Home Enteral Tube Feeding

Troubleshooting

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Enteral tube feeding (ETF) is recommended by the National Institute for Health and Care Excellence (NICE)[1] for people who are malnourished or at risk of malnutrition, have inadequate or unsafe oral intake and a functional, accessible gastrointestinal tract. Home enteral tube feeding (HETF), also known as home enteral nutrition (HEN), may be required when ETF is indicated in a primary care setting.[2]

Over recent years HETF has become increasingly widespread due to:[3-6]

- Advances in medicine and technology
- The inclusion of specialised roles within the HETF teams (e.g. enteral nutrition nurse specialists [ENNS])
- The higher prevalence of ageing-related diseases
- The growing evidence of HETF-associated benefits for both patients and the health system
- The government's 'Five Year Forward View' to promote the shift of healthcare provisions from costly acute hospitals to community settings
- The NHS Long Term Plan to promote supported self-management (meaning the ways that health and care services encourage, support and empower people to manage their ongoing physical and mental health conditions themselves).

Complications related to enteral access devices and ETF can be a problem, particularly in the home setting.[7] In a recent retrospective observational study of attendees to a UK emergency department (ED), it was found that dislodged and blocked feeding tubes are two of the main enteral feeding complications resulting in ED attendance and subsequent admissions.[8] The study concluded that enteral tube complications can place a hidden burden on the patient, the ED and healthcare costs, and suggested that a greater investment in education and support for caregivers may reduce this burden.[8]

The British Association for Parenteral and Enteral Nutrition (BAPEN)[2] states that the service supporting patients on HETF has a responsibility to:

- Facilitate the smooth transition from hospital to home
- Monitor the nutritional status and make changes to the feed plan as indicated
- Monitor the tube integrity and stoma health, initiating interventions as indicated
- Respond to tube and stoma complications to avoid unnecessary hospital admissions, or for the patient to be aware of the procedure if they experience such complications
- Liaise with other health and social care professionals to resolve any nutritional or tube related issues
- Where appropriate, optimise the patient's capacity to meet their nutritional requirements via the oral route, to either reduce reliance on enteral feeding or expedite tube removal. This can be achieved by maintaining effective communication with health professionals in the hospital and community setting regarding the appropriateness of oral feeding
- Coordinate specialist review if unable to resolve complications in the community.

The Gloucestershire HETF Team incorporates multi-disciplinary team (MDT) working between ENNS and HETF dietitians. This approach reflects the BAPEN suggested best practice for patients on ETF to receive support from a well-coordinated MDT, which allows for a scope of extended roles and professional development to optimise the support patients can receive.[2] This means, within reasonable limitations, the ENNS and dietitians may be able to troubleshoot one another's patient queries.

Common complications in HETF

Complications of HETF depend on several factors, including the patient's clinical condition, ETF device used and method of feeding. Ojo[9] compiled a summary of worldwide articles investigating challenges of HEN across the globe. He concluded that the main HETF complications are aspiration pneumonia, diarrhoea, vomiting, tube blockage, tube dislodgement, tube leakage, stoma site infection and overgranulation. The order of prevalence varied from country to country. BAPEN lists a further few complications including mouth discomfort or infections, reflux, abdominal painor distension and constipation.[10] This list reflects the complications most frequently reported to our HETF Team in Gloucestershire.

Aspiration

Aspiration is the inhalation of foreign material into the airways beyond the vocal cords.[11] A common misconception about enteral feeding is that it eliminates the risk of aspiration. In ETF patients, aspiration pneumonia has a prevalence ranging from 4-95%, with a mortality rate of 17–62%.[12] Aspiration risk for gastrostomy feeding (typically used in long-term ETF) is the same as for nasogastric tube (NGT) feeding (typically used in short-term ETF).[13] Aspiration can occur without any obvious signs of vomiting or regurgitation.[13] Other risk factors associated with the development of aspiration pneumonia include advancing age, poor oral hygiene, impaired consciousness and sedative medications.[14] To reduce the risk of aspiration, consider reducing the risk of reflux (see below). If aspiration is suspected, refer the patient to their GP, NHS 111 or the local emergency department.

Gastrointestinal disturbance

Diarrhoea (passing looser, watery or more frequent stools than is normal for that individual),[15] constipation (not passing stools regularly or being unable to completely empty the bowel),[16] reflux (acid leaking up from the stomach into the oesophagus),[17] nausea and vomiting are common ETF complications.[2] Patients, carers and healthcare professionals (HCPs) often hold the feed liable. It's advisable to consider whether a recent feed change may have contributed, and to review appropriateness of feeding regimen including method, volume, rate, temperature and concentration of feed. It may also be helpful in some situations to consider if a temporary change or break in feeding may help alleviate symptoms. However, it should be recognised that there are many variables affecting gastrointestinal tolerance and the points below should be considered to troubleshoot each symptom:

Diarrhoea

Consider:[13]

- Maintaining accurate stool records
- Reviewing medical history including any pre-existing bowel disorders
- Whether the patient is constipated (faecal impaction may result in overflow diarrhoea)
- Hygiene practices around feed administration
- Infective cause, including microbial contamination of feed, and obtain stool sample
- If the feed is being given at the prescribed pump rate or slow bolus
- If a recent medication change may have contributed. Ask doctors to review antibiotics/laxatives/medications containing sorbitol (drugs in a sorbitol syrup containing ≥15 g of sorbitol can have a laxative effect)
- Liaison with medical team to establish if anti-diarrhoeal medication may be appropriate
- If losses are excessive in which case losses may need replacement with water or oral rehydration solution (e.g. Dioralyte) to reduce the risk of dehydration
- A review of fibre intake
- Use of a peptide feed or post-pyloric feeding if ongoing malabsorption is suspected
- Bile acid sequestrants, e.g., cholestyramine, if bile salt diarrhoea is suspected
- Probiotic use.

Constipation

Consider:[13]

- The patient's regular bowel pattern prior to constipation
- Reviewing medical history including any pre-existing bowel disorders
- If a recent medication change may have contributed. Ask doctors to review medications that may result in constipation
- Liaison with medical team to establish if laxatives (as required or ongoing) may be appropriate
- A review of fibre and fluid intake
- Whether activity could be helpful (depending on mobility and general wellness)
- Probiotic use - He *et al*.[18] reiterated the relationship between constipation and gut microbiota. Their study found the effects of probiotic compounds on constipation relief were associated with various aspects, including gastrointestinal transit rate, number and weight of stools, serum and intestinal gastrointestinal regulatory hormones, and serum cytokines. Higher dosages promoted the colonisation of specific strains. The study confirmed the clinical use of probiotics to improve constipation symptoms by combining strains with different mechanisms for the alleviation of constipation.

Reflux, nausea & vomiting

Consider:[13, 19-22]

- Maintaining accurate records of frequency and (if applicable) volume of vomiting, along with an activity/routine log to help establish cause
- Reviewing medical history prior to symptoms
- Infective cause
- Whether the patient is constipated
- If positioning is correct (patients should be fed propped up by 30° or more and should be kept propped up for 30 minutes after feeding). Continuous feed should not be given overnight in patients who are at risk
- If feeding times could be amended to allow for at least 30 minutes before being moved, including for hoisting, personal care or travel
- If the feed is being given at the prescribed pump rate or slow bolus
- If a recent medication change may have contributed. Ask doctors to review medications that may result in nausea and/or vomiting
- Liaison with medical team to establish if anti-sickness, anti-reflux or prokinetic medication may be helpful (note that prokinetic agents such as metoclopramide and domperidone are not recommended for the long-term treatment of gastro-oesophageal reflux disease, owing to the risks of these medications outweighing the benefits)

- If losses are excessive in which case losses may need replacement with water or oral rehydration solution (e.g. Dioralyte) to reduce the risk of dehydration
- Tube migration e.g. post-pyloric feeding tube migrating into the stomach
- Use of a peptide feed or post-pyloric feeding route if ongoing
- Bowel obstruction if ongoing vomiting alongside bowel symptoms; refer patient to GP, NHS 111 or your local emergency department.

Bloating

Consider:[23]

- Whether the patient is constipated
- If a recent medication change may have contributed. Ask doctors to review medications that may cause bloating (e.g. effervescent medications)
- If a recent feed change may have contributed
- If the feed is being given at the prescribed pump rate or, if bolus, that it is given slowly
- A review of fibre intake
- Probiotic use
- Liaison with medical team to consider prokinetic agents such as metoclopramide or erythromycin
- Venting the gastric tube (not advised with jejunal tubes):
  - Option 1 - Venting may be done by unclamping and leaving the end of the tube open or attaching a syringe without the plunger or extension set to the tube. Air might release passively, or the stomach may be gently massaged to help push air out. The end of the tube, syringe or extension set may be held over a bowl in case any stomach content escapes, but liquid should not be drawn off actively and, in some localities, patients may be advised to replace any escaped liquid via the feeding tube). A water flush may be required after venting.
  - Option 2 - Using a Farrell valve system.[24] The Farrell Valve System is a closed enteral decompression system intended to allow excess gas to be removed from the stomach (gastric distention/bloating) and to prevent the loss of nutrition, medication, and stomach contents. While venting, any nutrition that goes into the Farrell bag and tubing must be gravity fed back into the patient. The white roller clamp helps control the speed at which the nutrition is fed into the patient.

Tube blockage

As per the above-mentioned study by Barrett *et al.,*[8] tube blockage is one of the most frequent issues encountered with ETF. Blockages can occur due to feed coagulation, inadequate flushing, or medication residues. The small internal diameter of fine-bore tubes increases the risk of occlusion.[13] Although gastrostomy tubes are larger in size, blockages can still occur, and therefore measures to minimise risk should still be taken.[13]

- Flushing the tube regularly with water.[13] Consideration should be given to the type of water used to flush EF tubes. For gastric tubes, the choice is tap, cooled, boiled or sterile water. For post-pyloric feeding, sterile water should be used; it is important to note that, once the container has been opened, it is no longer sterile[13]
- Flushing the tube with 30 ml water at the beginning and end of medicines administration (unless fluid restricted) and 10 ml water between each individual medicine[25]
- Crush, dissolve and administer drugs separately from each other to avoid precipitation from drug interactions[13, 25, 26]
- Note that some medications shouldn't be crushed, including those that are potentially carcinogenic, teratogenic, cytotoxic, enteric-coated, sustained- or time-delayed release medications. If the delayed time-release capsule contains pellets, you may be able to remove these from the capsule and suspend them in water, but they should not be crushed (pellets may increase the risk of tube blockage)[27]
- Using drugs in syrup or dispersible form, rather than as crushed tablets.[28]

When attempting to unblock a tube, consider the following:

- Flushing with warm water should be tried initially, along with manipulation of the tube (e.g. rubbing the tube between your thumb and forefinger or milking the tube)[29, 30]
- Wrapping the tube in a warm flannel around the blockage may also be helpful
- Soda water or sodium bicarbonate mixed with water can be effective in clearing a blockage
- BAPEN/BPNG[29] recommend attempting to flush the tube with warm water using a 'push pull' action with the syringe. However, excess force should not be used as this risks fracturing the tube
- Pancreatic enzymes are effective and can unblock a feeding tube blocked with feed within 10–20 minutes.[31] However, this is unlikely to be effective on blockage caused by medication
- Cola, pineapple juice and lemonade should not be used, as the acidity may contribute to occlusion by denaturing the proteins in the EF[28, 32]
- Use the largest practical enteral syringe to avoid tube damage.[25]

Accidental tube removal

Dislodged feeding tubes are another of the most frequent issues encountered with ETF.[8] It is essential that patients and carers be aware of what to do if the feeding tube becomes dislodged or is accidentally removed. Depending on the patient's tube type, clinical condition and care situation, some patients may require hospitalisation for reinsertion of a feeding tube. If they can manage some oral intake safely this may be required in the interim while an elective procedure is planned, whereas limited oral intake may require emergency admission. If a gastrostomy tube is accidentally removed, prompt replacement is required to preserve the stoma tract, which can start to heal immediately.[13, 33, 34] Inadvertent dislodgment of the tube is particularly dangerous when it occurs prior to mature tract formation and may result in spillage of gastric contents and diffuse peritonitis.[33]

Balloon replacement tubes can be used, and a spare tube should be routinely supplied to the patient in case of such circumstances.[13]

Where there is no spare tube available, a Foley catheter is sometimes used to maintain the tract until an appropriate feeding tube is reinserted. This is generally discouraged as it is unlicensed for enteral use. If a Foley catheter is used to preserve the tract, it must not be used for feeding, and end users should be made aware of the potential risks of its use in this way.[36]

Stoma plugs are now commercially available, designed solely to preserve the stoma tract in cases of accidental tube removal.[13]

If frequent tube removal occurs, consider whether a low-profile device or securing devices such as feeding tube belts may be appropriate.

Stoma site problems

Stoma site leakage, infection, abscesses and overgranulation are common problems for percutaneous feeding tubes.[37] Correct positioning of the external fixation device can often prevent overgranulation.[38] Maintaining thorough hand hygiene, avoiding unnecessary dressings around the stoma and ensuring a clean and dry stoma can prevent infection, and rotation of the fixator can prevent pressure on any one area of the skin.[38] A swab of the site may be required to identify or rule out infection. In Gloucestershire our HETF team offer routine stoma reviews to identify early signs of any issues. The ENNS are experts at advice regarding treatment for minor gastrostomy-related complications.[13]

Buried bumper syndrome

Buried bumper syndrome (BBS) occurs when the gastric mucosa grows over the internal bumper of the gastrostomy tube, resulting in migration through, or into, the abdominal wall.[13] It has a reported prevalence of 1.5-8.8%.[39] BBS usually presents at least 4 months post-PEG but has been reported to occur as early as 21 days after PEG placement.[39] Common symptoms include feed delivery failure or the need for more pressure when giving feeds, peritubular leakage, complete occlusion of the tube, and abdominal pain.[13, 39]

BBS can be prevented by ensuring that the tube is measured and fitted correctly, and regularly advanced into the stomach and rotated. Should BBS occur, even if asymptomatic, the tube must be removed (via endoscopy or surgery) as continued bumper migration may lead to bleeding, perforation, peritonitis or death.[13, 39]

Microbiological contamination of feed

ETF products are an ideal growth medium for microbial contamination.[13]

To reduce the risk:

- Consider using commercially prepackaged, sterile, ready-to-hang feeds as modular feeds carry a greater risk of microbiological contamination.[40, 41] Additional care should be taken with jejunal feeds in patients with achlorhydria and immunosuppressed patients as their lack of gastric acidity and impaired immune function, respectively, may increase infection risk[13]
- Consider limiting the hang-time of non-sterile feeds to a maximum of 4 hours[42]
- Replace the reservoir and giving set daily.[13] Patchell *et al.*[43] recommends if a giving set or reservoir is used for longer than 4 hours, to fill the reservoir with feed for up to 24 hours' use rather than 4 hours. For modular feeds it is still necessary to decant 4-hourly quantities to minimise the time the feed is left at room temperature and thus reduce bacterial growth. The remaining feed is kept refrigerated until required.[43] If the patient is considered particularly vulnerable to infection, consider if these need to be changed more frequently. In Gloucestershire our local policy is to use a new reservoir every 4 hours for decanted or reconstituted products, and to use a new giving set if there is a gap in time between feeds (up to 24 hours)
- Ensure hygienic handling of systems and adequate hand hygiene[33, 44, 45]
- Ensure that systems marked as 'single use' are used only once and that reusable equipment for single-patient use are cleaned, labelled and stored appropriately in accordance with local policy.[13]

If microbial contamination is suspected, consider if fluid and electrolyte replacement is required, and refer the patient to their GP, NHS 111 or the local emergency department.

Refeeding syndrome

Refeeding syndrome (RFS) is a group of clinical symptoms and biochemical shifts that can occur in malnourished or starved individuals upon the reintroduction of nutrition.[13] The hallmark biochemical feature is hypophosphataemia, however the syndrome is complex and may also feature abnormal sodium and fluid balance; changes in glucose, protein and fat metabolism; thiamine deficiency; hypokalaemia; and hypomagnesaemia.[46, 47] In addition to the Parenteral and Enteral Nutrition Group (PENG) RFS guidelines, a number of additional factors could result in RFS and prompt an urgent HETF review:[1, 46, 48]

- Changes in oral intake or a deterioration in swallow
- Localised or systemic infection
- Ongoing malabsorption or poor feed tolerance (e.g. inflammatory bowel disease, chronic pancreatitis, cystic fibrosis, short bowel syndrome)
- Feeding regimens which do not provide reference nutrient intakes (RNI) for vitamins or minerals
- Recent admission and discharge from hospital during which feeding may have been intermittent or withheld for treatment
- Tube complications resulting in poor nutritional intake
- Anorexia nervosa
- Chronic alcoholism
- Oncology diagnoses
- Elderly patients (comorbidities, decreased physiological reserve)
- Patients with uncontrolled diabetes mellitus (electrolyte depletion, diuresis)
- Long-term users of antacids (magnesium and aluminium salts bind phosphate)
- Long-term users of diuretics (loss of electrolytes).

Patients at risk of RFS require close monitoring of their nutritional intake, biochemical monitoring and prophylactic micronutrient prescription.[1] This can be challenging to manage in the community, and communication between the dietitian, patient/carers and the medical team/GP is critical. A clear plan should be formulated to ensure that all team members are aware of their roles and responsibilities in close monitoring and treatment.[13] From experience it may be useful to have the recommendations available to share with medical teams when required, and bear in mind that there may result in unforeseen logistical and practical challenges when managing RFS in the community; e.g. HETF team service provision limited to weekday office hours, thereby limiting the time available to support patients as opposed to 24-hour hospital support; GP surgeries closing for the weekend or bank holidays thereby delaying blood forms and prescriptions; lack of ownership for blood form completion and checking biochemical results; patients may be unable to travel for blood tests; prescriptions can take several days to be implemented; and inappropriate formats of supplements may be provided by the pharmacy. Consider hospital admission if these barriers compromise patient safety.

Extended or advanced roles of practice

With lots of potential complications in HETF, it's promising to know that in the last 2 years there have been many roles created for extended or advanced practice HETF dietitians. This refers to an expanded scope of practice in which dietitians take on additional responsibilities beyond their typical specialist duties to provide comprehensive care for patients requiring HETF.[49] Potential additional responsibilities may include:

- Education and training to patients and their caregivers on safe and effective HETF techniques, tube care, feed preparation, and administration
- Troubleshooting and problem-solving common issues related to HETF, such as tube blockages, stoma site issues and equipment failure
- Contributing to quality improvement initiatives related to HEN and engage in research to advance the understanding and practice in this field
- Replacing tube parts such as the external fixator, clamps or tube ends
- Conducting balloon water checks
- Unblocking feeding tubes
- Measuring stoma length and insertion of low-profile gastrostomy device
- Insertion of nasogastric tubes
- Replacing balloon gastrostomy tubes
- Advancing and rotating gastrostomy tubes
- Checking of pH.

The benefits of creating such roles are to support workforce shortfalls by streamlining services, preventing hospital admissions, reducing waiting times and helping to meet the rising demands on healthcare. These roles also support in retention of experienced staff, provides job satisfaction and promotes working in autonomy.[49]

Conclusion

Effective HETF services have been associated with reduced hospital admissions, length of stay, and cost of hospitalisation, as well as improvements in psychological wellbeing, quality of care and patient satisfaction.[50, 51] The advantage of a HETF team is that MDT and co-ordinated care is facilitated in the primary care setting; team members have knowledge and experience of ETF and care provision in the community.[52] Ojo and Patel[53] suggest that, as many trusts do not have a HETF team, HCP's knowledge of the role of such teams may be limited. Therefore, it is important that HETF teams advertise their presence and demonstrate their 'worth' through evaluation of service quality and calculation of cost effectiveness. The dietitian's role in the discharge of patients on HETF into the community is integral to the process, and timely and effective communication is necessary to ensure that a patient is discharged safely.[13] For the HCPs working outside HETF, prior to HETF being recommended it is important that practical issues such as discharge planning, training and support in the community be considered due to the impact of ETF on everyday activities, including meals, sleep, travel, work and social activities. It is important that practical issues such as discharge planning, training and support in the community be considered prior to HETF being recommended.[13, 50] HETF patients and their carers should receive training and information from members of the MDT on:[1]

- The care of their tubes and their enteral feeding regime, outlining all procedures related to setting up feeds, using feed pumps, the likely risks and methods for troubleshooting common problems and be provided with an instruction manual (and visual aids as appropriate)
- Both routine and emergency telephone numbers to contact a relevant HETF HCP
- The arrangements for the delivery of equipment, ancillaries and feed with appropriate contact details for any homecare company involved.

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