Enteral Feeding

Care and Maintenance of the Stoma Site and Feeding Tube

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Post Test Answers

1. True. Enteral feeding is also considered to be safer than parenteral feeding.

2. B. Today's feeding tubes are made out of materials that are biocompatible and incorporate features to stabilise the tube more effectively. The other statements are false. Nasogastric tubes are designed for short-term feeding. Printed information on the tube includes graduation marks for verification of tube position. French size, manufacturer, etc.; and the type of feeding tube and its placement will depend on the patent's clinical condition and the length of time the tube will be needed.

3. False. Dressings are not recommended for long-term use and should be avoided unless absolutely necessary. If dressings are used, they should be monitored, and soiled or wet dressings changed often to prevent accumulation of moisture and to keep the skin around the stoma clean and dry.

4. D. All of the above. Gastrostomy and Jejunal tubes are placed surgically through an open surgical procedure or a laparoscopic procedure; endoscopically; or radiologically.

5. D. All of the above. Also assess for warmth, rashes, irritation and gastrointestinal drainage.

6. False. Hydrogen peroxide should not be used. Do not rotate jejunal tubes as torque created on the tubes may cause them to retract into the stomach.

7. True. Leakage can also be caused by tube displacement, inadequate tube stabilisation or incorrect feeding practices.

8. D. All of the above. Tube occlusion can also be caused by measurement of gastric residual, pill fragments, thick formulas and medications, and formula contamination.

9. A. Use room temperature water for flushing tubes. The other answers are incorrect because pill medications must be crushed and dissolved in warm water before administering, but always in association with the pharmacist or physician. Acidic irritants such as cranberry juice or cola can actually contribute to the occlusion of tubes. The amount of water used for tube flushing will depend on the patient's needs and can range from 10 to 50 mL for adults, and 3 to 10 mL for infants.

10. D. All expect A. Never pull on an enteral feeding tube to verify placement. Tubes that are displaced can cause serious physical problems. Pulling on a tube can also cause the tube to be pulled out of the body, and can result in further patient discomfort and interruptions to the feeding schedule.

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XI. Post Test

1. T/F Enteral feeding is preferred over parenteral feeding because it is less expensive and keeps intestinal defences intact.

2. The following can be said regarding feeding tubes:
   a - Nasogastric and jejunal tubes are designed for long-term feeding
   b - Today's feeding tubes are made out of materials that are biocompatible and incorporate features to stabilise the tube more effectively
   c - Printed information on the tube explains how to insert the tube
   d - The type of feeding tube and its placement will depend on the availability of tubes

3. T/F Dressings should always be used with gastrostomy tubes to cover the stoma site.

4. Gastrostomy and Jejunal feeding tubes can be placed in these ways:
   a - Surgically
   b - Endoscopically
   c - Radiologically
   d - All of the above

5. Daily inspection of the patient's stoma should include assessment for:
   a - Redness
   b - Swelling
   c - Oedema
   d - All of the above

6. T/F When caring for the stoma site and tube, always clean around the stoma with hydrogen peroxide, wash the tube with soap and water, and rotate the bolter and tube 360º plus a quarter turn.

7. T/F Leakage of gastric or jejunal contents can be caused by improperly sized tubes.

8. Tube occlusion can be caused by:
   a - Cranberry juice used as an irritant
   b - Reflux of gastric contents
   c - Poor flushing technique
   d - All of the above

9. The following can be said about maintaining tube patency:
   a - Use room temperature water for flushing tubes
   b - Small pills can be vigorously flushed through the tube
   c - Cranberry juice can be used to flush occluded tubes
   d - 30 mLs is the recommended amount of water that should be used during every flushing

10. To verify tube placement, use the following:
    a - Pulling on the tube
    b - Aspirating gastric contents
    c - Referencing tube marks
    d - All except A

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Bowling, T (ED) Nutrition Support for Adults and Children – a Handbook for Hospital Practice, Abingdon: Radcliffe Medical Press. 2004.

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I. Introduction

Today in many homes, hospitals and nursing homes, there are patients who cannot or will not eat, and who require long-term nutritional support. Patients with feeding tubes can vary widely from premature infants to the elderly. They may be survivors of strokes, chronic conditions such as cancer, or head trauma.[1] Enteral feeding tubes are the life-lines that enable these patients to receive the nutrition and medications they need to survive. Enteral or tube feeding refers to the administration of a prescribed diet by means of a flexible tube that may be inserted into the stomach or small bowel either transnasally, surgically, radiologically or endoscopically.[1,2,3,4] Tube enterostomies are considered for patients who have a functioning GI tract, but who cannot ingest sufficient food and nutrients orally to meet daily nutritional requirements, necessitating nutritional support over an extended period of time, or when nasal intubation is impossible.[2,4] Enteral feeding is preferred over parenteral feeding as a less expensive and safer alternative, helping patients with growth and maintenance of nutritional needs while keeping important intestinal defences intact.[2] Keeping intestinal defences intact and functioning is important in keeping the normal bacterial flora in check. Conditions for which enteral nutrition may be indicated include anorexia, malabsorption, chronic malnutrition, infants with failure to thrive, major burns, severe trauma, hepatic or renal failure, oesophageal tumours, stroke and cerebral palsy.[4,5]

Optimal care and management by the multidisciplinary care team are the keys to reducing complications and ensuring a more successful patient outcome. As a healthcare provider caring for patients requiring enteral feeding, it is important to become familiar with the individual types of feeding tubes, their components, care, potential complications and preventative measures.

II. Objectives

This booklet is designed to provide a practical guide to the care and maintenance of feeding tubes and the stoma site with troubleshooting recommendations for preventative measures and treatment options. These are general guidelines and are not intended to replace or supersede manufacturer instructions, clinical judgement or institution policies.

The objectives of this booklet are to:

- Identify various long-term enteral feeding tubes and their common components.
- Explain and demonstrate daily care and maintenance of the stoma site, possible complications and their management.
- Explain and demonstrate daily care and maintenance of the enteral feeding tube, possible complications and their management.
- Discuss tube removal, replacement and placement verification techniques.

III. Gastrostomy and Jejunal Feeding Tubes

For decades, Levin stomach tubes, Foley catheters and nasogastric tubes made from polyvinylchloride (PVC) and latex were commonly used for enteral feeding.[1] However, in recent years, advances in new materials and designs have resulted in enteral feeding tubes which are soft, durable, biocompatible and which incorporate features to secure and stabilise the tubes more effectively.[1] These newer silicone and polyurethane feeding tubes are specifically designed for long-term feeding and prevent a variety of conditions such as stomach leaks, prolapse into the gastric outlet, tube migration, tube deterioration, tissue reaction, irritation and granulation.[1,6]

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VII. Promotion of Best Practices

Because of the wide variety of feeding tubes available, and the variety of complications associated with their use, healthcare providers become active participants in the use and development of best practices. Through the adoption of professional standards of practice, along with facility-wide protocols, a facility and its caregivers can promote successful outcomes. Here are various ways this can be facilitated:

Establish policies, procedures and methods to evaluate care that improve consistency and promote successful outcomes by all healthcare providers.[2] Written policies and procedures on the care and maintenance of enteral feeding tubes can provide consistent care. The policies and procedures can be created by adopting standards written by professional organisations.

The British Association for Parenteral and Enteral Nutrition (BAPEN) is an association of doctors, nurses, dietitians, pharmacists and nutritionists, scientists and patients that publishes guidance on the importance of good nutrition in clinical practice and the necessity for interdisciplinary care.

They have published a handbook on nutrition to support practice in adults and children.[15] They also provide ongoing education and in-service training.[2,5] Healthcare providers should continually learn about enteral feeding in order to promote optimal patient care and update expertise. This should include a review of possible complications, troubleshooting tips, the necessity for infection prevention and control techniques, and knowing when to contact the physician.[2,5]

The National Institute for Clinical Excellence control guidelines provide resources to healthcare providers on the possible complications associated with enteral tubes, and nursing interventions.[16] Begin discharge planning early with the patient.[2,5,6] Many patients are discharged to homecare with enteral feeding. The more information the patient and family or other caregivers receive on the care and maintenance of the feeding tube, the greater the change for a successful outcome.[4]

BAPEN advocates training and education by healthcare providers to patients and their families that is specific to the patient's assessed needs, abilities and readiness, as appropriate to the care and service provided. For example, education should include information on the safe and effective use of formulas, medication administration, care of the tube and stoma, and techniques to monitor possible complication.[15] In addition, Patients on Intravenous and Nasogastric Nutrition Therapy (PINNT) provide free information and support to patients and their caregivers who are dependent on enteral nutrition.

VIII. Conclusion

Enteral feeding is a safe, effective way to deliver nutrition to patients who are not able to meet their needs through normal eating. Through the collaborative efforts of the multidisciplinary enteral feeding team, and with knowledge of feeding tubes, possible complications, and preventative measures, we can significantly improve patient care, meet nutritional goals and decrease the complications associated with tube feeding.[3,13]

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A. Long-Term Feeding Tubes

The type of feeding tube and its placement will depend on various factors, including the patient's clinical condition and the length of time the tube will be needed.[1]

There are two categories of enteral feeding tubes: nasoenteric and enterostomy tubes. **Nasoenteric tubes** are placed either nasally or orally – typically in patients requiring short-term nutritional support, usually for less than 30 days. **Enterostomy tubes** are placed into the stomach or small bowel through an incision in patients requiring nutritional support over an extended period of time, usually greater than 30 days.[2,3]

For the purpose of this booklet, we will focus on the long-term enterostomy feeding tubes which can be divided into two main groups: Gastrostomy tubes – those tubes placed into the patient's stomach, and Jejunal feeding tubes – those placed into the duodenum or proximal jejunum using a variety of techniques. These groups can be further categorised into standard and low profile feeding tubes, either with a balloon or non-balloon internal retention device.

1. Gastrostomy Tubes

Gastrostomy feeding tubes are placed in the stomachs of patients who require long-term feeding, are unable to tolerate oral feeding, and who are at low risk for aspiration.[1,6]
There are three main types of gastrostomy tubes: Percutaneous Endoscopic Gastrostomy (PEG) tubes, low-profile gastrostomy tubes, and standard gastrostomy tubes.

The PEG tube is a commonly used feeding tube, primarily used as an initial placement tube to establish the tract and stoma site.[1,5] Technically and historically, PEG tubes have been placed endoscopically, but today PEG tubes can also refer to tubes placed percutaneously by interventional radiology.

Standard Gastrostomy Tubes, balloon or non-balloon, may be placed surgically as an initial device or as a replacement feeding tube. Surgical gastrostomy tubes are placed generally during a laparotomy or open surgical procedure using a Stamm surgical gastrostomy technique and placed in patients where surgical placement is the only option – such as those who may have had previous gastric surgery, are morbidly obese, may have oesophageal obstruction or may have the presence of ascites.[1,6]
Standard gastrostomy tubes, balloon or non-balloon, used as replacement devices are placed once the initial gastrostomy tube has created a well-formed tract between the stomach and abdominal wall, which generally occurs within six weeks, although the time for the tract to mature may vary.[1,6,7]

The **Low Profile Gastrostomy tube** is a lightweight alternative to the standard gastrostomy tube. The low profile tube rests comfortably just above the abdomen and is well suited for active adults, paediatric patients and those prone to pulling on their feeding tubes. Some low profile gastrostomy feeding tubes are suitable for initial placement, but most are designed for insertion in a well established tract.[1,3,6]

2. Jejunal Tubes

Jejunal tubes are used to feed formula into the distal duodenum or proximal jejunum. They are placed in patients who cannot absorb adequate nutrition through the stomach, who have intestinal mortality problems, or who are at risk of aspiration.[1,3]

Today, there are five main types of Jejunal tubes: the Percutaneous Endoscopic Jejunostomy (PEJ) tube; the Gastro-Jejunal (G-J tube); the Jejunostomy tube; the needle catheter Jejunostomy tube; and the Roux en Y jejunostomy tube.

The **Percutaneous Endoscopic Jejunostomy (PEJ) tube** often refers to a small-bore threaded through an existing PEG or standard gastrostomy tube and may be used when jejunal feeding and simultaneous gastric decompression are desired.[1,4,6] The PEG/PEJ tube tends to clog easily because of the small internal tube diameter. It also presents difficulties in flushing when trying to maintain patency, and has been associated with high rates of dislodgement. [4]

The **Gastro-Jejunal (G-J)** tube may be a balloon or non-balloon retention device and may be placed directly through the stomach and into the jejunum either surgically, endoscopically or radiologically and allows for early feeding in haemodynamically stable patients.[1,6] G-J tubes have one port for direct feeding into the jejunum and a separate port that allows simultaneous access to the stomach for decompression or medication administration.[1]

The **Jejunostomy Tube** is placed directly into the jejunum during an open surgical procedure often using the Witzel tunnel technique, and the tube may include suture wings for anchoring it in place.[1] Jejunostomy tubes usually have one port for direct feeding into the jejunum.

The **needle catheter Jejunostomy tube** may be used in patients undergoing GI tract surgery who require short-term jejunal feeding. The tube is tunnelled sub-mucosally. The narrow tube only has an external suture to keep it in place, so it may block or fall out easily.

The **Roux en Y Jejunostomy tube**– this may be useful in the long-term allowing a low profile tube to be placed directly into the jejunum.

B. Components

The following components are common to most feeding tubes:

- Fixed or moveable external bolsters secure the feeding tube on the outside of the abdomen to prevent inward migration.
- Balloon or non-balloon internal bolsters secure the device inside the stomach or jejunum and prevent outward tube migration (not with a needle catheter jejunostomy).
- An adapter, which contains one to three ports, accommodates various types of administration set, syringes for the delivery of fluids and medications, and a balloon to secure the tube internally.
- Low profile devices have a port which attaches to an administration or extension set to allow formula, water and medication to be added through the feeding tube. This port also contains an anti-reflux valve, which prevents leakage of stomach contents through the tube.
- Printed information on the tube itself includes centimetre graduation marks providing easy verification of tube position. Additional printing allows for identification of the tube by French size, identification of the medication port, feed port, manufacturer, and the balloon inflation port on balloon retained services.
- Radiopaque features allow the tube to be seen easily during fluoroscopy.

IV. Stoma Site Care and Maintenance, Complications and Management

A. Stoma Site Care and Maintenance

Some of the most common complications with feeding tubes are stoma site problems. Daily assessment and care of the stoma site is needed to protect the skin around the tube and maintain the tube's position. The following general recommendations may make the difference between a patient with a successful outcome and one with preventable complications. However, always use clinical judgement and refer to your institution's

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- Gently slide the external bolster down the tube toward the abdomen until it rests 2-3 mm above the skin; approximately the thickness of a 50 pence coin.
- Verify proper placement of the tube.
- Flush the tube to verify patency.
- Document the date, the type, size and lot number of the tube, the fill volume of the balloon (if applicable), the centimetre mark on the tube that is closest to the top of the external bolster, skin condition and patient tolerance to the procedure. Start feeding and medication only after proper placement and patency.

Note: Replacement of low-profile devices should follow a similar procedure; however, because the external retention device is fixed, the stoma should be measured with a stoma-measuring device to determine the proper length of the replacement tube. Care should be taken to account for proper measurement of the stoma. This can be accomplished by taking two measurements, one with the patient in supine position and the other in the sitting position and by taking the average of these two measurements. This should be done after cleaning and prior to placement of the new tube.

C. Tube Placement Verification

After replacing a tube, and before beginning any feeding or instillation of any medication, you must verify tube placement. This is critical for various reasons:

- Tubes displaced due to migration or episodes of vomiting or coughing can migrate to the oesophagus, leading to aspiration or failure to meet nutritional goals.[3]
- Tubes with internal balloons can move away from the stomach wall and lodge in the pyloric sphincter causing gastric outlet obstruction.[3]
- Tubes that pull through the gastrointestinal tract into the peritoneum can cause peritonitis.[3] Therefore, be sure to check placement before feeding or installation of any medication if there is any sign that the tube has migrated.[2,3,13]

There are three ways to verify tube placement:[1,2,4,8,9,10]

1. Reference and document the tube graduation marks. Many enteral feeding tubes have graduation marks to indicate the depth of the tube placement. If not, a mark should be made with a non- toxic permanent ink pen where the tube exits the body. You can also measure the external length of the feeding tube. If there is a change in the position of the markings or in the length of the tube, verify the position of the tube with other methods before proceeding.

2. Aspirate to determine if the tube is in the stomach. This method is used to aspirate contents from the area where the tip of the tube is located. If the material is gastric contents, with pH of 5.5 or less, the tube should be located in the stomach. Attach a 30 mL syringe to the gastric port of the tube and draw back the piston of the syringe. The content should be gastric, either appearing to be similar to the most recent feedings, or other gastric contents, clear or with some residual. Flush the tube with 30 mL of water after verifying gastric contents.
   Note: Do not check for residuals through jejunal tubes as this could cause the mucosa to be suctioned into the tube and injure the patient or clog the tube.

3. Use radiographic verification. If there is any doubt as to the position of the tube, or if other methods are questionable or inadequate, always use radiographic confirmation. This is the most accurate way to verify tube placement. Start feeding and medication only after confirmation of proper tube placement.

VI. Feeding Tube Removal, Replacement and Verification Techniques

A. Standard Balloon Gastrostomy Tube Removal

In some care settings, a registered specialist nurse may replace gastrostomy tubes. Follow your institution's policies and Scope of Professional Practice to determine whether and under what circumstances this practice is employed. PEG tube, non-balloon gastrostomy tube and jejunostomy tube removal typically require a physician; however, if you are called upon to replace a balloon gastrostomy tube, follow these general guidelines.

To remove a standard balloon gastrostomy tube:[7,10]

- First, make sure that this type of tube can be replaced at the bedside.
- Assemble all equipment and supplies, then cleanse your hands using aseptic technique and apply clean, powder-free, gloves.
- Rotate the tube 360º to ensure that the tube moves freely and easily, then loosen the external bolster if it is not fixed.
- Firmly insert an applicable slip tip or luer-lock syringe into the balloon inflation port and withdraw all the fluid from the balloon.
- Apply counter pressure to the abdomen and remove the tube with gentle, but firm traction.

Note: If resistance is encountered, slide the external bolster up the tube away from the abdomen, then lubricate the tube and stoma with a water-soluble lubricant. Simultaneously push and rotate the tube approximately 1" inward. Gently manipulate the tube free. If the tube will not come out, refill the balloon with the prescribed amount of water, adjust the external bolster and notify the physician. Never use excessive force to remove a tube.

B. Balloon Gastrostomy Tube Replacement

To replace a balloon gastrostomy tube: [7,8,10]

- First cleanse the skin around the stoma site and allow the area to air dry.
- If the stoma site is large, wait 10-15 minutes to insert the new tube to allow some shrinking of the stoma site.
- Slide the external bolster toward the head of the tube, away from the balloon on the distal end.
- Check the integrity of the balloon by filling the balloon with the amount of sterile or distilled water recommended by the manufacturer.
- Remove the syringe and ensure that the balloon is evenly filled and does not leak.
- Reinsert the syringe and remove the water from the balloon.
- Lubricate the tip of the tube with water-soluble lubricant. Do not use oil or petroleum jelly as these can damage the tube.
- Gently insert the tube through the tract and into the stomach.
- Fill the balloon with the amount of sterile water recommended by the manufacturer. Never use air, or exceed the recommended fill volume.
- Gently pull the tube up and away from the abdomen until the balloon contacts the inner stomach wall.
- Clean any residual fluid or lubricant from the tube and stoma.

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policies or the manufacturer's instructions for complete daily care and maintenance guidelines. Strict adherence to infection control protocols is of utmost importance whenever the stoma and tube are inspected. Always begin with proper hand hygiene. Clean hands with liquid soap and water and ensure that hands are dried thoroughly. Or, use a waterless alcohol-based gel or foam and allow hands to air dry. Then, put on a pair of clean, powder-free gloves.[9,10]

Immediately after the initial tube is placed, a sterile dressing may cover the site – usually for the first 24 hours. After adequate healing time, the dressing should be removed and the site inspected on a daily basis.[7,8]
During every daily inspection, begin by assessing the skin around the tube for signs of infection, including: redness, irritation, oedema, swelling, tenderness, warmth, rashes, purulent or gastrointestinal drainage.[1,6,7,9]
A small amount of serosanguineous drainage on the dressing is normal on new sites.[7] Also look for pressure necrosis, skin breakdown or hypergranulation tissue, as these may require systemic and local antimicrobial therapy.[7] Assess the patient for any signs of pain, pressure or discomfort around the stoma site, and be sure to notify the physician or follow your local protocol if there are complications noted.[9]
After the assessment, routine site care should include cleansing the skin around the stoma with warm water and mild soap, using a circular motion, moving from the tube outward, followed by thorough rinsing and drying around the site[1,6,8]

If sutures are present, use non-woven gauze to thoroughly clean the skin under the external bolster, rinse thoroughly and dry.[1,6,8] Some patients have a skin barrier or stabilising device that secures the tube in place and replaces the need for sutures. If these types of devices are used, be sure to clean around the stoma before replacing and/or changing the device.[6,7] Do not use hydrogen peroxide to clean the stoma as hypergranulation has been associated with the frequent use of hydrogen peroxide.[6,7]
Inspect the gastrostomy tube and rotate the bolster and tube 360º plus a quarter turn daily to ensure proper tube fit, to prevent tissue from adhering to the tube, to relieve pressure on the skin and to allow for air circulation.[1,9,10] Do not rotate jejunal tubes as torque created on the tubes may cause them to retract into the stomach.

B. Stoma Site Complications and Management

Common stoma site complications include:

1. Infection
2. Pressure Necrosis
3. Skin Breakdown
4. Hypergranulation
5. Peritubular Allergic Reactions

1. Infection

Bacterial infections can be characterised by pain, inflammation, skin redness or warmth, and can be caused by excess moisture due to leakage, pressure at the site, or lack of prophylactic antibiotics at the time of tube insertion. If infection is present, the site should be cleansed twice daily with water alone. Bacterial infections may be treated with prescribed oral antibiotics or topical antibiotic ointments according to swab results. However, do not use any antibiotic for longer than the prescribed period, as this could lead to the development of resistant organisms. To assure that the infection has been treated effectively, assess the area for signs and symptoms of an infection following the treatment duration. It is thought that bacterial infections around PEG tube sites may be caused by bacteria present in the patient's mouth that are pulled down by the tube during the insertion process

Yeast infections have a characteristic rash area of erythema with satellite lesions spreading away from the area of redness. Papules or pustules may also be present.[11] Yeast infections proliferate in warm, dark, moist environments and are commonly caused by body perspiration, leakage and denuded skin.[6,11] In fact, Candida albicans infection is fairly common in infants and toddlers in nappies. Patients with immunosuppression, diabetes mellitus, on antibiotic therapy, or on corticosteroid therapy are often predisposed to this condition.[11]

Examine the tube and the site for causes of the overgrowth of yeast on the skin. As excessive moisture on the skin in a covered area is a risk factor for the development of a fungal infection, correct excessive leakage and change moist dressings on a more frequent basis. The skin around the tube should be cleansed and allowed to air dry. An antifungal preparation should be applied to the skin surrounding the tube. If the moisture around the tube is excessive, a polyurethane dressing may be used to contain the moisture and should be changed on a scheduled frequent basis.[6,7,11] The physician should be notified of the presence of a topical fungal infection, as systemic treatment may be prescribed and the tube replaced to prevent further infection.[11] If the patient has diabetes mellitus, be sure to work with others in the healthcare team to control the patient's blood sugar.

2. Pressure Necrosis

Pressure necrosis is characterised by skin redness and irritation and can cause "buried bumper syndrome" from bolsters that are held too tightly against the skin. Tight bolsters can distort the external opening and cause internal and external pressure ulcers.[1,3,7]

To prevent pressure necrosis, make sure the internal bolster contains the proper fill volume (for balloon-retained devices) and that the external bolster is resting just above the skin surface by 2-3 millimetres (mm) – approximately the thickness of a 50 pence coin.[1,7,8] To treat pressure necrosis, gently cleanse the skin; avoid scrubbing or picking of residual skin barriers, and treat the area by applying a no-sting barrier or dust the skin with a barrier powder. For ulcerations, consider the use of alginates, hydrofibre or hydrocolloid dressings.

3. Skin Breakdown

Skin breakdown is characterised by skin redness, irritation and inflammation or bleeding. It can be caused by excessive moisture around the stoma site due to wet or soiled dressings, or the leakage of gastric or jejunal contents.[7]

Dressings are not recommended for long-term use and should be avoided unless absolutely necessary. If dressings are used, they should be monitored, and soiled or wet dressings changed often to prevent the accumulation of moisture and to keep the skin around the stoma clean and dry.[6,7,8,9] Follow your institution's protocol or physician orders and use caution when applying the dressing to the stoma site. Do not pull up on the tube, as this will put pressure on the internal bolster and the stomach wall. Instead, loosen the external bolster to allow for the thickness of the dressing.[9]

Minor skin breakdown caused by moisture can be treated with stomahesive powder or hydrocolloid and pectin wafers then sealed with an alcohol-free skin barrier.[7] When using pectin wafers, cut a hole slightly larger than the stoma in the centre of the barrier then place it around the tube. For ulcerations, consider the use of calcium alginates, a hydrofibre, or hydrocolloid dressings.[11] Skin breakdown may also result from leakage of gastric or jejunal contents around the tube onto the skin.[1,6,7,10]

Possible causes of skin breakdown may include:
- Tube displacement
- Inadequate tube stabilisation
- Improperly sized tube
- Incorrect feeding practices

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4. Tube Deterioration

All enteral feeding tubes have a limited life span. Tube deterioration is due to many things:
- Normal wear and tear
- Formula and medication regimens
- Infection
- Tube abuse
- Gastric pH
- Patient anatomy
- Interaction of medication and treatments (for example, chemotherapy combined with certain medications can contribute to tube deterioration.)[9,10]

If, while assessing the tube, you see abnormalities such as cracking, wall aneurysm areas, or deteriorating anchoring device damage, notify the physician or change the tube according to facility policies.

5. Balloon Burst or Leak

Silicone balloons typically last several months; however, balloons can rupture or develop leaks due to several factors including gastric pH, tube care, over-inflation of the balloon and various medications.[10] Water in the balloon may migrate over time through the balloon membrane and lose volume.[6] Check the balloon weekly for the proper fill volume according to the guidelines below.

To check the volume of the balloon: [1,6,7,9,13]
- Insert a syringe into the balloon inflation port and withdraw the fluid while holding the tube in place. Compare the amount of water in the syringe to the amount recommended by the manufacturer or the amount initially prescribed and documented in the patient's record. If the amount is less than recommended or prescribed, refill the balloon, then draw up and add the amount needed to bring the balloon volume up to the recommended and prescribed amount of water. Be aware as you deflate the balloon there may be some gastric contents that can leak around the tube. Document the fluid volume, the amount of volume to be replaced (if any), the date and time.
- Wait 10-20 minutes and repeat the procedure. The balloon is leaking if it has lost fluid, and the tube should be replaced. A deflated or ruptured balloon could cause the tube to dislodge or be displaced. If the balloon is ruptured, it will need to be replaced. Secure the tube into position using tape, then following facility protocol and/or call the physician for instructions.

Note: Refill the balloon using sterile or distilled water, not air. Air may seep out and cause the balloon to collapse. Be sure to use the recommended amount as over inflation can obstruct the lumen or decrease balloon life, and under inflation will not secure the tube properly.

Use room temperature tap water for tube flushing. Sterile water may be appropriate where the supply of quality municipal water is of concern. The amount of water will depend on the patient's needs, clinical condition, and type of tube, but the average volume ranges from 10 to 50 mL for adults, and 3 to 10 mL for infants. Hydration status also influences the volume used for flushing feeding tubes. In many cases, increasing the flushing volume can avoid the need for supplemental intravenous fluid. However, individuals with renal failure and other fluid restrictions should receive the minimum flushing volume necessary to maintain patency.

- Do not use excessive force to flush the tube. Excessive force can perforate the tube and can cause injury to the gastrointestinal tract.
- Document the time and amount of water used in the patient's record. This will enable all caregivers to monitor the patient's needs more accurately.

2. Pyloric Obstruction
A gastrostomy tube that slips into the stomach can migrate the pylorus and obstruct this area. Signs of pyloric obstruction include nausea, aspiration, unexplained pain, vomiting and obstruction of flow.[1,8]

It is important to verify tube placement before use and to monitor the tube daily to be sure that there is no movement of the external bolster. Document the position of the bolster in the patient's record.[1] If a pyloric obstruction is suspected, feedings should be stopped and the physician notified immediately.

3. Accidental Tube Removal or Dislodgement
Accidental gastrostomy tube removal can result from excessive pulling on the tube or rupture of the balloon. If a feeding tube is accidentally removed, it must be replaced as quickly as possible as the stoma may begin to close within two to four hours.

Even if the balloon is broken and the tube has fallen out, the tube may be temporarily replaced into the stoma to maintain patency, if this is an acceptable protocol in your facility. Wash the tube with soap and water, rinse and dry. Insert the tube, secure it onto the skin with tape, and refer the patient to the healthcare provider for replacement of the tube.

If the jejunal tube falls out, contact the physician immediately. This type of tube generally needs to be replaced in the radiology or gastroenterology department in a timely fashion to prevent the stoma from closing.[7]
If a feeding tube falls out and a replacement tube is not immediately available, a suitable temporary alternative may be inserted and secured into the stoma until a replacement gastrostomy tube can be obtained.

Although rare, a feeding tube can migrate from the stomach if the stomach wall pulls away from the abdominal wall. In this situation, the feeding tube could slip between the stomach and the abdominal wall, causing feedings to be introduced into the peritoneal cavity causing peritonitis. This can be seen in patients with newly placed gastrostomy tubes in which healing is incomplete or if the patient is at high risk for poor healing. It is associated with abdominal pain, nausea and/or vomiting and can be caused by an improperly positioned external bolster, tubes that are not secured adequately, and excessive pulling on the tube.[13] Another indication may include an unexpected increase or decrease in tube length as measured by the centimetre markings on the tube.[8] If you are unable to verify the tube position and suspect that it is dislodged, discontinue any tube usage and notify the physician immediately as the tube may need to be replaced, the patient hospitalised, and antibiotics prescribed.[13]

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If you suspect gastric leakage:[1,6,7,10]
- Gently clean and dry the site, then check the site after 30 minutes to see if there is any fresh leakage. This will indicate whether there is actual gastric leakage and not just spillage from a previous feeding or tube check. If there is actual gastric leakage and the skin is intact, apply a skin protectant or moisture barrier. Notify the physician if the redness extends more than 1cm from the stoma or is accompanied by pain, swelling or denuded skin. Consider referring the patient to a nutritional nurse specialist, a tissue viability nurse or a stoma nurse specialist.
- Verify the appropriate balloon fill volume for balloon-retained devices. The balloon may be leaking if it has lost the prescribed amount of fluid and the tube may need to be replaced. If the correct amount of water remains in the balloon, the device may be poorly sized or inadequately stabilised and should be re-evaluated.
- Make sure the tube is adequately stabilised and check for proper external bolster placement by verifying that the external bolster rests just above the abdomen by 2-3 mm and that the internal bolster or balloon rests against the stomach wall by gently pulling on the tube and checking for resistance. Check for proper internal bumper or balloon placement by either referencing the graduation marks on the tube to see if the tube has moved, aspirating the stomach contents to assess for gastric residuals, or radiographic verification.
- Verify tube patency by flushing the tube with water. Leaks can also be caused by improper patient positioning during feeding, by infusing the feeding formula too rapidly, or by feeding too large a volume.[10] Keep the patient elevated at least 30º during, and one hour after feeding. This will also help to prevent aspiration.[8,9,10,12] If the feeding volume is too large, consult the dietitian who may change the regimen to smaller, more frequent, or continuous volume feedings.[10]

4. Hypergranulation
Hypergranulation is also known as hyperplasia, hyperkeratosis, and/or "proud flesh".[11,14] Hypergranulation tissue is characterised by wart-like papules or nodules, reddish-brown or white-grey skin discoloration, and lesions at the mucocutaneous border.[11] It may be caused by excessive tube movement or excessive moisture, use of hydrogen peroxide, and constant exposure to drainage. It can lead to bleeding if not treated.[6,7,9,11]

To treat hypergranulation tissue, gently cleanse the skin and contact the physician or nurse specialist, as the area may need to be cauterised with silver nitrate or treated with dexamethasone ointment with antimicrobials.[6,7,8,9] The site should also be kept free of moisture and the tube stabilised to restrict its mobility.[9]

5. Peritubular Allergic Reactions
Peritubular allergic reactions can occur with the use of strong soaps, solutions, ointments, and other skin care products used around the stoma site; a latex urinary catheter used as a gastrostomy tube; or by the introduction of new medications, foods or gloves contacting the site.[6,11] Irritant dermatitis (usually from contact of stomach contents into the peristomal skin), characteristically range from oedema, well-defined erythema, or loss of epidermis. In allergic dermatitis, characteristics include pruritus, papules, vesicles, crusting or oozing.[11]

If you suspect an allergic reaction, assess the patient for known allergies or dermatological problems and any new medications or foods.[11] Limit the use of chemicals and products on the skin and remove all irritants and allergens. If the skin is denuded, treat with a skin barrier preparation, and consult the physician and/or tissue viability nurse as topical or systemic steroids may be prescribed and dermatological testing scheduled.[6,11] If you suspect the allergic reaction is caused by a latex urinary catheter, consult the physician as the tube may need to be replaced.

V. Feeding Tube Care and Maintenance, Complications and Management

A. Tube Care and Maintenance

Daily assessment and care of the tube is needed to maintain a properly functioning tube, and prevent complications.

Begin by assessing the tube for any abnormalities such as damage or clogging. Clean the tube and external bolster, using a mild soap and water, being careful not to pull or manipulate the tube or bolster excessively, then rinse thoroughly and dry well.[1,9,10]

Check to make sure that the external bolster is positioned correctly so that it rests 2-3 mm above the abdomen.[10] Next clean the feeding port, medication port, and balloon port (if applicable) with non-woven gauze to remove all food and debris.[1,10] Flush thoroughly with enough water to clear all formula, and be sure there isn't any residual formula left to pool and dry inside the valve and stem opening.[10]

B. Tube Complications and Management

Potential tube complications may include:

1. Occlusion
2. Pyloric Obstruction
3. Accidental Tube Removal or Dislodgement
4. Tube Deterioration
5. Balloon Burst or Leak

1. Occlusion

Tube occlusion or clogging is a common but preventable complication. Obstructed tubes disrupt the feeding schedule, delay medication delivery and subject the patient to the inconvenience of tube replacement and repeated X-ray exposure, anaesthetic and endoscopy.[8] Proper care and maintenance will result in feeding tubes that remain open and functional for a longer period of time.[6]

Tube occlusion is generally caused by:

- Poor flushing techniques
- Failure to flush after measurement of gastric residuals
- Inappropriate administration of medication
- Pill fragments
- Viscous medications
- Thick formulas, such as concentrated or enriched formulas that are generally thicker and more likely to obstruct tubes
- Formula contamination that leads to coagulation
- Reflux of gastric or intestinal contents up the tube [1,3,4,6,8,13]

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To Unclog A Tube.[1,4,6,8,9,13]

1. Make sure that the feeding tube is not kinked or clamped off.
2. If the clog is visible above the skin surface, gently massage or milk the tube between your fingers to break up the clog.
3. Next, place a catheter tip syringe filled with warm water into the appropriate adaptor or lumen of the tube and gently pull back on, then depress the plunger, to dislodge the clog.
4. If the clog remains, repeat step 2 above. Gentle suction alternating with syringe pressure will relieve most obstructions.
5. If this fails, consult the physician and consider trying a solution of pancreatic enzymes and sodium bicarbonate (1 teaspoon Pancrex powder mixed with 30 mL 8.4% sodium bicarbonate or warm water) instilled through a catheter tip syringe. Allow to remain in the tube for 30 minutes. Do not use cranberry juice, pineapple juice, alcoholic drinks, cola drinks, meat tenderiser or chymotrypsin, as they can actually cause clogs or create adverse reactions in some patients. If unsuccessful, consider using a proprietary product such as Corflo Clog Zapper™. If the clog is stubborn and cannot be removed, the tube will have to replaced.

Tube Patency Guidelines.[1,4,5,6,8,9,10,13]

Proper tube flushing is the best way to avoid clogging and maintain tube patency. Always follow your institution's policies and the manufacturer's instructions whenever flushing. The following are general guidelines to avoid clogging and maintain tube patency:

- Flush the feeding tube with water every four to six hours during continuous feeding, anytime the feeding is interrupted, before and after every intermittent or bolus feeding, or at least every eight hours if the tube is not being used.
- Flush the feeding tube after checking gastric residuals to avoid contact of formula with gastric acids. This will prevent coagulation of the formula that can lead to a clogged tube.
- Flushing the feeding tube before and after medication administration and between medications. This will prevent the medication from interacting and potentially causing the tube to clog.
- Use liquid medication or soluble tablets when possible and consult the pharmacist to determine if it is safe to crush solid medication and to mix with water. If safe, pulverise the solid medication into a fine powder form using a tablet crusher or pestle and mortar. Dissolve the powder in warm water before administering through the feeding tube. Never crush enteric-coated medication, sustained release drugs, cytotoxics or antibiotics. Never mix medications together or with formula. Follow BAPEN medication guidelines. www.bapen.org.uk
- Avoid using acidic irritants such as cranberry juice and cola beverages to flush feeding tubes as the acidic quality when combined with formal proteins may actually contribute to tube clogging.

General flushing guidelines.[2,8]

- Use a 30 to 60 mL catheter tip or slip tip syringe, depending on the proximal end of the feeding tube. Do not use smaller size syringes as this can increase pressure on the tube and potentially rupture smaller tubes.

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