Enteral Feeding

Enteral feeding refers to the delivery of a nutritionally complete feed, containing protein, carbohydrate, fat, water, minerals and vitamins, directly into the stomach, duodenum or jejunum.[1]

Gastroenteric tube feeding plays a major role in the management of patients with poor voluntary intake, chronic neurological or mechanical dysphagia or gut dysfunction and in patients who are critically ill.[2, 3]

Supplemental parenteral nutrition is used in a step-up approach when full enteral support is contra-indicated or fails to reach the required intake targets.[4]

Patient selection

The use of home enteral feeding is increasing worldwide.[5] Multidisciplinary primary care teams focused on home enteral nutrition can provide cost-effective care.[6]

Enteral feeding should be considered for malnourished patients or in those at risk of malnutrition who have a functional gastrointestinal tract but are unable to maintain an adequate or safe oral intake.[1, 7]

Enteral nutrition is often used for children as well as for adults.[8] Children may require enteral feeding for a wide range of underlying conditions, such as for malnutrition, for increased energy requirement (eg, cystic fibrosis), for metabolic disorders and also for children with neuromuscular disorders.

Although it is often a life-saving manoeuvre, the patient’s quality of life may be adversely affected.[9]

Enteral feeding is particularly beneficial for:

- Critically ill patients, in whom enteral feeding promotes gut barrier integrity and reduces rates of infection and mortality.[10]
- Postoperative patients with limited oral intake. The complication rate and duration of hospital stay are reduced by early enteral feeding after:
  - Elective gastrointestinal surgery
  - Gastrointestinal cancer surgery[12]

- Early post-pyloric feeding (duodenal or jejunal) is useful as, although gastric and colonic function is impaired postoperatively, small bowel function is often normal. Feeding is usually introduced after 1 to 5 days.
- Patients with severe pancreatitis, without pseudocyst or fistula complication. Enteral feeding promotes the resolution of inflammation and reduces the incidence of infection.[13]

Low-flow enteral feeding may also be useful in combination with parenteral nutrition to maintain gut function and reduce the likelihood of cholestasis.
Access

Short-term access is usually achieved using nasogastric (NG) or nasojejunal (NJ) tubes at an initial continuous feeding rate of 30 mls per hour. Percutaneous endoscopic gastrostomy (PEG) or jejunostomy placement should be considered if feeding is planned for longer than one month:

- **NG tubes:**
  - These are the most commonly used delivery routes but depend on adequate gastric emptying.
  - They allow the use of hypertonic feeds, high feeding rates and bolus feeding into the stomach reservoir.
  - Tubes are simple to insert but are easily displaced.

- **NJ tubes:**
  - These reduce the incidence of gastro-oesophageal reflux and are useful in the presence of delayed gastric emptying.
  - Post-pyloric placement can be difficult but may be aided by intravenous prokinetics or fibre-optic observation.

- **PEG tubes:**
  - Indications for gastrostomy include stroke, motor neurone disease, Parkinson's disease and oesophageal cancer.\(^{14}\)
  - Relative contra-indications include reflux, previous gastric surgery, gastric ulceration or malignancy and gastric outlet obstruction.
  - They are inserted directly through the stomach wall endoscopically or surgically, under antibiotic cover.

- **Percutaneous jejunostomy tubes:**
  - They permit early postoperative feeding and are useful in patients at risk of reflux.
  - They are inserted through the stomach into the jejunum, using a surgical or endoscopic technique.
  - This can be difficult and has more complications.

Feed preparations

Various nutritionally complete pre-packaged feeds are available:

- **Standard enteral feeds:**
  - These contain all the carbohydrate, protein, fat, water, electrolytes, micronutrients (vitamins and trace elements) and fibre required by a stable patient.

- **'Pre-digested' feeds:**
  - These contain nitrogen as short peptides or free amino acids and aim to improve nutrient absorption in the presence of pancreatic insufficiency or inflammatory bowel disease.
  - The fibre content of feeds is variable and some are supplemented with vitamin K, which may interact with other medications.

Nutrients such as glutamine, arginine and essential omega-3 fatty acids are able to modulate immune function. Enteral immunonutrition may decrease major infectious complications and length of hospital stay in surgical and some critically ill patients. Further research is ongoing.\(^{15}\)

Complications of enteral feeding

**General complications of feeding**

See the separate article on Nutritional Support in Primary Care.
Tube complications
- **NG tube:**
  - This may cause nasopharyngeal discomfort and later nasal erosions, abscesses and sinusitis.
  - Although acute complications such as pharyngeal or oesophageal perforation, intracranial or bronchial insertion are uncommon, they may be fatal.
  - Longer use may cause oesophagitis, oesophageal ulceration and stricture.
  - Fine-bore tubes should be used and replaced in the alternate nostril each month. Large stiff tubes are particularly unsafe in the presence of varices and insertion of any tube should be avoided for three days following acute variceal bleed.

- **Percutaneous gastrostomy or jejunostomy tubes:**
  - These can lead to complications related to endoscopy plus bowel perforation and abdominal wall or intraperitoneal bleeding.
  - Post-insertion complications include stoma site infections, peritonitis, septicaemia, peristomal leaks, dislodgement and gastrocolic fistula formation.
  - All feeding tubes should be flushed with water before and after use, as they block easily. Blockages can sometimes be removed by flushing with warm water or an enzyme solution but some tubes may need to be replaced.

**Infection**
- Bacterial contamination of enteral feed can cause serious infection. Administration sets and feed containers should be discarded every 24 hours to minimise the risk of infection. Feeds should never be decanted and equipment should not be handled.

**Gastro-oesophageal reflux and aspiration**
- Reflux occurs frequently with enteral feeding, particularly in patients with impaired consciousness, poor gag reflex and when fed in the supine position. Patients should be propped up by at least 30° whilst feeding and should remain in that position for a further 30 minutes to minimise the risk of aspiration. Post-pyloric tubes should be used in unconscious patients who need to be nursed flat.
- Reflux is more likely with accumulation of gastric residues. Gastric aspirates should be measured regularly and the feeding regimen altered or prokinetics added to reduce gastric pooling.

**Gastrointestinal symptoms**
- Gut motility and absorption are promoted by hormones released during mastication, with co-ordinated stomach emptying and the in presence of intraluminal nutrients.[16]
- As the usual physiological mechanisms are bypassed during enteral feeding, gastrointestinal symptoms such as abdominal bloating, cramps, nausea, diarrhoea and constipation are common.
- Symptoms may respond to reduced feed administration rates, continuous rather than bolus feeding, alternative feed preparation or the addition of prokinetic agents.

**Re-feeding syndrome**
- This occurs in previously malnourished patients who are fed with high carbohydrate loads.
- Carbohydrates (eg, glucose) in the feed can cause a large increase in the circulating insulin level. This results in a rapid and dramatic fall in phosphate, potassium and magnesium - with an increasing extracellular fluid (ECF) volume.
- As the body tries to switch from catabolic (starvation mode) to using exogenous fuel sources, there is an increase in oxygen consumption, increased respiratory and cardiac workload (may precipitate acute heart failure and tachypnoea and make weaning from a ventilator difficult). Demand for nutrients and oxygen may outstrip supply. Both of the above can lead to multiple organ failure; respiratory and/or cardiac failure, arrhythmias, rhabdomyolysis, seizures or coma, red cell and/or leukocyte dysfunction.
- The gut may have undergone some atrophy with starvation and, with the return of enteral feeding, there may be intolerance to the feed, with nausea and diarrhoea.
- Feeds should be started slowly and the electrolytes closely monitored and adequately replaced to avoid these problems developing.

**Monitoring**
Monitoring should include the general observations and laboratory schedule recommended for all forms of nutritional support, particularly if the patient is at high risk of re-feeding syndrome.[11] Consideration should also be given to:
- The position of nasally inserted tubes, which should be checked before each feed by obtaining tube aspirate of pH <5.5 on pH paper.[17]
- The function of nasal tubes and the development of erosions, which should be assessed daily.
- Gastrostomy and jejunostomy stoma sites, which should be checked each day for tube position and signs of infection.

**Home therapy**
The number of patients receiving home enteral feeding has increased considerably in recent years.[18] It is now estimated that more than twice as many patients receive enteral nutrition in the community compared with those in hospital.
• Treatment is usually initiated in secondary care but GPs can also refer patients for elective home enteral nutrition with outpatient feeding tube placement. PEG tubes are the easiest feeding tubes to manage in the community.
• Patients are managed by a co-ordinated multidisciplinary team, including a dietician and district nurse. They may also be invited to attend hospital PEG review clinics.
• GPs are responsible for co-ordinating community services, so should be informed of all patients discharged on enteral feeding and any feeding regimen changes. Feed preparation and regimens are generally advised by dieticians and prescribed by GPs.
• Manufacturing companies will deliver stock directly to patients' homes.
• Patients and/or carers must be trained in the use of enteral feeding pumps and systems and how to deal with simple problems. Unfortunately, blocked tubes are still a common problem for nursing home residents.
• Patients and/or carers should also be aware of the potential hazards of tube feeding and encouraged to contact a relevant health professional in emergency situations.
• Professionals should be aware of the potential negative impact of tube feeding on carers’ own eating habits.

Further reading & references

• Caring for children and young people in the community receiving enteral tube feeding; NHS Quality Improvement Scotland (September 2007)
• Malnutrition Universal Screening Tool (MUST); British Association of Parenteral and Enteral Nutrition (BAPEN)
• NDR (Nutrition and Diet Resources) UK

15. Nutrition in critical illness; Anaesthesia UK
16. Reducing the harm caused by misplaced nasogastric feeding tubes; National Patient Safety Alert (#5), 2005
17. Collier J; Enteral Feeding - An Overview

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