Nursing Standard

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nutrition

**Why you should read this article:**
- To refresh your knowledge of the various methods that can be used for enteral feeding and medicines administration
- To enhance your awareness of the reasons why patients may require enteral feeding
- To familiarise yourself with the common complications that may occur when undertaking enteral feeding

# Providing optimal nursing care for patients receiving enteral feeding

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## Abstract

Enteral feeding is defined as the intake of food directly into the gastrointestinal (GI) tract. Enteral feeding tubes can also be used to administer medicines. Patients who may require enteral feeding include those who are unconscious, or those with neurological swallowing disorders, upper GI obstruction, GI dysfunction or malabsorption. There are many methods for undertaking enteral feeding including nasogastric, post-pyloric, gastrostomy and continuous pump feeding. When undertaking enteral feeding, nurses and other healthcare professionals should be aware of the potential complications such as tube blockage and infection. This article examines the various enteral feeding routes, discusses the administration of medicines, and details the common complications involved in enteral feeding.

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## Key points

- *Enteral feeding involves providing nutrition directly into the patient's gastrointestinal (GI) tract via a feeding tube*
- *Patients who have a functioning gut but are unable to swallow may be fitted with an enteral tube to enable feeding and medicines administration*
- *Enteral feeds contain specified volumes of nutrients such as proteins and carbohydrates, some of which are pre-digested by enzymes, and are available in various volumes and presentations such as bottles or packs*
- *Methods of undertaking enteral feeding include nasogastric, post-pyloric, gastrostomy and continuous pump feeding*
- *Common complications of enteral feeding include tube blockages and GI symptoms such as vomiting, diarrhoea and constipation*

**Keywords**

**clinical, diet, enteral nutrition, gastrostomy, nutrition, nutritional intake, nutritional support, parenteral nutrition**

Enteral feeding refers to the practice of providing nutrition directly into the patient's gastrointestinal (GI) tract via a feeding tube (British Association for Parenteral and Enteral Nutrition (BAPEN) 2018a). Patients who have a functioning gut but are unable to swallow may be fitted with an enteral tube to enable feeding and medicines administration (Rowat 2015). It has been identified that a range of patients may require enteral feeding (Gramlich et al 2018). In the UK, the National Institute for Health and Care Excellence (NICE) (2017) recommends the use of enteral feeding in a variety of patients, including those who are unconscious, or those with neurological swallowing disorders, anorexia (Morley 2010), upper GI obstruction, GI dysfunction or malabsorption. According to BAPEN (2018a), patients affected by these conditions may include those who have:

» Experienced a stroke or other neurological condition that can impair swallowing.
» Undergone some types of surgery, including operations on the face, neck, throat, oesophagus or stomach.
» Experienced a blockage to the oesophagus or stomach.
» Undergone radiotherapy to the throat or oesophagus.

In addition, enteral feeding is indicated for patients with increased nutritional requirements. This includes patients with conditions that result in hypermetabolism and the need for increased calorie intake, such as cancer, sepsis or burns (Jeschke 2016), and for treatment of conditions such as Crohn's disease (NICE 2017).

Unlike parenteral feeding – where nutrients, electrolytes and fluids are administered directly via a central or peripheral vein, bypassing the GI tract entirely – enteral feeding still relies on a functioning GI tract. Parenteral feeding is used in patients with a dysfunctional GI tract, and can be an option when enteral feeding is unable to deliver the required amount of nutrients (Baker and Harbottle 2014).

The number of patients supported by enteral feeding is increasing, with advances in technology making home enteral nutrition (HEN) increasingly affordable and accessible (Ojo 2015). The ageing population in the UK has resulted in an increase in the number of people requiring nutritional support such as enteral feeding, including 1.3 million adults over the age of 65 years who are at risk of malnutrition (BAPEN 2014). In the 2015 British Artificial Nutrition Survey, most of the 3,216 new registrations of adults receiving HEN were over the age of 60 years, which was an increase of 2% since 2010 (BAPEN 2018b).

This article aims to enhance nurses' knowledge of enteral feeding by detailing the commonly used enteral feeding routes, the administration of medicines, common complications and the potential psychological effects of tube feeding.

## Enteral feeding routes and timing

Enteral feeds usually comprise sterile nutritional liquids that are licensed for administration via an enteral feeding tube. These feeds contain specified volumes of nutrients such as proteins and carbohydrates, some of which are pre-digested by enzymes, and are available in various volumes and presentations such as bottles or packs (BAPEN 2016).

### Gastrostomy feeding

Gastrostomy feeding is indicated when long-term enteral feeding is required. Gastrostomy feeding involves the surgical insertion of a tube through the exterior surface of the abdomen and into the patient's stomach (Gandy 2014). The feeding tube can be located

surgically, endoscopically or radiologically; feeding tubes that are located endoscopically are known as percutaneous endoscopic gastrostomy (PEG) tubes, while those located radiologically are referred to as radiologically inserted gastrostomies.

## Post-pyloric feeding

The pylorus is a muscular valve located between the stomach and small intestine, which is comprised of the duodenum, jejunum, and ileum. Post-pyloric feeding refers to feeding directly into the jejunum or duodenum [Q1. If post-pyloric feeding into the jejunum is called a jejunostomy, what is post-pyloric feeding into the duodenum called, and does it follow the same insertion method as a jejunostomy?], and is achieved either by an extension of a pre-existing gastrostomy into the jejunum, or by inserting the feeding tube through the exterior surface of the abdomen and into the jejunum, which is known as a jejunostomy. Post-pyloric feeding can also involve the use of a nasojejunal tube, which passes through the nose, stomach, pylorus and into the jejunum.

Post-pyloric feeding may be indicated in cases of ileus (intestinal blockage) or if gastrostomy feeding has failed (Armer et al 2019). Post-pyloric feeding is also an option for patients who are at a high risk of pulmonary aspiration (Armer et al 2019). Most of the patients who undergo post-pyloric feeding should be able to tolerate a whole-protein feed, although peptide-based or elemental feeds may be required for patients with pancreatic or biliary insufficiency (Armer et al 2019).

## Nasogastric feeding

Nasogastric feeding should be considered when short-term nutritional support of under six weeks' duration is required, or when gastrostomy feeding is contraindicated; for example, because of severe obesity, active gastric ulceration, total or partial gastrectomy, or oesophageal tumours preventing the passage of an endoscope (Armer and White 2014, Armer et al 2019). In nasogastric feeding, a tube made from a radiopaque polyvinyl chloride (PVC), polyurethane or silicone is inserted into one of the patient's nostrils, down through the oesophagus and into the stomach.

Nasogastric feeding should be undertaken by a competent nurse [Q2. ok to change to 'appropriately trained nurse?] or other healthcare professional at the bedside or, if bedside placement is not possible, in the endoscopy department. The position of the end of the tube must be confirmed before any feed, water or medicine is administered through the tube. To confirm that the end of the tube is accurately located in the stomach, gastric aspirate can be withdrawn through the tube using a syringe and its pH checked. Gastric aspirate has a pH of 5.5 or less, whereas respiratory tract fluid has a pH of 6 or over (Irving et al 2018). If gastric aspirate cannot be obtained, an X-ray may be required to confirm the position of the tube. However, using gastric aspirate to confirm the location of the nasogastric tube reduces the patient's exposure to radiation. When undertaking nasogastric feeding, nurses should always follow local guidelines and evidence-based practice (NHS Improvement 2016).

Nasogastric feeding is associated with a high risk of respiratory infection (Brogan et al 2014). This is because nasogastric tubes can migrate into the trachea during placement, and can be easily dislodged when in situ, for example by vomiting. This places patients at high risk of pulmonary aspiration, which can prove fatal and is classed as a 'never event' (NHS Improvement 2018).

## Continuous pump feeding

Continuous pump feeding involves administering a formulated feed at a predetermined rate of mL per hour (mL/h) via a pump. Continuous feeding is administered over a period of 16 to 20 hours per each 24-hour period, but may be longer or shorter depending on the feed rate and the volume of feed required. Feeds are generally infused at a rate of **50-150mL/h** [Q3. could you provide a reference to support this figure?]. It is recommended that patients are permitted to be rested from feeding for at least 90 minutes per day to enable the gastric pH to return to normal. This is because continuous feeding raises gastric pH, thereby inhibiting its role in preventing bacterial growth (Bonten et al 1994).

Continuous feeds are recommended for patients undergoing post-pyloric feeding (Niv et al 2009), and for inpatients on sliding scale insulin therapy (Mabrey et al 1995).

## Bolus feeding

Bolus feeding involves an infusion of up to 300mL of feed over a 10-30-minute period (Armer and White 2014). Bolus feeds are administered using syringes or by gravity. It is recommended that 60mL [Q4. Can you check this figure – in the Bischoff reference we have seen, it states a 50ml syringe? Also, can you explain why smaller/narrower syringes damage the tube?] syringes are used for administering bolus feeds, to reduce the risk of damage to the tube associated with smaller and narrower syringes (Bischoff et al

2020). It should be noted that only ENfit-compliant syringes can be used to administer bolus feeds and medicines; ENFit is a standardised enteral feeding device connector that is designed to reduce misconnections between unrelated delivery systems such as enteral medicines by a parenteral route [Q5. We have added this example from the reference – is it correct?], which is listed as a never event (NHS Improvement 2018).

## Administering medicines

People undergoing enteral feeding often require multiple medicines (polypharmacy) to be administered. Administering medicines in patients undergoing enteral feeding **while avoiding polypharmacy** [Q6. should this be 'avoiding drug interactions'? (since it may not be possible to avoid polypharmacy)] is a significant clinical challenge for nurses. Polypharmacy is common among patients undergoing enteral feeding. Hospital inpatients undergoing enteral feeding can be taking as many as ten tablets per day (Barbosa et al 2012), while Joos et al (2016) found that care home residents who were undergoing enteral feeding were taking a median of six medicines each, including antiepileptic medicines, medicines used to treat constipation, and medicines such as proton pump inhibitors used to treat stomach acid-related disorders. Loperamide hydrochloride, codeine phosphate, colestyramine and antibiotics are commonly used medicines in the treatment of diarrhoea in patients who are undergoing enteral feeding to treat malabsorption or GI dysfunction because of conditions such as pancreatitis (van der Heide 2016). One multicentre study found that **91% of patients receiving enteral feeding** [Q7. was this specifically nasogastric feeding, as per the reference?] were at risk of potential drug-drug interactions (Gimenes et al 2019).

Medication errors are common occurrences in UK hospitals (Milch et al 2006). Many medicines are now produced in various formulations such as extended release or enteric coating, which are designed to improve the efficacy of the medicines for certain conditions. However, the increase in formulations with similar names has made it easier for medication errors to occur at any stage in the medicine pathway, including preparation, dispensing and administration (Cornish 2005).

BAPEN (2019) guidance on administering medicines via enteral feeding tubes recommends that if more than one medicine is to be administered, the healthcare professional should flush the tube with at least 10mL of water between medicines to ensure that any previous medicines are cleared. It is also important to note that medicines become unlicensed if mixed. The overarching consideration when administering medicines via enteral feeding tubes is ensuring that any medicines have a viscosity that is compatible with the tube, thereby avoiding blockages (Roulet and Benoit 2016). The BAPEN (2019) guidance recommends liquid medicines or soluble tablets as the preferred formulations for medicines administration via a feeding tube.

According to Barbosa et al (2012), it is common practice to administer oral medicines via enteral feeding tube – for example by crushing tablets and mixing them with liquid – even when similar intravenous medicines are available. Carers have also reported challenges in obtaining medicines in a suitable formulation for enteral feeding (Alsaeed et al 2018). In the authors' clinical experience, it is likely that one of the main reasons for GPs prescribing medicines that need to be crushed before being administered via enteral feeding tubes is to reduce costs. However, the BAPEN (2019) guidance recommends that the practice of crushing tablets or opening capsules meant for oral use and administering these via an enteral tube should only be used as a last resort. There are several concerns regarding the crushing of oral medicines for use in enteral feeding tubes, including: the pharmaceutical implications, for example the properties of external release medicines can be altered by crushing; aero-contamination of the medicine; drug-nutrient interactions; and enteral feeding tube occlusion (Salmon et al 2013). Where possible, medicines should be obtained in liquid formulation; where this is not possible, alternative medicines should be considered.

Another important consideration for nurses is that the feeds used in enteral feeding can significantly reduce the efficacy of some medicines. For example, the absorption of penicillin can be reduced during enteral feeding, and a higher dose of penicillin may be required. This is because the absorption of penicillin becomes unpredictable with enteral tube feeding (UW Health 2015).

Phenytoin is a medicine used to prevent seizures and is commonly used in patients who are undergoing enteral feeding to treat underlying conditions, for example neuromuscular conditions such as epilepsy. The exact nature of the drug-nutrient interaction between phenytoin and enteral feeds is unclear; however, there is evidence that enteral feeding can severely reduce serum concentrations of phenytoin (Au Yeung and Ensom 2000). The care plan of any patient prescribed phenytoin and undergoing enteral feeding should include clear guidelines on dosage, schedule and route of administration, as well as the importance of careful monitoring (Au Yeung and Ensom 2000, BAPEN 2019).

## Common complications of enteral feeding

### Home enteral nutrition

Patients are frequently discharged home while undergoing enteral feeding. In an audit of adult patients undergoing HEN, Bhinda et al (2009) found that the most common complications included: an inability to rotate or advance the feeding tube, which is required to avoid buried bumper syndrome (a growth of gastric mucosa over the internal plate or bumper that secures the tube inside the gastric wall); tube deterioration; erythema and leakage at the stoma site; granuloma; and candida-related infections, which are common when silicone tubes are used. Buried bumper syndrome is a serious complication of enteral feeding and can cause pain, peritonitis or death (Armer et al 2019). Dowman et al (2015) reported a high incidence of buried bumper syndrome among patients with PEG tubes in situ, while Clarke and Lewis (2015) identified [Q8. suboptimal?] **PEG position**, high body mass index (BMI) and inadequate staff training as possible risk factors for buried bumper syndrome.

Barone et al (2014) observed a significantly higher number of HEN-related complications among patients with neurological conditions compared with patients who have cancer. The researchers also found that age was not significantly associated with the number of complications observed. Villar Taibo et al (2018) reported that only one quarter of patients undergoing HEN experienced enteral feeding tube complications, which mostly comprised mild GI symptoms.

### Gastrointestinal complications

GI complications of enteral feeding, such as diarrhoea and constipation, are often attributed to the use of feeds in patients receiving HEN; however, there is little evidence to support this (Bowling and Silk 1998). In the authors' clinical experience, it may be more likely that any GI complications are side effects of medicines and suboptimal hygiene practices.

Catafesta and Francesconi (2012) found that up to 87% of the GI symptoms observed among patients receiving enteral feeding – including vomiting, diarrhoea and constipation – could be attributed to the side effects of medicines. Diarrhoea was associated with the use of laxatives, antibiotics, oncologic agents, sorbitol-containing medicines, and antiretrovirals. Constipation was associated with antiparkinsonian medicines such as levodopa, opioids, non-steroidal anti-inflammatory drugs, ferrous sulfate and diuretics. Nausea and vomiting were associated with oncologic agents, opioids and antibiotics (Catafesta and Francesconi 2012). Constipation has been found to be more common than diarrhoea among hospital inpatients undergoing enteral feeding (Bittencourt et al 2012, Catafesta and Francesconi 2012). Similarly, Lim et al (2018) found that, among older patients receiving HEN with a mean age of 77 years, the three most commonly reported GI complications were constipation, abdominal distension and vomiting.

While it may be unlikely that GI complications in patients undergoing enteral feeding are caused by feeds, there is some evidence that feed choice can assist in effectively managing these symptoms. One study by Zhao et al (2017) found that a combination of fibre-containing feed and probiotics was effective in treating diarrhoea associated with enteral nutrition. Similarly, prokinetic medicines (those that enhance gastric motility) were found to be effective in preventing constipation (Bittencourt et al 2012). Zhao et al (2017) also found that the incidence of diarrhoea was significantly higher among patients with stomach cancer undergoing enteral feeding with fibre-free feeds compared with those undergoing enteral feeding with fibre-enriched feeds. Therefore, the evidence suggests that prescribing fibre-containing feeds could assist in the prevention of GI complications.

### Tube blockage

In the case of enteral feeding tube blockage, coagulated protein from feeds is more challenging to clear than blockages caused by medicines alone (Garrison 2018). Blockages can result when the metal ions found in antacids, such as those containing aluminium hydroxide, bind to the protein in enteral feeds, which causes an occlusion; the medicine sucralfate, which can be used to treat gastric ulceration, has also been found to contribute to tube blockage (Gil-Almagro and Carmon-Monge 2016). Both aluminium hydroxide and sucralfate have been implicated in cases of oesophageal bezoars (a hard mass of indigestible matter) that have resulted from coagulated feed in patients undergoing enteral feeding (Marcus et al 2010).

Garrison (2018) found that an **articulated medical device (AMD)** [Q9. in the abstract of this reference this is referred to as an 'actuated mechanical occlusion clearing device' – ok to change?] specifically designed to unblock feeding tubes was more effective at clearing feeding tubes than warm water flushes or commercial enzyme treatments. The use of this AMD was also associated with significantly lower tube clearing time and nursing time than the other two methods (Garrison 2018).

In the authors' clinical experience, tube blockage can be prevented by flushing the feeding tube with at least 30mL of sterile or cooled boiled water in between each medicine administration and before and after feeds, while Bischoff et al (2020) recommended that drinking-quality water may also be used. Farrug et al (2019) recommended referring patients for specialist management if an enteral feeding tube is blocked or showing signs of leakage.

Alivizatos et al (2012) reported that the most frequent tube-related complication is inadvertent tube removal by patients resulting from a broken tube or tube blockage, which accounted for approximately half of tube-related complications over a 17.5-month period. Other common complications included tube leakage, dermatitis of the stoma, and diarrhoea.

### Hygiene

Hygiene is an important aspect in preventing enteral feeding-related complications. For example, it is common practice to change giving sets (the mechanism which delivers the feed from the feed container to the tube and pump) used for enteral feeding daily. Lyman et al (2017) studied bacterial growth rates in giving sets and found that using a ready-to-hang feeding product (bags of feed that can be attached to a drip) at room temperature resulted in a low rate of bacterial growth. Refrigerating the giving set between bolus feeds, and rinsing the giving set between bolus feeds, also resulted in a low bacterial growth rate; however, it was found that rinsing the set was more time-consuming than refrigeration or leaving a ready-to-hang feeding product in place (Lyman et al 2017).

## Psychological effects of enteral feeding

The quality of life of patients undergoing enteral feeding is affected by their ability to manage any challenges, as well as the support they receive from healthcare professionals such as nurses (Bjuresäter et al 2015). Food has a significant role in people's personal lives, culture and interactions with others. While enteral feeding does not preclude eating and drinking in all patients, those undergoing long-term enteral feeding have described missing being able to eat and drink, and may find it particularly challenging on social occasions centred around food (Brotherton et al 2006).

To minimise the psychological effects of enteral feeding on patients, nurses should adopt a shared decision-making approach to patient care (Barratt 2018, Pearce 2019). While it is not always possible to provide patients with a choice of feeding modality because of the lack of alternatives to enteral nutrition, it is important to consider the patients' values, such as their preferences and expectations, when deciding whether to initiate enteral feeding (White and Brereton 2018). This may assist the patient in weighing up their concerns about enteral feeding against the potential benefits, thereby ensuring that they have been included in the decision-making process.

Effective communication is essential in the provision of enteral nutrition. One survey of carers of patients undergoing enteral feeding revealed that 62% ($n$=24/39) of respondents had not received advice on medicines administration via feeding tube from healthcare professionals (Alsaeed et al 2018). Clinical jargon has also been identified as a barrier to patients' ability to understand nutrition messages from healthcare professionals, and may be potentially frightening to patients at times when they are vulnerable, such as immediately after diagnosis (Zarotti et al 2019).

## Conclusion

The number of patients receiving enteral feeding in the UK is increasing. Common enteral feeding routes include nasogastric feeding for short-term nutritional support and gastrostomy feeding for long-term feeding. People undergoing enteral feeding often require multiple medicines to be administered, and the complications associated with enteral feeding such as tube blockage and GI symptoms are often related to the administration of these medicines. Enteral feeding can also have psychological effects, for example negatively affecting the social role of food for the patient and their family and friends. The overall aim of nutritional support is not only to understand the role of nutrition in optimising a patient's physical health, but also to consider the social and psychological aspects, so that the patient can achieve a healthy nutritional intake.

## References


Alivizatos V, Gavala V, Alexopoulos P et al (2012) Feeding tube-related complications and problems in patients receiving long-term home enteral nutrition. Indian Journal of Palliative Care. 18, 1, 31-33. doi: 10.4103/0973-1075.97346

Alsaeed D, Furmiss D, Blandford A et al (2018) Carers' experiences of home enteral feeding: a survey exploring medicines administration challenges and strategies. Journal of Clinical Pharmacy and Therapies. 43, 3, 359-365. doi: 10.1111/jcpt.12664

Armer S, White R (2014) Enteral nutrition. In Gandy J (Ed) Manual of Dietetic Practice. Fifth edition. John Wiley and Sons, Oxford, 344-357.

Armer S, White R, McNair H (2019) Enteral nutrition. In Gandy J (Ed) Manual of Dietetic Practice. Sixth edition. John Wiley and Sons, Oxford, 351-364.

Au Yeung SC, Ensom MH (2000) Phenytoin and enteral feedings: does evidence support an interaction? The Annals of Pharmacotherapy. 34, 7-8, 896-905. doi: 10.1345/aph.19355

Baker M, Harbottle L (2014) Parenteral nutrition. In Gandy J (Ed) Manual of Dietetic Practice. Fifth edition. John Wiley and Sons, Oxford, 364-371.

Barbosa AP, de Paula SL, Barbosa DS et al (2012) Oral drug administration by enteral tube in adults at a tertiary teaching hospital. Clinical Nutrition ESPEN. 7, 6, e241-e244. doi: 10.1016/j.clnme.2012.09.002

Barone M, Viggiani MT, Amoruso A et al (2014) Influence of age and type of underlying disease on complications related to home enteral nutrition: a single Italian center experience. Journal of Parenteral and Enteral Nutrition. 38, 8, 991-995. doi: 10.1177/0148607113498422

Barratt J (2018) Developing clinical reasoning and effective communication skills in advanced practice. Nursing Standard. 34, 2, 37-44. doi: 10.7748/ns.2018.e11109

Bhinda M, Nimmo J, Hubbard GP (2009) An audit of gastrostomy tube types and complication rates in home enteral tube-fed patients in Croydon Primary Care Trust (PCT). Proceedings of the Nutrition Society. 68, OCE1, E25. doi: 10.1017/S0029665109001669

Bischoff SC, Austin P, Boeykens K et al (2020) ESPEN guideline on home enteral nutrition. Clinical Nutrition. 39, 1, 5-22. doi: 10.1016/j.clnu.2019.04.022

Bittencourt AF, Martins JR, Logullo L et al (2012) Constipation is more frequent than diarrhea in patients fed exclusively by enteral nutrition: results of an observational study. Nutrition in Clinical Practice. 27, 4, 533-539. doi: 10.1177/0884533612449488

Bjuresäter K, Larrson M, Athlin E (2015) Patients' experiences of home enteral feeding (HETF) – a qualitative study. Journal of Research in Nursing. 20, 7, 552-565. doi: 10.1177/1744987114568655

Bonten MJ, Gaillard CA, van Tiel FH et al (1994) Continuous enteral feeding counteracts preventive measures for gastric colonization in intensive care unit patients. Critical Care Medicine. 22, 6, 939-944. doi: 10.1097/00003246-199406000-00010

Bowling TE, Silk DB (1998) Colonic responses to enteral tube feeding. Gut. 42, 2, 147-151. doi: 10.1136/gut.42.2.147

British Association for Parenteral and Enteral Nutrition (2014) Nutrition Screening Surveys in Hospitals in the UK, 2007-2011. bapen.org.uk/pdfs/nsw/bapen-nsw-uk.pdf (Last accessed: 5 February 2020.)

British Association for Parenteral and Enteral Nutrition (2016) Choice of Enteral Tube Feed. bapen.org.uk/nutrition-support/enteral-nutrition/choice-of-enteral-tube-feed (Last accessed: 5 February 2020.)

British Association for Parenteral and Enteral Nutrition (2018a) Enteral and Parenteral Nutrition. bapen.org.uk/nutrition-support/assessment-and-planning/enteral-and-parenteral-nutrition (Last accessed: 5 February 2020.)

British Association for Parenteral and Enteral Nutrition (2018b) BANS Report 2018: Home Enteral Tube Feeding (HETF) in Adults (2010-2015). bapen.org.uk/pdfs/reports/bans/bans-report-2018.pdf (Last accessed: 5 February 2020.)

British Association for Parenteral and Enteral Nutrition (2019) Administering Drugs Via Enteral Feeding Tubes: A Practical Guide. bapen.org.uk/pdfs/d_and_e/de_pract_guide.pdf (Last accessed: 5 February 2020.)

Brogan E, Langdon C, Brookes K et al (2014) Respiratory infections in acute stroke: nasogastric tubes and immobility are stronger predictors than dysphagia. Dysphagia. 29, 3, 340-345. doi: 10.1007/s00455-013-9514-5

Brotherton AM, Abbott J, Aggett PJ (2006) The impact of percutaneous endoscopic gastrostomy feeding upon daily life in adults. Journal of Human Nutrition and Dietetics. 19, 5, 355-367. doi: 10.1111/j.1365-277X.2006.00712.x

Catafesta J, Francesconi C (2012) Association between medication use and adverse gastroenterologic events in patients receiving enteral nutrition therapy at a university hospital. Revista de Gastroenterologia de Mexico. 77, 4, 161-166. doi: 10.1016/j.rgmx.2012.06.003

Clarke E, Lewis S (2015) Low incidence of complications with Freka PEG tubes. Frontline Gastroenterology. 7, 4, 332. doi: 10.1136/flgastro-2015-100645

Cornish P (2005) "Avoid the crush": hazards of medication administration in patients with dysphagia or a feeding tube. Canadian Medical Association Journal. 172, 7, 871-872. doi: 10.1503/cmaj.050176

Dowman JK, Ditchburn L, Chapman W et al (2015) Observed high incidence of buried bumper syndrome associated with Freka PEG tubes. Frontline Gastroenterology. 6, 3, 194-198. doi: 10.1136/flgastro-2014-100503

Farrug K, Shastri YM, Beilenhoff U et al (2019) Percutaneous endoscopic gastrostomy (PEG): a practical approach for long-term management. BMJ. 364, k5311. doi: 10.1136/bmj.k5311

Gandy J (2014) Manual of Dietetic Practice. Fifth edition. John Wiley and Sons, Oxford.

Garrison CM (2018) Enteral feeding tube clogging: what are the causes and what are the answers? A bench top analysis. Nutrition in Clinical Practice. 33, 1, 147-150. doi: 10.1002/ncp.10009

Gil-Almagro F, Carmon-Monge FJ (2016) Oesophageal bezoar as a complication of enteral nutrition in critically ill patients. Two case studies. Intensive and Critical Care Nursing. 32, 29-32. doi: 10.1016/j.iccn.2015.08.003

Gimenes FR, Baysari M, Walter S et al (2019) Are patients with a nasally-placed feeding tube at risk of potential drug-drug interactions? A multicentre cross-sectional study. PLoS ONE. 14, 7, e-22202484. doi: 10.1371/journal.pone.0220248

Gramlich L, Hurt RT, Jin J et al (2018) Home enteral nutrition: towards a standard of care. Nutrients. 10, 8, e1020. doi: 10.3390/nu10081020

Irving SY, Rempel G, Lyman B et al (2018) Pediatric nasogastric tube placement and verification: best practice recommendations from the NOVEL project. Nutrition in Clinical Practice. 33, 6, 921-927. doi: 10.1002/ncp.10189

Jeschke MG (2016) Postburn hypermetabolism: past, present, and future. Journal of Burn Care and Research. 37, 2, 86-96. doi: 10.1097/BCR.0000000000000265

Joos E, Mehuys E, Remon JP et al (2016) Analysis of drug use in institutionalized individuals with intellectual disability and tube feeding. Acta Clinica Belgia. 71, 2, 76-80. doi: 10.1080/17843286.2015.1122332

Lim ML, Yong BY, Mar MQ et al (2018) Caring for patients on home enteral nutrition: reported complications by home carers and perspectives of community nurses. Journal of Clinical Nursing. 27, 13-14, 2825-2835. doi: 10.1111/jocn.14347

Lyman B, Williams M, Sollazo J et al (2017) Enteral feeding set handling techniques. Nutrition in Clinical Practice. 32, 2, 193-200. doi: 10.1177/0884533616680840

Mabrey ME, Barton AB, Corsino L et al (1995) Managing hyperglycaemia and diabetes in patients receiving enteral feedings: a health system approach. Hospital Practice. 43, 2, 74-78. doi: 10.1080/21548331.2015.1022493

Marcus EL, Arnon R, Sheynkman A et al (2010) Esophageal obstruction due to enteral feed bezoar: a case report and literature review. World Journal of Gastroenterology. 2,10, 352-356. doi: 10.4253/wjge.v2.i10.352

Milch CE, Salem DN, Pauker SG et al (2006) Voluntary electronic reporting of medical errors and adverse events. An analysis of 92,547 reports from 26 acute care hospitals. Journal of General Internal Medicine. 21, 2, 165-170. doi: 10.1111/j.1525-1497.2006.00322.x

Morley JE (2010) Anorexia, weight loss, and frailty. Journal of the American Medical Directors Association. 11, 4, 225-228. doi: 10.1016/j.jamda.2010.02.005

National Institute for Health and Care Excellence (2017) Nutrition Support for Adults: Oral Nutrition Support, Enteral Tube Feeding and Parenteral Nutrition. Clinical Guideline No. 32. NICE, London.

NHS Improvement (2016) Resource Set: Initial Placement Checks for Nasogastric and Orogastric Tubes. https://improvement.nhs.uk/documents/193/Resource_set_-_Initial_placement_checks_for_NG_tubes_1.pdf (Last accessed: 5 February 2020.)

NHS Improvement (2018) Never Events List 2018. https://improvement.nhs.uk/documents/2899/Never_Events_list_2018_FINAL_v7.pdf (Last accessed: 5 February 2020.)

Niv E, Fireman Z, Vaisman N (2009) Post-pyloric feeding. World Journal of Gastroenterology. 15, 11, 1281-1288. doi: 10.3748/wjg.15.1281

Ojo O (2015) The challenges of home enteral tube feeding: a global perspective. Nutrients. 7, 4, 2524-2538. doi: 10.3390/nu7042524

Pearce L (2019) Shared Decision-Making: How Nurses Can Help Patients Weigh Up the Issues. rcni.com/nursing-standard/features/shared-decision-making-how-nurses-can-help-patients-weigh-issues-145601 (Last accessed: 5 February 2020.)

Roulet L, Benoit E (2016) Letter: medication administration via enteral feeding tube. International Journal of Clinical Pharmacy. 38, 4, 747-748. doi: 10.1007/s11096-016-0314-5

Rowat A (2015) Enteral tube feeding for dysphagic stroke patients. British Journal of Nursing. 24, 3,138-145. doi: 10.12968/bjon.2015.24.3.138

Salmon D, Pont E, Chevallard H et al (2013) Pharmaceutical and safety considerations of tablet crushing in patients undergoing enteral intubation. International Journal of Pharmaceutics. 443, 1-2, 146-153. doi: 10.1016/j.ijpharm.2012.12.038

UW Health (2015) Dosing of Medications in Patients Receiving Continuous Enteral Feedings – Adult – Inpatient Clinical Practice Guideline. uwhealth.org/cckm/cpg/medications/Medication-Dosing-for-Continuous-Enteral-Feedings---Adult---Inpatient-15.09.18---new-links.pdf (Last accessed: 5 February 2020.)

van der Heide F (2016) Acquired causes of intestinal malabsorption. Best Practices and Research Clinical Gastroenterology. 30, 2, 213-224. doi: 10.1016/j.bpg.2016.03.001

Villar Taibo R, Martínez Olmos MÁ, Bellido Guerrero D et al (2018) Epidemiology of home enteral nutrition: an approximation of reality. Nutricion Hospitalaria. 35, 3, 511-518. doi: 10.20960/nh.1799

White S, Brereton L (2018) Examining the role of patient values in decisions about long-term enteral feeding: a qualitative study. Clinical Nutrition. 37, 3, 1046-1052. doi: 10.1016/j.clnu.2017.04.022

Zarotti N, Coates E, McGeachan A et al (2019) Healthcare professionals' views on psychological factors affecting nutritional behaviour in people with motor neuron disease: a thematic analysis. British Journal of Health Psychology. 24, 4, 953-969. doi: 10.1111/bjhp.12388

Zhao R, Wang Y, Huang Y et al (2017) Effect of fibre and probiotics on diarrhea associated with enteral nutrition in gastric cancer patients: a prospective randomized and controlled trial. Medicine. 96, 43, e8418. doi: 10.1097/MD.0000000000008418