. Requires account to access.
115. Pars H, Çavuşoğlu H. A literature review of percutaneous endoscopicgastrostomy: dealing with complications. Gastroenterol Nurs. 2019 Jul-Aug;42(4):351-9. https://doi.org/10.1097/SGA.0000000000000320
116. Pickering K. The administration of drugs via enteral feeding tubes. Nurs Times. 2003 Nov;99(46):46-9.
117. Arab K, Petit A. Complications of percutaneous gastrostomies (immediate complications excepted). Nutr Clin Metab. 2011 Sep;25(3):190-5. https://doi.org/10.1016/j.nupar.2011.06.005
118. Lee J, Spratling R. Care of gastrostomy feeding tube in children with developmental disabilities. Rehabil Nurs. 2014 Sep-Oct;39(5):221-4.
119. Nijs EL, Cahill AM. Pediatric enteric feeding techniques: insertion, maintenance, and management of problems. Cardiovasc Intervent Radiol.2010 Dec;33(6):1101-10. https://doi.org/10.1007/s00270-010-9837-7
120. Roche V. Percutaneous endoscopic gastrostomy: clinical care of PEG tubes in older adults. Geriatrics. 2003 Nov;58(11):22-6, 28-9.
121. Bourgault AM, Heath J, Hooper V, Sole ML, Nesmith EG. Methods used by critical care nurses to verify feeding tube placement in clinical practice. Crit Care Nurs. 2015 Feb 1;35(1):e1-e7. https://doi.org/10.4037/ccn2015984
122. Dynamic Health. Feeding tube placement verification. EBSCO Information Services. 2022. 8 p. https://www.dynahealth.com/nursing-skills/feeding-tube-placement-verification Requires account to access.
123. Odhiambo M. Enteral nutrition: infection control. JBI EBP Database. 2022 pr 4; JBI-ES-1984-2 3 p.
124. Dynamic Health. Preventing or managing complications associatedwith enteral nutrition: nutrition. EBSCO Information Services. 2022. 12 p. https://www.dynahealth.com/health-profession/preventing-or-managing-complications-associated-with-enteral-nutrition-nutrition Requires account to access.
125. Williams TA, Leslie GD. A review of the nursing care of enteral feeding tubes in critically ill adults: part II. Intensive Crit Care Nurs. 2005 Feb;21(1):5-15. https://doi.org/10.1016/j.iccn.2004.08.003
126. Carter-Stephens R. Buried bumper syndrome: prevention and management in the community. Br J Community Nurs. 2021 Sep 2;26(9):428-32. https://doi.org/10.12968/bjcn.2021.26.9.428
127. Beucher S, Cavayé M. Gastrostomy: appropriate care for every day. Arch Pediatr, 2010 Jun;17(6):754-5. https://doi.org/10.1016/S0929-93X(10)70094-4
128. Farou N, Lucas C, Olympia RP. School nurses on the front lines of healthcare: children with medical devices—a "BOLUS" of information about gastrostomy tube malfunctions and infections. NASN Sch Nurse. 2021 May;36(3):144-8. https://doi.org/10.1177/1942602X20940026
129. Green SM, Townsend K, Jarrett N, Westoby C, Fader M. People with enteral tubes and their carers' views of living with a tube and managing associated problems: a qualitative interview study. J Clin Nurs. 2019 Oct;28(19-20):3710–20. https://doi.org/10.1111/jocn.14972
130. Rodrigues LN, Silva AMO, Xavier MS, Chaves EMC. Complications and cares related to the use of the gastrostomy tube in pediatrics. ESTIMA, Braz. J. Enterostomal Ther. 2018;16:Article 1018. http://doi.org/10.30886/estima.v16.464

131. Seemann P. Managing hypergranulation tissue. Ostomy Wound Manag. 2010 Nov;56(11):18. https://www.hmpgloballearningnetwork.com/site/wmp/content/managing-hypergranulation-tissue
132. Baskin WN. Acute complications associated with bedside placement of feeding tubes. Nutr Clin Pract. 2006 Feb;21(1):40-55. https://doi.org/10.1177/011542650602100140
133. Chang WK, Wang NC, Wang WM, Chen JF. Prospective evaluation of peristomal cutaneous changes among patients with long-term percutaneous endoscopic gastrostomy. Adv Skin Wound Care. 2014 Jun;27(6):260-7. https://doi.org/10.1097/01.ASW.0000449854.63913.25
134. Dynamic Health. Gastrostomy tube placement interventions, adult. EBSCO Information Services. 2022. 9 p. https://www.dynahealth.com/care-interventions/gastrostomy-tube-placement-interventions-adult Requires account to access.
135. Dynamic Health. Gastrostomy tube placement interventions, pediatric. EBSCO Information Services. 2022. 12 p. https://www.dynahealth.com/care-interventions/gastrostomy-tube-placement-interventions-pediatric Requires account to access.
136. Forest-Lalande L. Feeding gastrostomies: prevention and management of tube-related complications. WCET Journal. 2012 Jul-Sep;32(3):22-27.
137. Dynamic Health. Performing enteral tube dressing change and skin care in pediatric patients. EBSCO Information Services. 2022. 8 p. https://www.dynahealth.com/nursing-skills/performing-enteral-tube-dressing-change-and-skin-care-in-pediatric-patients Requires account to access.
138. Dynamic Health. Replacing a gastrostomy tube. EBSCO Information Services. 2022. 8 p. https://www.dynahealth.com/nursing-skills/replacing-a-gastrostomy-tube Requires account to access.
139. Providence Health Care; Vancouver Coastal Health. Enterostomy feeding tubes: care and management (G- tubes, J-tubes or GJ-tubes). 2019 Nov 8. 41 p. Report No.: BD-00-07-40067.
140. Ang SY, Lim ML, Ong HS, Chong JNC, Ng XP, Lam M, Chan MM, Lopez V, Lim SH. A descriptive study of enteral tube feeding among adults in an acute care tertiary hospital-patient selection, characteristics and complications. Clin Nutr ESPEN. 2020 Jun;37:58-64. https://doi.org/10.1016/j.clnesp.2020.03.021
141. Teitelbaum D, Guenter P, Howell WH, Kochevar ME, Roth J, Seidner DL. Definition of terms, style, and conventions used in A.S.P.E.N. guidelines and standards. Nutr Clin Pract. 2005 Apr;20(2):281-5. https://doi.org/10.1177/0115426505020002281
142. Santini E. Best practices in enteral nutrition. Nutr Ther Metab. 2010;28(2):64-7.
143. Davies N, Barrado-Martín Y, Vickerstaff V, Rait G, Fukui A, Candy B, Smith CH, Manthorpe J, Moore KJ, Sampson EL. Enteral tube feeding for people with severe dementia. Cochrane Database of Syst Rev. 2021 Aug 13;(8):Article CD013503 96 p. https://doi.org/10.1002/14651858.CD013503.pub2
144. Sánchez-Sánchez E, Ruano-Álvarez MA, Díaz-Jiménez J, Díaz AJ, Ordonez FJ. Enteral nutrition by nasogastric tube in adult patients under palliative care: a systematic review. Nutrients. 2021 May;13(5):Article 1562. https://doi.org/10.3390/nu13051562
145. Kuraoka Y, Nakayama K. Factors influencing decision regret regarding placement of a PEG among substitute decision-makers of older persons in Japan: a prospective study. BMC Geriatr. 2017 Jun 28;17:Article 134. https://doi.org/10.1186/s12877-017-0524-2
146. Boldo-Roda E, Peris-Trias A, de Lucia-Peñalver GP, Martinez-Ramos D, Miralles-Tena JM. Reflections in front of a case of ventral hernia after PEG tube removal. Gastrointest Endosc. 2005 Aug;62(2):323-4. https://doi.org/10.1016/s0016-5107(05)00555-9
147. Kachare MD, Rossi AJ, Mahpour NY, Davidov T. Incisional hernia after percutaneous endoscopic gastrostomy tube placement: importance of avoiding the linea alba. ACG Case Rep J. 2019 Jul;6(7):Article e00120. https://doi.org/10.14309/crj.0000000000000120
148. Navarro F, Loflin C, Diegidio P, Atwez A, Reeves J. Herniation through gastrostomy site: case report. Int J Surg Case Rep. 2016;25:165-6. https://doi.org/10.1016/j.ijscr.2016.05.054
149. Braegger C, Decsi T, Dias JA, Hartman C, Kolacek S, Koletzko B, Koletzko S, Mihatsch W, Moreno L, Puntis J, Shamir R, Szajewska H, Turck D, van Goudoever J; ESPGHAN Committee on Nutrition. Practical approach to paediatric enteral nutrition: a comment by the ESPGHAN committee on nutrition. J Pediatr Gastroenterol Nutr. 2010 Jul;51(1):110-22. https://doi.org/10.1097/MPG.0b013e3181d336d2
150. Im JP, Cha JM. Proton pump inhibitor use before percutaneous endoscopic gastrostomy is associated with adverse outcomes. Gut Liver. 2014 May;8(3):248-53. https://doi.org/10.5009/gnl.2014.8.3.248
151. Maqbool SZ, Anwar R, Bashir S. Determine of frequency of local infection following peg tube insertion in cancer patients. Pak. J. Med. Health Sci. 2017 Jan-Mar;11(1):64-7. https://pjmhsonline.com/2017/jan_march/pdf/64.pdf
152. Lipp A, Lusardi G. A systematic review of prophylactic antimicrobials in PEG placement. J Clin Nurs. 2009 Apr;18(7):938-48. https://doi.org/10.1111/j.1365-2702.2008.02585.x
153. Sandy-Hodgetts K, Alves P, Conway B, Djohan R, Idensohn P, McIsaac C, Morgan-Jones R, Nair HKR, Rochon M, Romanelli M, Serena T, Tariq G, Wainwright T. Optimising prevention of surgical wound complications: Detection, diagnosis, surveillance and prediction. London (UK): Wounds International, International Surgical Wound Complications Advisory Panel; 2022. 28 p. https://www.woundsinternational.com/resources/details/optimising-prevention-surgical-wound-complications-detection-diagnosis-surveillance-and-prediction
154. Barnadas G. Navigating home care: enteral nutrition—part one. Pract Gastroenterol. 2003 Oct;27:13-35
155. DiBaise JK, Anton Decker G. Enteral access options and management in the patient with intestinal failure. J Clin Gastroenterol 2007 Aug;41(7): 647-656. https://doi.org/10.1097/01.mcg.0000225691.62121.8e
156. Maselli KM, Camacho L, Delaplain PT, Nguyen, MVL, Mallicote M, Philippe-Auguste M, Gayer CP. Nurse practitioner-managed clinic reduces emergency department visits for parents of children with problematic gastrostomy tubes. J Pediatr Surg Nurs. 2021 Apr-Jun;10(2):56-63. https://doi.org/10.1097/JPS.0000000000000286

157. Blagrave P. Enteral tube feeding in long-term care: tube feeding no longer the exclusive domain of hospitals. Can Nurs Home. 2002 Jun;13(2):16-21.
158. Siau K, Troth T, Gibson E, Dhanda A, Robinson L, Fisher NC. How long do percutaneous endoscopic gastrostomy feeding tubes last? A retrospective analysis. Postgrad Med J. 2018 Aug;94(1114): 469-74. https://doi.org/10.1136/postgradmedj-2018-135754
159. Dynamic Health. Maintaining and replacing gastrostomy feeding buttons in pediatric patients. EBSCO Information Services. 2022. 9 p. https://www.dynahealth.com/nursing-skills/maintaining-and-replacing-gastrostomy-feeding-buttons-in-pediatric-patients Requires account to access.
160. Initial and ongoing verification of feeding tube placement in adults (applies to blind insertions and placements with an electromagnetic device). Crit Care Nurs. 2016 Apr 1;36(2):e8-e13. https://doi.org/10.4037/ccn2016141
161. Online Care Procedures. Verifying proper placement of a gastric or enteric tube or button [Internet]. Sherbrooke (QC): Centre d'expertise en santé de Sherbrooke; 2022 [cited 2023 Apr 21]. Requires account to access.
162. Ni MZ, Huddy JR, Priest OH, Olsen S, Phillips LD, Bossuyt PM, Hanna GB. Correction: selecting pH cut-offs for the safe verification of nasogastric feeding tube placement: a decision analytical modelling approach. BMJ Open. 2018 Jan;8(1):Article e018128. Erratum for: BMJ Open. 2017 Nov;7(11):Article e018128. http://dx.doi.org/10.1136/bmjopen-2017-018128corr1
163. Burd A, Burd RS. Guide for home gastrostomy tube care. K Gracey editor. Adv Neonatal Care. 2003 Aug;3(4):206-7. https://nann.org/uploads/Education/Guide_for_Home_Gastronomy_Tube_Care.pdf
164. Kyawt K. Gastrostomy feeding (school setting): tube care and infection control [evidence summary]. JBI EBP Database. 2021:Article JBI-ES-1357-1. 4 p.
165. Induja L, Aslam T, Chithra S, Andhuvan G. Pharmacist intervention and preparation of manual in the administration of drugs through enteral feeding tube. Int J Pharm Sci. 2018 Dec;10(12):21-4.
166. Online Care Procedures. Flushing gastric or enteric tubes or buttons [Internet]. Sherbrooke (QC): Centre d'expertise en santé de Sherbrooke; 2022 [cited 2023 Apr 21]. Requires account to access.
167. Walsh K, Woten M. Feeding tube irrigation: performing. Pravikoff D, editor. EBSCO Information Services. 2017, 4 Aug. 20 p.
168. NHS Tees, Esk and Wear Valleys. Enteral feeding jejunostomy (JEJ): procedure for learning disabilities adult and children. CLIN-0104-v1. Enteral Feeding jejunostomy (JEJ) procedure. 2020 Oct 30. https://www.tewv.nhs.uk/content/uploads/2021/12/Enteral-Feeding-Jejunostomy-JEJ-Procedure.pdf
169. Metheny NA. CE: monitoring adult patients for intolerance to gastric tube feedings. Am J Nurs. 2021 Aug 1;121(8):36-43.
170. Wiese AN, Rogers MJ, Way M, Ballard E. The impact of removing gastric residual volume monitoring and enteral nutrition rate titration in adults receiving mechanical ventilation. Aust Crit Care. 2020;33(2):155-61. https://doi.org/10.1016/j.aucc.2018.12.001
171. Yasuda H, Kondo N, Yamamoto R, Asami S, Abe T, Tsujimoto H, Tsujimoto Y, Kataoka Y. Monitoring of gastric residual volume during enteral nutrition. Cochrane Database Syst Rev. 2021 Sep 27;9(9):Article CD013335. https://doi.org/10.1002/14651858.CD013335.pub2.
172. Holly A, Curtis N. Educational vs practice : evidence-based comparison of enteral nutrition tube residual management. P13 University of South Alabama.
173. Naik RP, Joshipura VP, Patel NR, Haribhakti SP. Complications of PEG: prevention and management. Trop Gastroenterol. 2009 Oct-Dec;30(4):186-194.
174. León AH, Hebal F, Stake C, Baldwin K, Barsness KA. Prevention of hypergranulation tissue after gastrostomy tube placement: a randomised controlled trial of hydrocolloid dressings. Int Wound J. 2019 Feb;16(1):41-6. https://doi.org/10.1111/iwj.12978
175. Mitchell A, Llumigusin D. The assessment and management of hypergranulation. Br J Nurs. 2021 Mar 11;30(5):S6-S10. https://doi.org/10.12968/bjon.2021.30.5.S6
176. Rollins H. Hypergranulation tissue at gastrostomy sites. J Wound Care. 2000 Mar;9(3):127-9.
177. Daoust C, Leduc, C. Cautérisation du tissu d'hypergranulation (bourgeon) au pourtour d'une gastrostomie. Montreal: Université de Montréal, CHU Sainte-Justine; 2019 Aug. 1 p. Technique de soins infirmiers# 11.7.
178. St-Cyr D. L'hypergranulation: un obstacle à la cicatrisation des plaies. Perspectives Infirmières. 2012 Nov-Dec:50-3. https://www.oiiq.org/sites/default/files/uploads/periodiques/Perspective/vol9no6/10_Soins_de_plaies.pdf
179. Rippke F, Berardesca E, Weber TM. pH and microbial infections. Curr Probl Dermatol. 2018;54:87-94. https://doi.org/10.1159/000489522
180. Lynch CR, Fang JC. Prevention and management of complications of percutaneous endoscopic gastrostomy (PEG) tubes. Pract Gastroenterol. 2004 Nov;28:66-77.
181. Abiramalatha T, Thanigainathan S, Ninan B. Routine monitoring of gastric residual for prevention of necrotising enterocolitis in preterm infants. Cochrane Database Syst Rev. 2019 Jul 9;(7):Article CD012937 38 p. https://doi.org/10.1002/14651858.CD012937.pub2
182. Elser HE. Positioning after feedings: what is the evidence to reduce feeding intolerances? Adv Neonatal Care. 2012 Jun;12(3):172-5. https://doi.org/10.1097/ANC.0b013e318256b7c1
183. Farsi Z, Kamali M, Butler S, Zareiyan A. The effect of semirecumbent and right lateral positions on the gastric residual volume of mechanically ventilated, critically ill patients. Nurs Res. 2020 Aug;28(4):Article e108. https://doi.org/10.1097/jnr.0000000000000377
184. Bryant RA, Nix DP. (2011). Acute and Chronic Wounds-Nursing Management (4th ed). Philadelphia: Mosby.
185. Vizhi K, Rao HB, Venu RP. Percutaneous endoscopic gastrostomy site infections: incidence and risk factors. Indian J Gastroenterol. 2018 Mar;37(2):103-7. https://doi.org/10.1007/s12664-018-0822-4

186. Institut national d'excellence en santé et en services sociaux (INESSS). La culture de plaie : pertinence et indications. Avis rédigé par Anne Bergeron. Québec, Qc : INESSS; 2020. 198 p https://www.inesss.qc.ca/fileadmin/doc/INESSS/Rapports/Biologie_medicale/INESSS_Avis_Culture_plaie.pdf
187. Hoepffner N, Schröder O, Stein J. Enteral nutrition by endoscopic means; II. complications and management. Z Gastroenterol, 2004 Dec;42(12): 1393-8. https://doi.org/10.1055/s-2004-813807
188. Hopkins B, Donnelly-VanderLoo M, Davis B, Madill J. Prevalence and management of enteral nutrition intolerance in the non-ICU setting in Canada. Canada J Clin Nutr. 2017 Jun;5(2):82-101. http://dx.doi.org/10.14206/canad.j.clin.nutr.2017.02.07
189. Özcan M. PEG complications and enteral nutrition in hemodynamic instability. Turk J Cerebrovasc Dis. 2019 Oct; 25(S2):108-9. https://docplayer.biz.tr/179425653-Editor-prof-dr-atilla-ozcan-ozdemir-editor-yardimcisi-prof-dr-ethem-murat-arsava-onceki-editorler-prof-dr-gazi-ozdemir-prof-dr.html

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