Clinical Guideline

Health
Hunter New England
Local Health District

Enteral Feeding Tube - Adult

Document Registration Number: HNELHD CG 31

Sites where Guideline applies	Hunter New England Local Health District
This Guideline applies to:	
1. Adults	Yes
2. Children up to 16 years	No
3. Neonates – less than 29 days	No
Target audience	All clinical staff
Description	Guidelines for the care of adult patients receiving enteral nutrition via an enteral feeding tube
Keywords	NG, nasogastric, enteral, feed, NGT, nutrition, tube
Replaces Existing Guideline?	Yes
Registration Numbers of Superseded Documents	Enteral Feeding Tube Guidelines – Adult_February 2007

Related documents (Policies, Australian Standards, Codes of Conduct, legislation etc.)

- NSQHS Standard 4
- NSW Health Policy Directive 2007_079 Correct patient, Correct procedure, correct site
- NSW Health Policy PD 2005_406 Consent to Medical Treatment
- NSW Health Policy Directive PD 2007_036 Infection Control Policy
- NSW Health Policy Directive PD2011_015 Care Coordination: Planning from Admission to Transfer of Care in NSW Public Hospitals
- NSW Health Policy Directive PD2009_060 Clinical Handover – standard key principles
- PD 2009_019 Fine Bore Nasogastric Feeding Tubes for Adults Policy
- PD2011_078: Nutrition Care http://www0.health.nsw.gov.au/policies/pd/2011/pdf/PD2011_078.pdf
- Safe Administration of Liquid Medicines by Routes other than Injection Document Number PD2012_006 http://www0.health.nsw.gov.au/policies/pd/2012/pdf/PD2012_006.pdf

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TABLE OF CONTENTS

1.0 Introduction [1, 2, 3, 4, 5, 6, 7, 8]

1.1 Purpose

The purpose of this document is to establish guidelines for the care of adult patients receiving enteral nutrition via an enteral feeding tube.

1.2 Enteral nutrition

Adequate nutrition plays an important role in maintaining optimal health. Approximately 36% of adult patients hospitalised are malnourished and of those 64% are not recognized as malnourished. Still other patients are at risk of deteriorating nutritionally with their nutritional functional status worsening during their hospital stay. Malnutrition contributes to higher mortality and risks of infection, delayed wound healing, pressure areas, decreased survival after 12 months and other complications. This leads to extended lengths of stay with associated increased costs. Enteral feeding is the preferred method of nutrition over total parenteral nutrition in the presence of a functioning intestine. Feeding via the gastrointestinal tract is easier, safer, less expensive and more physiological than feeding via parenteral administration. Delivery of nutrition into the gastrointestinal tract allows more effective use of nutrients and promotes preservation of intestinal integrity. Early enteral feeding even lower than ideal calories reduces gut-related sepsis and decreases septic complications in a patient who is hospitalised.

The challenge is to recognise malnourished and at risk patients, implementing nutritional support thus improving the patient's quality of life and reducing health care cost. This can be achieved through a multidisciplinary approach of medical officers, nurses, speech pathologists and dieticians.

Respecting patient choices: - artificial feeding is a recognised medical treatment and the patient has the right to accept this treatment if they consider it appropriate for them or to decline this treatment. The respecting patient choices facilitator can be contacted to discuss this with the patient.

Physical and psychosocial issues

"Food provides sustenance and also holds symbolic meaning. The giving of food is part of ceremonies, social gatherings, holiday traditions, religious events, the celebration of birth and the mourning of death".

Whether in hospital or in the community, patients experience many challenges not only with their disease process but also with enteral feeding. There are issues consisting of physical, body image, sexual activity, acceptance/compliance, scheduling around infusions and not eating that need to be discussed. Having a supportive family and friends are important for the patient to adjust to these changes. Their support will encourage self-confidence and independence. At http://www.parenteralnutritiondownunder.com/ and www.oley.org there are resources along with stories from patients who have gone through or are going through similar situations and issues.

Aetiology of malnutrition

Refer to table below which summarises diseases or symptoms, which may place a patient at risk for malnutrition.

Mechanism	Disorder
Impaired Intake	Altered level of consciousness AIDS Anorexia/Bulimia Chewing or swallowing problems, including dysphagia Congenital anomalies Dementia Developmental delay Difficulty with feeding skills

	Emesis and hyperemesis of pregnancy Intake of drugs with anti-nutrient or catabolic properties (steroids, immunosuppressive agents, anti-tumour agents) Inadequate oral intake Self-imposed dietary restrictions
Impaired digestion and absorption	Chronic pancreatitis Chronic disease Radiation enteritis Short bowel syndrome Cystic fibrosis
Impaired utilisation	Cancer Diabetes mellitus Drug-nutrient interactions End stage liver disease Inborn errors of metabolism
Increased nutrient losses	Chronic renal disease/dialysis Chronic blood loss Effusions Draining abscesses, wounds or fistulas Malabsorption syndromes Nephrotic syndrome
Increased nutrient requirements	Age-related: prematurity, adolescent pregnancy, elderly, burns sepsis, trauma Fever and infection Multiple organ failure
Psychosocial factors	Homelessness Loneliness/isolation Poverty Substance abuse Mental illness
Institutional factors	NBM > 7days on intravenous fluids for hydration

1.3 When should a referral be made to a dietician?

Nutrition support

The patient is unable to meet requirements due to:

- Nil by mouth (NBM)
- poor oral intake
- increased requirements such as burns, trauma, infection
- functional impairment
- Indicators include:
  - unintentional significant weight loss (> 5% body weight in past 6 months)
  - enteral feeding (NG/PEG) or parenteral feeding (TPN)
  - cachexia
  - wounds (e.g., pressure ulcers)
  - burns
  - multi-trauma
  - gastric surgery

Dietary modification or nutritional counselling

Medical conditions requiring

- modified diets
- nutritional counselling
- Indicators include:
  - dialysis patients
  - hyperkalaemia
  - new diagnosis of IBD, coeliac, IDDM, NIDDM
  - unstable diabetes

Confounding factors include

- Age over 65

For more information refer to Nutrition and Dietetics intranet site
HNE Health Intranet - Nutrition and Dietetics

2.0 Indications for enteral nutrition [9]

Patients with a functioning gastrointestinal tract whose oral caloric and protein intake is insufficient to adequately meet requirements.

2.1 Clinical situation	Examples
Hypermetabolism	Postoperative, organ transplantation, trauma, sepsis, burns
Neurologic disease	Cerebrovascular accident, head injury, dysphagia
Gastrointestinal	Short bowel syndrome (~100 cm jejunum and 150 cm ileum with an intact ileo-caecal valve are needed for adequate absorption) inflammatory bowel disease, high output GI fistulas (< 500ml/24 hr), pancreatitis, malabsorptive disorders, gastroesophageal reflux disease (GERD).
Organ system failure	Respiratory, cardiac, renal, hepatic and multi-system failure.
Malignant disease	Cancer cachexia, radiation enteritis, chemotherapy enteritis, neoplasms
Malnutrition	Failure to thrive
Psychiatric disease	Eating disorders
Miscellaneous	AIDS enteropathy, cystic fibrosis, inborn errors of metabolism

Patients should be weighed on admission and at least weekly.

3.0 Contraindications for enteral nutrition [9]

3.1 Contraindications may include: -

- Acute pancreatitis
- Enteric anastomosis
- Ischaemic bowel
- Enteric fistula depending upon duration and location
- Imminent bowel resection
- Imminent endoscopy for bowel obstruction
- High nasogastric losses
- Severe exacerbation of irritable bowel disease
- Non-functioning gut: refer to Total Parenteral Nutrition (TPN) team
- Quality of life may not be improved by the intervention
- If the patient does not accept this as appropriate for them (Respecting patient choice)

4.0 **Refeeding syndrome** [10, 11, 12]

4.1 The refeeding syndrome is characterised by acute electrolyte abnormalities, fluid retention and dysfunction of various organ systems. This can result in significant morbidity and occasionally death. The metabolic complications of refeeding can occur when malnourished patients are treated with nutritional therapy via any route. To avoid refeeding syndrome a thorough nutritional assessment by a medical officer or dietitian should be under taken to help identify those at risk.

Normally with prolonged starvation or significant weight loss feeding should be introduced slowly with regular monitoring of electrolytes, urea, creatinine, serum phosphate, magnesium, glucose and fluid balance. In the initial feeding period extra potassium, phosphate and magnesium may be required depending on blood levels.

4.2 Potential metabolic disturbances
- Hypokalaemia
- Hypophosphataemia
- Hypomagnesaemia

4.3 Potential complications of these electrolyte and mineral disturbances
- Cardiac arrhythmia/sudden death
- Congestive heart failure

4.4 Pulmonary
- Dyspnea
- Respiratory failure

4.5 Neurologic
- Seizures
- Weakness
- Paresthesias
- Delirium
- Guillain-Barre

4.6 Musculoskeletal
- Rhabdomyolysis
- Myalgia

4.7 Haematologic
- Haemolytic anaemia
- Thrombocytopenia

4.8 Immunologic
- Infection

4.9 Metabolic
- Metabolic acidosis
- Hyperglycaemia/insulin resistance

4.10 Renal
- Acute tubular necrosis
- Myoglobinuria
- Haemoglobinuria

4.11 Patients most at risk of refeeding syndrome

Patients meeting one of the following criteria:

- Unintentional weight loss > 10% body weight
- Prolonged fasting or minimal intake > 7–10 days
- Low levels of phosphate. Potassium and/or magnesium prior to any feeding

Patients with two or more of the following criteria:

- BMI < 18.5 kg/m^2
- Unintentional weight loss of > 10% within the last 3–6months
- Very little or no intake > 5 days
- History of alcohol abuse or some drugs including chemotherapy

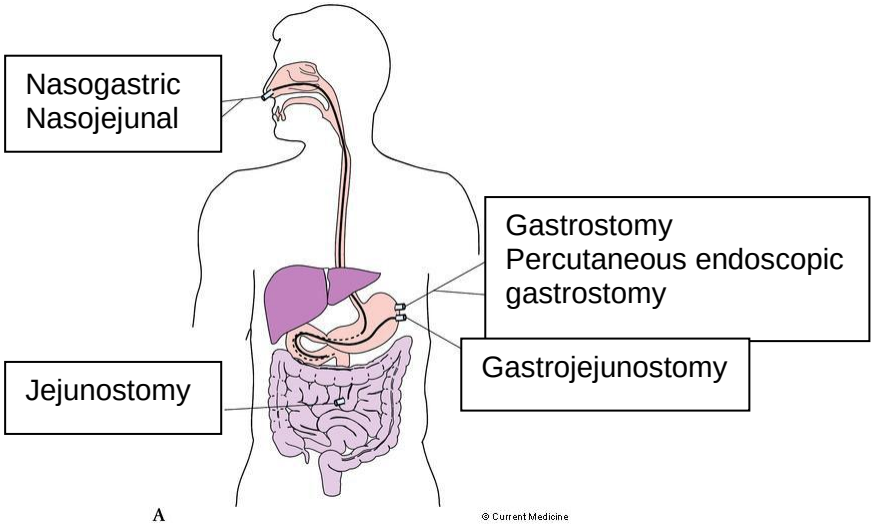
This definition is based on the NICE guidelines 2006

Consider supplementation of thiamine, B vitamins and multivitamin and mineral supplement to those patients at risk of refeeding. Monitor serum potassium, magnesium and phosphate and supplement these electrolytes if serum concentrations suboptimal.

5.0 Enteral feeding tubes [8, 13]

5.1 There are a variety of enteral feeding tubes available for use in the delivery of enteral nutrition. Indications for use may vary depending on the patient's age, clinical condition and nutrient requirements. The enteral feeding tube chart provides a description of each tube, indications for use and specific care.
There must be a mechanism or use of clear labelling to alert clinical staff that the device is in use for enteral feeds **ONLY**.
Note: the oral medicines portal **must not contain ports that can be connected to parenteral syringes** or have (distal or proximal) end connectors which can be connected to parenteral lines.

5.2 Note: Enteral feeding and intravenous equipment must never be interchanged.



Tube type	Description	Indication for use	Placement	Care notes
Nasogastric feeding tubes				
5.3 Short term Salem sump 12 to 16 Fr.	PVC Primary use for gastric decompression. Gastric tube size directed by specialist. **For bowel decompression use a 16 Fr**.	Maybe used for short term feeding in selected patient populations.	Inserted by MO or Nurse refer to Enteral Nasogastric Tube Insertion (Adult) HNELHD GandP 13_10. Apply a water based lubricant on tube prior to insertion. - **DO NOT FORCE** if resistance noted during tube insertion. - Coughing may indicate tube has passed into the trachea.	- refer to section 8 nasogastric tubes. May stay insitu for up to approximately two weeks. - for continuous suction connect to low wall suction 30-40mmHg, usual is -40mmHg
5.4 Long term Flexiflo	Biocompatible, small bore, radiopaque feeding tube with or without weighted tip, sizes 6, 8,10, 12 fr. Some come with stylet to facilitate insertion. Tip may be placed into stomach (nasogastric - NG) or small intestine (nasojejunal- NJ)	Used for short to intermediate term enteral feeding	Refer to Enteral Nasogastric Tube Insertion (Adult) HNELHD GandP 13_10. -Apply water on tube prior to insertion. -High risk patients include those with: 1. Altered mental status 2. Endotracheal intubation 3. Impaired cough/gag reflex. - DO NOT FORCE if resistance noted during tube insertion. - Coughing may indicate passage of tube into trachea.	May stay in place up to approx 4 weeks at a time. -Flush with 30 ml with warm water after each feeding, 4 to 6 hours during continuous feeding or between intermittent feedings. -Check taping of feeding tube every shift. Make sure nasal membranes are not being irritated by pressure from tube.
5.5	Dual lumen silicone tube.	Used to provide gastric	Placed in radiology or in OT.	- Medications should be given through gastric port,

Nasogastrojejunal tube (NGJ)	Proximal port labelled "gastric" is positioned in the stomach. Distal port Labelled "jejunal" positioned in jejunum.	decompression with simultaneous feeding into the jejunum.		with tube clamped for 30 minutes after med administration. - Flush jejunal port with 30 ml of warm water after feeding is turned off and q 4 hours during continuous feeds and when tube is not in use. - Gastric port should be on low intermittent suction or gravity drainage when used for decompression.
Gastrostomy tubes				
5.6 Surgical Gastrostomy tube	Tube surgically placed directly through the abdominal wall into the stomach.	Long term enteral feeding.	Initial placement in OR. Replacement through stoma tract in well healed gastrostomy tubes.	Refer to surgeon as to when to remove sutures if present Patient should be closely monitored for sign of peritonitis, cellulitis at tube exit site, bleeding post placement.
5.7 Percutaneous Endoscopic Gastrostomy tube	Silicone/ polyurethane GT with internal and external retention device.	Long term enteral feeding or gastric decompression.	Placed endoscopically in the endoscopy unit or OT.	Does not require dressing. Retention device should be approx 2mm off the abdominal wall initially to prevent tube migration. Site care as per Site care as per- Percutaneous Endoscopic Gastrostomy (PEG), Gastrostomy, Jejunostomy and Low Profile Device Tube Care (Adult) HNELHD CP 13_04.. -Patient should be closely monitored for sign of peritonitis, cellulitis at tube exit site, bleeding post PEG placement.
5.8 Replacement tube	Silicone gastrostomy tube with retention disc on external portion of tube, balloon on internal portion.	Long term enteral feeding. Commonly used as replacement for initial gastrostomy tube. In some cases may be used as initial gastrostomy tube.	Placed through well-healed stoma tract.	Does not require dressing. Retention disc should be snug against abdominal wall initially to prevent tube migration. Site care as per- Percutaneous Endoscopic Gastrostomy (PEG), Gastrostomy, Jejunostomy and Low Profile Device Tube Care (Adult) HNELHD CP 13_04. Do not feed through balloon valve
5.9 Skin level gastrostomy	Skin level gastrostomy access device, with balloon on inner portion of tube. Requires device specific feeding adapter for use. Has internal anti-reflux valve to prevent leakage of intestinal contents when accessed.	Long term enteral feeding. May be used as initial access or replacement	Placed through well-healed stoma tract.	-Does not require dressing. Site care as per- Percutaneous Endoscopic Gastrostomy (PEG), Gastrostomy, Jejunostomy and Low Profile Device Tube Care (Adult) HNELHD CP 13_04. -Rotate button position 360 degrees within stoma tract daily. -Feeding adapters may be reused. Rinse well with warm water after each use. **DO NOT THROW WAY FEEDING ADAPTER**. Do not feed through balloon valve
5.10 Gastrojejunal Tube (GJ tube) for percutaneous endoscopically jejunostomy (PEJ)	Dual lumen silicone tube placed through gastrostomy. Proximal port, labelled "gastric" positioned in stomach. Distal	Used to provide gastric decompression with simultaneous feeding into the jejunum.	Placed by radiologic, laparoscopic, or endoscopic guidance or surgically in OT or by PEG technique.	Medications should be given through gastric port, with tube clamped for 30 minutes after med administration. - Flush jejunal port with 30-60 ml of warm water after feeding is turned off and 4th hourly

	port labelled "jejunal" positioned in jejunum.			during continuous feeds and when tube is not in use. Gastric port should be on low intermittent suction or gravity drainage when used for decompression. -Does not require dressing. Retention disc should be snug against abdominal wall to prevent tube migration.
5.11 Jejunostomy tube	Feeding tube placed surgically or by needle catheter technique into the jejunum.	Used for enteral nutrition in patients who require post-pyloric feedings.	Placed in the OT.	-Tubes have very small internal diameter and require careful attention to prevent clogging, 4th hr flushing 30ml of warm water Site care as per- Percutaneous Endoscopic Gastrostomy (PEG), Gastrostomy, Jejunostomy and Low Profile Device Tube Care (Adult) HNELHD CP 13_04. Do not rotate or move in and out.

6.0 FLUSHING and Blockages [8, 14, 15, 16]

6.1 Blockages of feeding tubes are caused by: -

- Coagulation of feeding tubes
- Medication fragments
- Precipitation of incompatible medication
- Tube kinking

There are up to three times more blockages reported with continuous than bolus feeds. The earlier a blockage is detected the better the chance of restoring patency.

6.2 To avoid rupturing the tube use no more than 40 PSI for example 30 mL or larger for gastrostomies and 60 mL or larger for naso-enteric or jejunal tubes.

6.3 Alternating gentle suction and pressure with warm water will remove most blockages.

6.4 To avoid blockages flushing the tube with warm water is vital.

6.5 Flush with a minimum of 30 mL using a 30 mL or 60 mL syringe when administering medications or intermittent feeds.

6.6 Flush: -

- Before and after feeds
- Before and after gastric residual volumes
- Before and after medications administered individually
- Routine prescribed times such as 4 to 6 hours during continuous feeds. Small bore nasogastric tubes and jejunostomy tubes should be flushed 4 to 6 hours when not in use to maintain tube patency.

6.7 Document flushes on fluid balance chart

6.8 Blockages

- Refer to section 17.1
- Don't use cranberry juice or Carbonated beverage
- If the feeding tube is difficult to flush or blockage occurs use the push pull method with first:
    1. Warm water
    2. Pancreatic enzyme
        - A tablet/capsule of pancreatic enzyme (any brand and strength) and a 324 mg tablet of sodium bicarbonate are dissolved in 5 mL of warm water just before instillation into the occluded tube. (Refer to pharmacist for assistance).

6.9 The flush regime appropriate for the patient will be documented as part of the dietician's care plan.

7.0 Medication administration [15, 17, 18, 19, 20]

7.1 Most medications can be successfully administered via PEG or nasgastric tube. However the consequences of inappropriate administration include both subtherapeutic and supratherapeutic dosing. Refer to Administering Medications via Enteral Feeding Tube (Adult) HNELHD CP 13_02.

7.2 Refer to the Australian Don't Rush to Crush Handbook for advice on crushing medications and administering via PEG or nasogastric tube. This book is an excellent resource with detailed instructions regarding drug administration, and suitability for tube administration.

7.3 To prevent clogging of feeding tubes, medications should be given in liquid form whenever possible.

7.4 Tablets should be finely crushed to a fine powder (as lumps may block tube) and mixed with at least 30 mL of warm water. Mortar and pestle and tablet crushers are available from pharmacies. Powder should be administered immediately because a) there is limited (if any) stability data, most drugs deteriorate quickly and b) some drugs "gel" increasing the likelihood of tube blockage.

7.5 Do not crush enteric-coated, sustained release or sublingual medications for administration via the feeding tube. Consult with prescribing medical officer and pharmacist for an appropriate alternative

7.6 Flush feeding tube with water before and after medication administration.

7.7 When multiple medications are to be administered at one time, administer each medication separately and flush the tube with water between each drug.

7.7 Medications must not be mixed with formula or added to feeding bag without consulting with pharmacy regarding compatibility and stability.

7.9 **Pharmacists are an excellent resource on medications administered via a feeding tube.**

7.13 For more information check drug information texts i.e., MIMS / E-MIMS (via CIAP), Australian Medicines Handbook.

8.0 Nasogastric tube [8, 14, 15, 19, 21, 22, 23, 24, 25, 26, 27, 28]

8.1 Insertion refer to Enteral Nasogastric Tube Insertion (Adult) HNELHD GandP 13_10.

8.2 Note for orogastric tubes refer to ICU or OT for recommendations.

8.3 Patients who have a Nasogastric tube 1. already *in situ* or 2. inserted for administration of feeds should have an x-ray to confirm tube placement prior to commencement of feed. Also if a feeding tube migrates in or out, cease feeds until repeat x-ray confirms position OK.

8.4 It is not necessary to routinely check the position of a nasogastric tube by X-ray if it is **only** being used for decompression as this can delay treatment. However aspiration of gastric contents should be tested using a pH indicator strip, refer to 8.6. The inserter should document how the position was checked and if any doubt exists or if adequate output from the tube is not being achieved then an x-ray should be attended.

8.5 Confirm nasogastric tube position every shift and after coughing or vomiting by aspiration of gastric contents and test using a pH indicator strip/paper, refer to 8.6, and visually check the patients mouth. If any doubt confirm with x-ray.

8.6 Testing the position of nasogastric feeding tube
- Aspirate below pH 5.0

Reposition patient and/or tube if unable to obtain aspirate

Note If there is any doubt the position and/or the clarity of the colour change on the pH indicator strips, particularly between the ranges pH 5 and 6, confirm with x-ray.
pH test can become difficult to interpret if the patient is on acid inhibiting agents or receiving continuous feeding.

8.7 If assessment is unclear an x ray is recommended.
An x-ray is recommended if the patient
- Is unconscious or heavily sedated
- Has an endotracheal tube or tracheostomy
- Is uncooperative during tube insertions
- Has a depressed gag and cough reflexes
- Exhibits confusion or are debilitated
- Has craniofacial trauma (laryngoscope for visualisation)

8.8 Commence fluid balance chart.

8.9 If fluid balance is no longer required this should be discussed with the MO, nurse and dietitian and documented in the patients progress notes.

8.10 Check for pressure injuries to the nares and tape secure 4/24 and retape prn. Use skin barrier wipe + or – hydrocolloid to protect skin from tape and to improve tape adherence. Document observations in patient's progress notes.

8.11 Advocate the placement of a PEG or post pyloric feeding tube in patients who require long term enteral nutrition.

8.12 Complications
- Rhinitis, pharyngitis, sinusitis, oesophagitis
- Nasal septum necrosis
- Nasopharyngeal ulcers
- Hoarseness
- Gastric ulceration
    - Pulmonary infection

- Complications are reduced with soft bore feeding tubes although smaller tubes have an increased risk of blocking

8.13 Refer to Removal of a Nasogastric Tube (Adult) HNELHD CP 13_03

8.14 Refer to Nasogastric Suction – Intermittent and Continuous (Adult) HNELHD CP 13_05

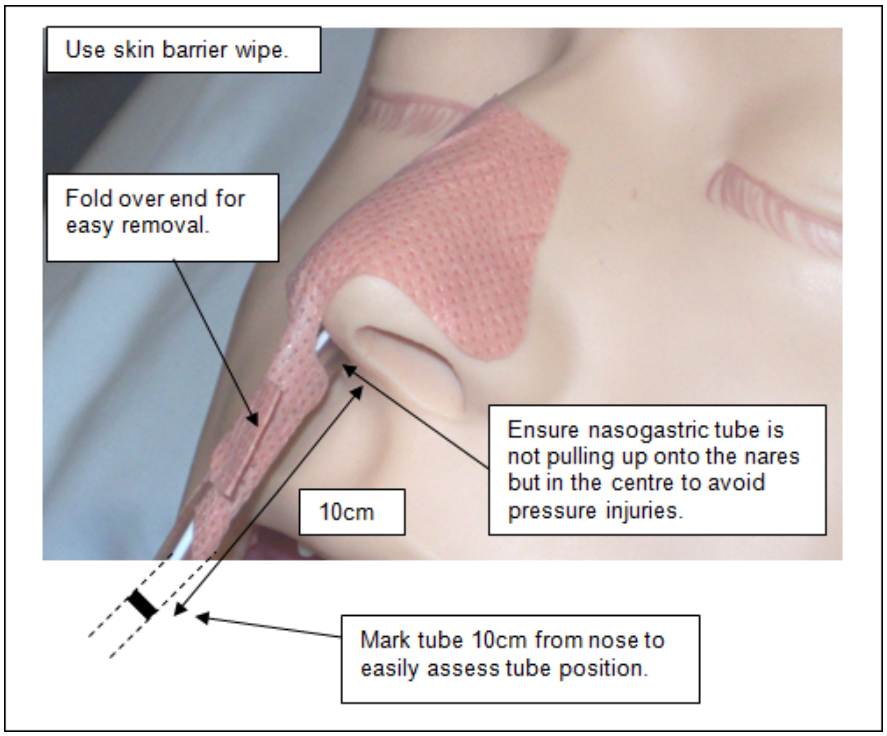
8.15 Nasojejunal tube (NJ)
The jejunal tube is placed the same way as a nasogastric tube with various techniques employed to place the tube post pyloric i.e., patient placed on their right side, prokinetics, etc (approx length of tube 70 cm).

8.16 Weekly or twice weekly weighs unless otherwise stipulated by MO or dietitian.

8.17 Measure and mark length of exiting tube with indelible ink, which should be checked regularly.

8.18 The insertion of a nasogastric tube can be uncomfortable and painful. The use of comforting strategies such as calming speech along with a relaxed environment, and pain relief such as 2% lidocaine gel, can decrease patient's anxiety, improving the success of the procedure.

8.19 Securing of a nasogastric tube

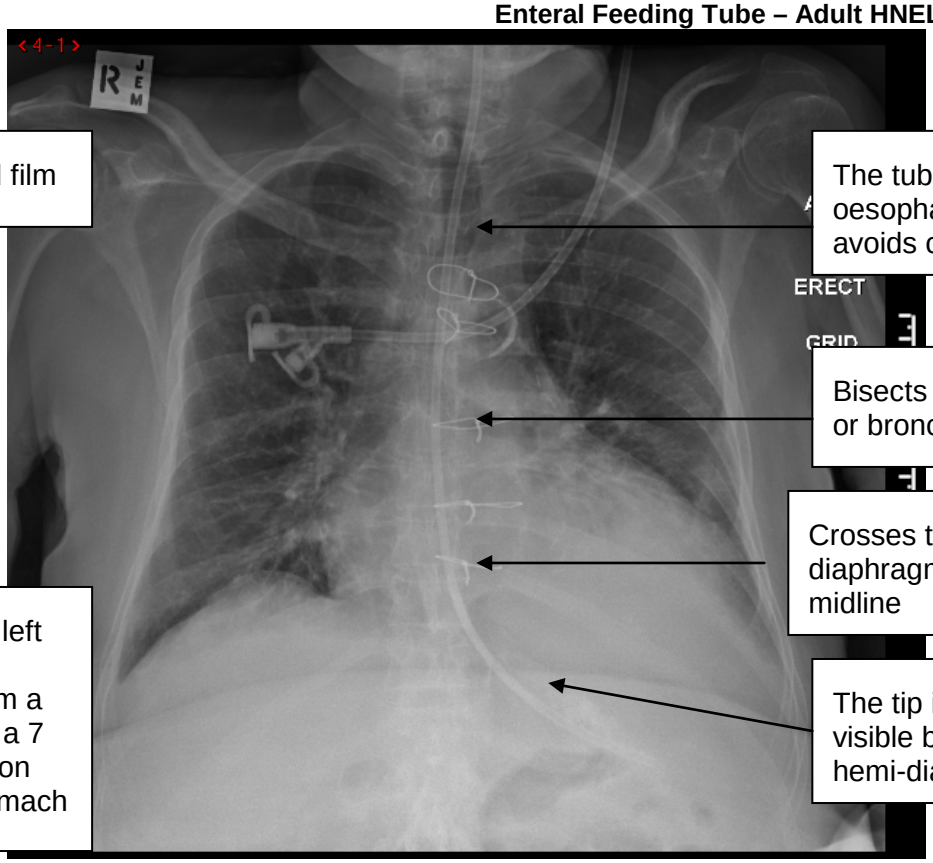


8.20 X-ray of inadvertent intracranial insertion of a nasogastric tube. A transnasal transsphenoidal resection of a large pituitary adenoma.

8.21 X-ray of nasogastric tube in the right lower lobe.

8.22 X-ray of transpyloric tube

8.23 X-ray of correct nasogastric tube placement



Note Feeding can commence if all criteria met. If unsure consider repeating or lateral view or seek senior assistance. Consider a lateral chest x-ray if the position of the tube tip is unclear consult with radiology

9.0 Gastrostomy and Percutaneous endoscopic gastrostomy tube [8, 22, 29, 30, 31]

9.1 Surgical Gastrostomy

An anaesthetic is usually required for the procedure. A common method is the Stamm for surgical placement of the gastrostomy tube. Via a laparotomy incision two concentric rows of purse string sutures are placed in the seromuscular layer of the stomach. A gastrostomy tube is inserted through an opening made through this layer and the first string suture is tied. The second suture is tied after the tube is slightly depressed surrounding it with a short tunnel of gastric wall.

9.2 Percutaneous Endoscopic Gastrostomy

Sedation is required for this procedure as an endoscope is inserted through the mouth into the stomach. The stomach and duodenum are then checked for any pre-existing pathological conditions ie ulcer, etc. The liver, colon and spleen are moved away from the gastrostomy site by distending the stomach with air. This brings the anterior gastric and the abdominal walls together. The lights are dimmed and the assistant then presses the spot where the brightest light transilluminates the abdominal wall, which is usually just proximal to the incisura of the intact stomach. Through the endoscope the finger pressure is seen and if this location is satisfactory, a local anaesthetic is infiltrated into the surrounding tissue. A 1cm incision is then made and a Seldinger needle introduced into the stomach. A guide wire is threaded through the needle and grasped by the endoscope assistant with a snare (previously passed through the endoscope). The guide wire and the scope are then brought out through the mouth. The dilating catheter with the attached PEG tube is then threaded over the guide wire and advanced through the patients oesophagus, stomach and up through the abdominal wall. After the external flange is threaded into place, the tube is cut off at the distal end and an adaptor is placed on the end for future feedings. The tube should be able to rotate freely at this point, and a repeat endoscopy is performed to check the internal flanges position.

9.3 Pre insertion protocol for ward patients

- Patients must be kept nil by mouth for a minimum of 6 h prior to procedure, this includes stopping any NG feeds
- Patient should have a patient IV access
- Patient must be dressed in hospital gown
- Patient must be lying on two slide sheets
- Consent form should be signed by patient or appropriate other
- PEG insertion data collection form (the pre-insertion sections) should be completed on the ward by the registrar

Post insertion PEG procedure

9.4 PEG and jejunostomy tube care refer to Percutaneous Endoscopic Gastrostomy (PEG), Gastrostomy, Jejunostomy and Low Profile Device Tube Care (Adult) HNELHD CP 13_04

9.5 Patient handout caring for your Percutaneous Endoscopic Gastrostomy (P.E.G)

9.6 Refer to enteral tubes section 5.

9.7 Friction and moisture at tube sites will promote hyper-granulation formation and skin breakdown.

9.8 Avoid pushing the 60 mL syringe too far into the PEG port connector, as this will enlarge the port, which will result in an ill-fitting cap resulting in leakage.

9.9 A new port connector can be obtained to replace the damaged one. This is achieved by cutting the PEG tube 1-2cm below the damaged port connector cleaning and drying the inside of the tube and inserting the new port connector. Refer to replacing port connector.

9.10 Report to Medical Officer any unexplained abdominal pain and consider the cause could be intramural feeding and/or peritonitis.

9.11 The life span of a PEG tube is variable however most last for 12 months or so. If the tube begins to deteriorate ie perishing, splitting, flattening or bubbling due to a yeast infection or blockage it would require changing.

9.12 Gastrostomy and PEG replacement refer to Gastrostomy Tube Replacement (Adult) HNELHD CP 13_06

9.13 To organise removal of PEG tube or gastrostomy tube please contact the inserting doctor, gastro resource nurse or qualified community nurse.

9.14 **Note** If gastrostomy/PEG tube falls out, it should be replaced within 1-2hrs before the stoma tract closes, preferably with a gastrostomy tube of similar size. If no gastrostomy tube available use a urinary catheter of similar size until replaced with a gastrostomy tube. It is suggested that a spare gastrostomy tube be available.

9.15 Notify MO immediately if gastrostomy/PEG tube becomes dislodged or requires replacement especially if the stoma is less than 2 weeks old.

9.16 How to move the external bumper

9.17 PEG tube. For tube removal check what is written on the tube ie remove externally or remove endoscopically, usually made from silicone or polyurethane respectively. If any doubt contact manufacturer for guidelines.

9.18 How to replace Y-port connector on the PEG tube.

10.0 Jejunostomy and Percutaneous endoscopic jejunostomy tube jejunostomy [8, 32, 33]

10.1 The jejunal tube is used for long term post-pyloric enteral feedings when bypassing the stomach is required. The risk of aspiration is significantly lower as feed is delivered more distally into the gastrointestinal tract.

10.2 Jejunal feeding may be indicated for

- Gastric reflux
- Upper gastric intestinal obstruction or fistula
- Absent gag reflex
- Gastric disease
- Delayed gastric or duodenal emptying
- High risk of aspiration
- Mental obtundation
- Abnormal upper gastrointestinal motility

10.3 Jejunal feeding is contraindicated for

- Primary small bowel disease due to the high risk of enterocutaneous fistula formation
- Radiation enteritis
- Crohn's disease

PEG and jejunostomy tube care refer to Percutaneous Endoscopic Gastrostomy (PEG), Gastrostomy, Jejunostomy and Low Profile Device Tube Care (Adult) HNELHD CP 13_04

Refer to enteral tubes section 5 - Types of jejunal feeding

10.4 Naso-jejunal tube (NJ)
The jejunal tube is placed the same way as a nasogastric tube with various techniques employed to place the tube post pyloric ie patient placed on their right side, prokinetics, etc. (approx length of tube 70c m).

10.5 Percutaneous endoscopic jejunostomy (PEJ) tube
The tube is placed endoscopically with the gastrostomy lumen of the PEJ used for gastric decompression and the jejunostomy lumen simultaneously delivers enteral feeds.

10.6 **Note** the above two methods do not provide the same protection as a jejunostomy tube as the pylorus is partially open by the feeding tube thus increasing the risk of duodenal/gastric reflux. Also the distal end of these tubes may migrate back into the stomach causing kinking and luminal occlusion, reflux and/or aspiration.

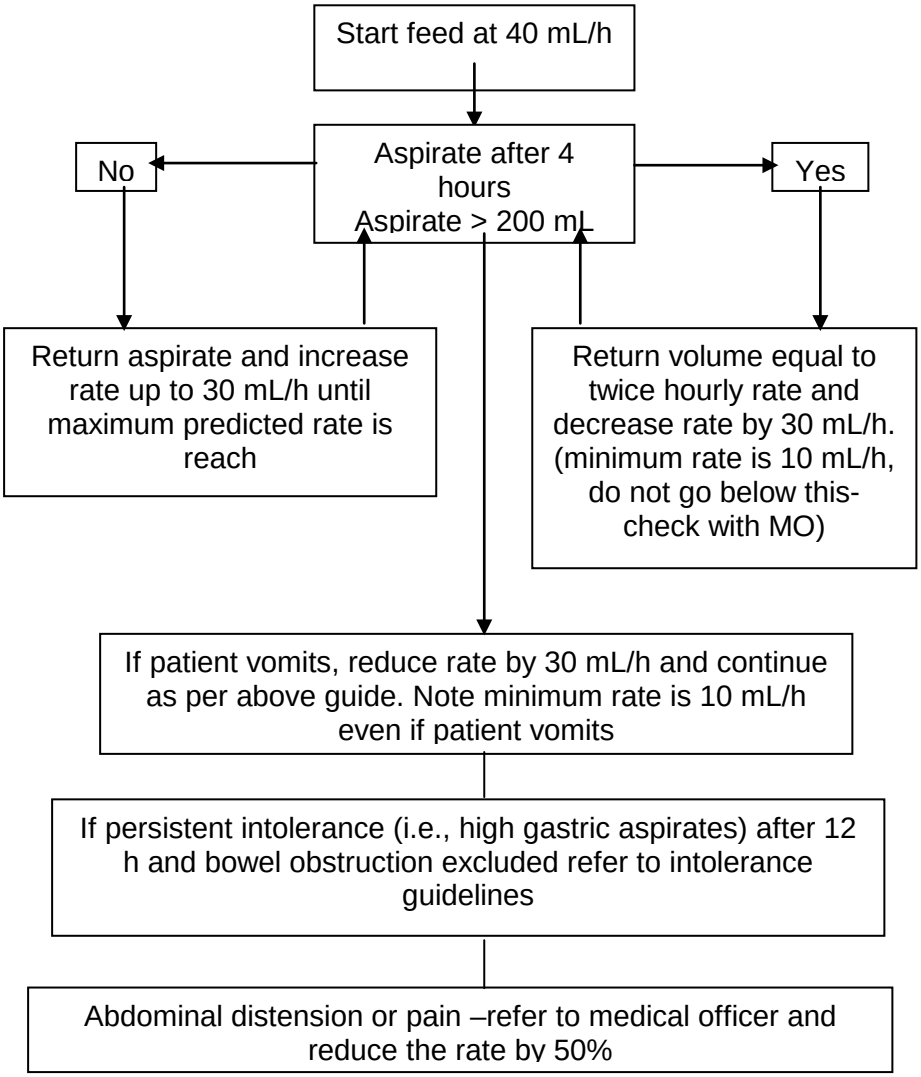
10.7 Jejunostomy tube
The jejunal tube is usually placed at the time of other surgery although laparoscopic placement has also been described. These tubes tend to be smaller in diameter and have an increased risk of blocking; therefore flushing 4th hourly can help minimize this.

10.8 **Note** use minimal amount of water to inflate jejunostomy tube otherwise it could lead to a blockage of intestinal contents proximal to the tube.

10.9 Notify MO immediately if NJ, PEJ or jejunostomy tube becomes dislodged or requires replacement.

11 Initiation of enteral feeds via a nasogastric tube[34]

A medical order is required to commence enteral feeds along with ongoing monitoring for refeeding syndrome. Consult with dietitian and if not available organise a referral. Commence feeding using an appropriate feed and below flow diagram as a guide under medical supervision.



Monitored the patient for feeling uncomfortable, nausea, distention or diarrhoea if aspirates are not attended as per ward protocol.

12 Initiation of enteral feeds via a PEG tube [14]

12.1 Contact gastro liaison nurse and dietitian prior to PEG placement

12.2 Check with MO and dietician to determine feeding regime,

12.3 <u>This is only a guide</u>

Nil by PEG for the first 4 hours following PEG insertion.

- Give 40 mL/h of water for 4 hours, using feeding pump.
- Can commence enteral feeds via PEG:
  - If patient was fed enterally until made NBM for the PEG insertion, then recommence feeds at the usual rate for that patient.
  - If it has been longer than 48 hours since the patient has been fed, then feeds may need to be commenced at a lower rate:
    - 4 0 mL/h x $^{4}/_{24}$ patient's usual feed
    - Increase by 20 mL/h every 4 hours until target rate is reached.
    - If the patient has not been on enteral feeds prior to PEG placement, contact your team dietitian for a feeding regimen.

13 Enteral feed administration [13, 15]

13.1 For enteral feed administration refer to Enteral Feeding Maintenance (Adult) HNELHD CP 13_08

13.2 Using the epump, and bolus feeds can be administered through the pump

General considerations: -

13.3 Reconstituted powdered formulas are good for 24 hours. Containers are labelled with formula name, strength, date and time of mixing, initials of mixer.

13.4 Reconstituted formulas are stored in the refrigerator.

13.5 Formula is administered at room temperature.

13.6 Decanted feeds must not be hung for more than 8 hours

13.7 Enteral feeding sets used for continuous or intermittent feeding are labelled with patient name, enteral formula name, date and time set hung and nurses initials.

13.8 CHANGE ENTERAL FEEDING SETS EVERY 24 HOURS

13.9 Maintain aspiration precautions as per unit or population based standards.

13.10 Elevate patient to > 30 degrees or ideally in a sitting position if tolerated during and for at least 30 minutes to 1 hour after feeds.

13.11 Monitor residuals as per order or unit protocol refer to section 11.

13.12 If patient experiences respiratory difficulties stop feeds, notify MO and verify tube position.

13.13 Monitor and document bowel movements

13.14 Connecting feed giving set to a ready to hang with screw on connection

13.15 Connecting feed giving set to a feed bag with spike

13.16 Connecting feed giving set to a feeding tube

13.17 Ready-to-hang formulas can be hung for 24 hours or as per manufactures instructions.

14 Enteral feed intolerance [34]

14.1 Notify Medical officer and dietician. (Below is only a guide)

Intolerant patients have at least one of the following

- Readily apparent abdominal distension OR
- Increased abdominal girth OR
- Clinically detected aspiration OR
- Gastric residuals > 200 mL for nasogastric feeds

14.2 Protocol for managing high gastric aspirates after 12 hours. (adults ie greater than 200 mL aspirate)

- Exclude bowel obstruction
- Minimise opioid use
- Correct any severe electrolyte disturbance and hyperglycaemia
- Trial a prokinetic (erythromycin 250 mg iv q6h (refer to section 14.6))
- If this fails consider post pyloric tube placement placed endoscopically – consult gastroenterologist

14.3 Document formula name, strength and amount administered on the fluid balance and in the progress notes.

14.4 Gastric residuals (returned residuals are not counted as intake. Residuals should be recorded but not be discarded unless specified in physician order, but instilled back into the feeding tube.)

14.5 Monitor and document bowel movements

14.6 Prokinetic – motility stimulants information including dose range

15 Methods of delivery of tube feeds [9, 35]

15.1 The dietician in consultation with the team and patient will determine the method of delivery.

15.2 Continuous feeding

MO and dietician: Document enteral feeding, specifying formula, strength, rate of administration, route and parameters for gastric residuals. Feeds will be delivered over a 24 hour period.

- Feeding pump refer to Kangaroo™ ePUMP Enteral Feeding Pump (Adult) HNELHD CP 13_07
- With decanted formulas LIMIT volume of formula in enteral feeding bag to that which will infuse over 4 hours.
- Ready-to-hang formulas can be hung for 24 hours or as manufacturer's instructions.
- It is recommended that gastric residuals be checked (2) two hours after the initiation of feedings and (4) four hours during the first 48 to 72 hours of the feeding or until the patient demonstrated tolerance to full volume of rate of feedings. If residuals exceed the ordered parameters or twice the hourly rate, the feeding should be withheld and the MO and dietitian notified.
- Residual should be checked at least once per shift as guided by unit protocol.
- Residuals are not monitored on feeding tube where the tip lies in the small intestine (e.g., NJ, Jejunal or jejunal port of NGJ or GJ tubes). In these cases patients should be monitored for gastric distension, feeling uncomfortable, vomiting or diarrhoea. If the patient has a combination NGJ or GJ tube, residuals may be checked via the gastric port of the tube.

15.3 Non-continuous feeding

This method is used for non-acute patients as well as rehabilitation or home patients. Patients have increased time away from equipment but can be associated with decreased gastric tolerance. MO and dietitian: write orders for enteral feeding, specifying formula, strength, volume and frequency of administration, route, parameters for gastric residuals and water flushes.

	Indications	Advantages	Disadvantages
15.3 Continuous	- Initiation of tube feeds - Critically ill patient - Small bowel feeding - Intolerance of intermittent or bolus tube feeding	- Pump assisted - Minimises risk of high gastric residuals and aspiration - Minimises risk of metabolic abnormalities	- Restricts ambulation - Infused over 24 hours - Increased costs due to equipment and supplies
15.4 Intermittent	- Non critically ill patient - Home tube feeding - Rehabilitation - certain drug interactions, requiring feeds ceased for administration	- Flexibility of feeding program - Inexpensive (less equipment and supplies) - Feeding over short period of time allows free time between feedings	- Higher risk of aspiration, nausea, vomiting, abdominal pain, distension and diarrhoea - Potential gastric intolerance to tube feeding rate - May require formula with more calories and protein
15.5 Bolus Intermittent	- Non critically ill patient - Home tube feeding - Rehabilitation	- Ease of administration - Inexpensive (no pump) - Feeding over short period (usually 15 minutes)	- Highest risk of aspiration, nausea, vomiting, abdominal pain, distension and diarrhoea - Potential gastric intolerance to tube feeding rate
15.6 Cyclic Intermittent	- Non critically ill patient - Home tube feeding - Rehabilitation	- Physical and psychological freedom from equipment for 8-6 hours- Beneficial for transitioning tube feeding to an oral diet (Tube feeds at night with oral diet during the day)	- Requires high infusion rate over short period (8-16 hours) - May require formula with higher calorie and protein density - Potential gastric intolerance to tube feeding rate

		- Patients requiring extra calories ie cystic fibrosis	

15.4 Oral hygiene is important and should be attended frequently. This includes daily brushing of the teeth, gum and tongue and/or mouthwash. Apply a lip lubricant to help prevent cracking.

16 Patient education and discharge planning for home enteral nutrition [36]

16.1 If the patient is being transferred to another facility, ensure feeding regime is part of the transfer documentation.

16.2 Discharge planning

- Notify ward and patient flow coordinator
- Notify dietitian. Providing enteral nutrition at home via the HNE home enteral nutrition (HEN) program requires at least 2 working day's notice to organise. Early notification will facilitate a smooth discharge for the patient.

16.3 The dietician is responsible for organising the following: -

- Formula (supply/ordering/delivery to home)
- Equipment required at home (including ENABLE application)
- Advising patient of costs involved
- Providing written HEN information booklets
- Nutrition review arrangement

16.4 The nurse is responsible for explaining care of feeding tube:-

- Monitor tube position
- Caring for the tube
- Cleaning of PEG site
- Rotation of PEG tube or
- Cleaning of nasogastric tube area and retaping
- Administration of medications
- Trouble shooting
- Nurse to explain setting up the feeding system
- Explain clean handling procedure
- Connecting the feeding system
- Connecting giving set to feeding tube
- Priming of pump
- Pump features and alarms
- Changing of feeding container
- Disconnecting the feeding system
- Position for feeding > 30 degrees or ideally in a sitting position for 30 minutes to one hour after intermittent or bolus feeds

17 PROBLEM SOLVING [8, 14, 15, 16, 17, 19, 22, 35, 36, 37, 38, 39]

Complications	Causes	Intervention
17.1 Blocked tube	Inadequate flushing of the tube Medication Fungus colonisation	If the feeding tube is difficult to flush or blockage occurs use the push pull method with first 1. Warm water (be patient) 2. Pancreatic enzyme: - **Note**: - MO must chart on medication stat sheet, a capsule of pancreatic enzyme (any brand and strength) and a 324 mg capsule of sodium bicarbonate. These are dissolved in 5 mL of warm water just before instillation into the occluded tube. Milk tube with fingers. Flush tube with warm water after giving formula and before and after medication and residual checks Flush every 4-–6 hours with continuous feeds Do not mix formula with medication **DO NOT** insert any device into a feeding tube as this could cause a perforation Check tube is not kinked If unable to unblock the tube **notify MO** or enteral resource person. If blockage caused by fungus colonization, where there is loss of tube integrity ie bubbling or collapse of tube a replacement tube is required.

17.2 Leakage of gastric contents	Infection at the site Increased gastric acid secretion Buried bumper syndrome Side torsion on the PEG tube Absence of external bolster to stabilize the tube Loss of balloon volume Constipation Delivery of feed too fast	Treat infection if present Consider proton pump inhibitor therapy Tube should exit stoma perpendicular, consider a clamping device to stabilize the tube Consider replacing PEG with a low profile device Check position of tube. It should rotate 360 and have in and out movement, to rule out buried bumper syndrome **Notify MO** Some practitioners replace the tube with a larger size but this is usually ineffective and can result in leakage around a larger stoma For severe leaks consider a post pyloric tube, Esomeprazole infusion Protect the skin with a skin barrier wipe Refer to constipation 17.11 Check balloon volume should have at least 5 mL of sterile water For gastrostomy (2–3 mL for a jejunal tube) Note a small amount of leakage is normal. The following products may assist with exudate and skin protection Skin barrier wipe, stoma adhesive powder, hydrocolloid, Sucralfate tablets crushed into powder or paste, foam or Eakin seal, zinc oxide
17.3 Buried bumper syndrome	Excessive tension between the internal and external flanges, Malnutrition Poor wound healing Significant weight gain Partial or complete growth of gastric mucosa over the internal flange Presents with leakage or infection, an immobile tube, abdominal pain, or resistance in flow through the tube	Suspect if no in out movement of PEG. Confirmed by endoscopy or radiographically, Gastrografin study performed with patient prone Buried bumpers should be removed using a technique which minimises trauma to the PEG tract **Notify MO**

17.4 Nausea and vomiting	Improper placement of tube Feeding too fast Patient positioning Contamination of formula Air in stomach Faecal impaction Intolerance to feeds	Check tube position prior to feeding and every shift during continuous feeds As per Adult Enteral Guidelines to establish and maintain nutrition in adults Deliver feeds at room temperature Ensure strict hygiene is adhered to at all times i.e., wash hands, non-sterile gloves and alcohol swabs, and equipment is kept clean Use appropriate equipment to deliver feeds Keep head of bed elevated at a 30 to 45 degree angle. If practical have patient to sit upright and encourage ambulation. Refrigerate unused formula and record date/time opened. Discard outdated formula every 24 h. Fill container with only enough feed for four hours. Clear tubing of air before feeding. Keep feed container filled so air does not enter through feeding set. Ensure adequate hydration Administer aperients Exclude bowel obstruction Minimise narcotic use Correct any electrolyte disturbances/hyperglycaemia **Notify MO and dietitian**
17.5 Large Aspirate >200 mL	Decreased gastric emptying which may be attributed to: Opioids Severe electrolyte disturbance Hyperglycaemia Patient positioning Bowel obstruction	Minimise opioid use Correct severe electrolyte disturbances/hyperglycaemia Keep head of bed elevated at a 30 degree angle. If practical have patient to sit upright and encourage ambulation. Consider prokinetics Exclude bowel obstruction Return volume equal to twice hourly rate and decrease rate by 30 mL/h. Do not go below a minimum rate of 10 mL/h. Consider post pyloric tube placement placed endoscopically. **Notify MO and dietician**
17.6 Bleeding around stoma	Hypergranulation tissue Trauma	A small amount of bleeding is normal if hypergranulation tissue present Anchor tube securely distally If excessive bleeding and discomfort **Notify MO** and/or resource person.

17.7 Infection/ excoriation of peri stomal skin	Excessive pressure between the PEG's external and internal flange Gastric leakage around site Stoma site not kept clean Patients with diabetes, obesity, poor nutritional status and those on chronic corticosteroid therapy are associated with higher infection rates	If diagnosed early, oral broad spectrum antibiotics 5–7 days may be all that is required If systemic signs: IV broad spectrum antibiotics plus local wound care, consider ID consult If peritonitis develops surgical intervention may be required Necrotizing fasciitis requires aggressive surgical debridement and IV broad spectrum antibiotics Correct cause of leak, a small leak is normal Inspect and clean regularly Signs and symptoms Pain, odorous and purulent discharge, erythema, induration, febrile. **Notify MO** The following products may assist Silver absorbent impregnated dressings, Medihoney, sucralfate
17.8 Hypergranulation tissue	Body rejecting foreign body Excessive movement Inflammation Excessive moisture	Keep area clean and dry Anchor tube securely If excessive bleeding and discomfort refer to resource people. **Notify MO** The following products may assist Foam dressing first line of treatment, hypertonic saline dressings, silver nitrate stick as prescribed by MO, Medihoney, Silver impregnated absorbent dressing, or debridement if problematic
17.9 PEG tube-y port connecter leaking	Inserting Toomey syringe to far into the Y-port connecter and enlarging port causing cap not to fit.	Gently insert syringe enough for sealed connection Cut PEG tube with clean scissors 1 to 2 cm below the Y-port, clean and dry inside tube and insert the new Y-port.

17.10 Diarrhoea	Rapid administration	**Continuous drip feeding** return infusion rate to previous tolerated rate, then gradually increase the rate again **Bolus feeding**- increase length of time for feeding. Allow for a short break during feeding. Offer smaller and more frequent feeds.
	Medications	Do not add medication to formula Medications that may cause diarrhoea – antibiotics, GI stimulants, beta blockers, laxatives, stool softeners, liquid medications with sorbitol.
	Hyperosmolar	Switch to isotonic feed Dilute current formula to isotonic strength and gradually increase to full strength
	Air in the stomach/intestine	Check feed mixed properly Vent air Elevate Head during feeding Avoid air in tubing or Toomey syringe entering patient.
	Tube migrated from stomach to small intestine	Reposition tube
	Cold feeds	Feeds should be at room temperature
	Rapid GI transit	Select fibre enriched feed May require elemental or semi-elemental feed
	Bacterial contamination	Wash hands, don non sterile gloves, use alcohol swabs and avoid contamination of feeds Refrigerate opened feeds for no longer than 24 hrs
	Management	**Notify MO and dietician** Only hang feeds according to manufacturer guidelines Change feeding set every 24 h Defined > 7 Bowel Actions per Day Cease Aperients Consider Causes (Inc Faecal Impaction) Check for Cl difficile, - if positive treat accordingly, - if negative give loperamide as per protocol If no improvement in 24 hrs consider changing feed Consider loperamide, codeine phosphate if diarrhoea becomes intractable, consider octreotide Do not starve routinely as treatment for diarrhoea
17.11 Constipation	Inadequate fibre/bulk Inadequate fluid	Try formula with added fibre Increase water Try stool softeners, suppositories, or enema as indicated **Notify MO and dietician**

17.12 Fungus	Moisture	**Notify MO** and treat stoma site with antifungal cream Treat mouth and tube with antifungal medications. Investigate and treat co-existing fungal infections
17.13 Fungal tube infection	Fungal	Reported to cause up to 70% tube failure by 450 days. No known treatment, replace tube.

18 Infection prevention [5, 15, 30, 35, 36, 40, 41, 42, 43]

18.1 It is a widely accepted practice for early delivery of enteral nutrition via a feeding tube: - orogastric, nasogastric or enterostomal either gastrostomy or jejunostomy. There are still associated complications: - gastrointestinal symptoms such as diarrhoea, infection, sepsis, pneumonia, extended hospital stays and death.

Enteral feeding can stimulate gut immunologic function and the formulas used which contain lipids and high concentrations of glucose create an ideal medium for bacterial proliferation once contamination occurs. Coagulase-negative staphylococci, Clostridium difficile and Gram-negative bacilli such as Serratia, Klebsiella and Enterobacter species have been associated with enteral feeding. Gastric pH of 1.5 to 2.5 destroy ingested organisms but a combination of tube feeding (which has an alkalising effect with a pH of 3.5) and H2 receptor antagonists increase nosocomial infection. It has been shown that there is a direct correlation between a pH greater than 3.5 and over growth of bacteria.

Contamination by either exogenous or endogenous means can occur with enteral feeds.

18.2 Exogenous contamination: - occurs when feeds are mixed and poured and also from organisms from hands, surface of the can or container, rim and when water may be added. It seems that a cumulative effect of inappropriate handling of the solution and feeding system leads to contamination. This can be exacerbated by an open feeding system. It has been shown that using non-sterile gloves significantly decreases the risk of contamination.

18.3 Endogenous contamination: - occurs through retrograde contamination of the feeding system by aspirating gastric contents to ascertain tube position, removal of the guide wire and the distal end of the feeding set. Further research is required to determine if this is as significant as micro colonization of medical devices such as prostheses and cannule. Food dye can also be a source of infection and there are several reports of toxicity by the U.S. Food and Advisory board. There is increasing evidence that contamination of feeds can lead to morbidity and death in hospital patients.

18.4 Closed feeding systems, which include medication ports are recommended as they reduce the risk of contamination by less contact with the feed. Also they decrease costs by reducing nursing time and feed waste.

18.5 Wash hands with an antimicrobial soap or an alcohol based hand gel before preparing, assembling and handling any part of the feeding system.

18.6 Wear personal protective equipment, don non-sterile gloves and change when soiled.

18.7 If you have an upper respiratory infection, wear a mask.

18.8 Discard damaged or dented cans and those past their expiry date.

18.9 Refrigerate opened feeds lower than 4 degrees cover, label and use within 24 hours.

18.10 Use warm tap water (not hot water) of good quality or sterile water if none available. Consider for immunocompromised or the critically ill patient sterile water.

18.11 Assemble feeding system on a clean surface.

18.12 Use a 70% alcohol wipe to disinfect the opening and rim of can before opening.

18.13 Avoid unnecessary handling of feeding system and ports.

18.14 Avoid skin, clothes and hands contacting the parts of the feeding system connections.

18.15 Disinfect ports with a 70% alcohol wipe before and after accessing. For example before administering medication or flushing.

18.16 Open system: - do not add any new feeds to existing feeds in previous container and the container should not hang longer than 4 hours.

18.17 Closed system: - store feeds at room temperature, which can last 24 hours. Check manufactures guidelines

18.18 Administer medications through the side port, wipe port with 70% alcohol, flushing before and after

18.19 When checking residual feeds, flush tube with 30mls of water before and after as this can reduce blockage of the feeding tube

18.20 Gastrostomy sites should be thoroughly washed with non irritant soap and water and dried daily

18.21 Risk of infection increases with hypergranulation tissue and excessive exudates. These can be managed with the use of an appropriate dressing refer to 17.7.

18.22 Feeding syringes must be replaced every 24 h and kept clean and protected whilst in use

19 Glossary [44, 45]

Achalasia	A combined defect of absent peristalsis of the oesophageal body and elevated lower oesophageal sphincter pressure.
Ampulla of Vater	The dilatation formed by the junction of the common bile duct and the pancreatic duct proximal to their opening into the duodenum.
Anabolism	Any constructive process by which simple substances are converted by living cells into more complex compounds, especially into living matter.
Anorexia	Lack of or loss of appetite for food.
Antacid	A substance that counteracts or neutralises acidity, usually gastric acidity.
Antibiotic	An agent that inhibits the growth of or kills microorganisms, used in the treatment of infectious diseases.
Anticholinergic	An agent that blocks the parasympathetic nerves.
Antidiarrhoeal	An agent that combats abnormally frequent and liquid faecal discharges.
Antiemetic	An agent that prevents or alleviates nausea and vomiting.
Antifungal	An agent that is destructive to fungi, suppresses their growth or reproduction, or is effective against fungal infections.
Antrum	The constricted, elongated, lower portion of the stomach.
Anus	The terminal orifice of the gastrointestinal tract.
Ascending colon	The portion of the large intestine between the caecum and the hepatic flexure.
Ascites	The effusion and accumulation of serous fluid in the abdominal cavity.
Aspiration	The act of inhaling, including the accidental inhalation of solids or liquids; (2) the removal of fluids or gases from a cavity by the application of suction. See also fine-needle aspiration.
Atresia	Congenital absence or closure of a normal body orifice or tubular organ.
Bile	An alkaline golden brown to greenish-yellow fluid that is secreted by the liver and poured into the small intestine via the bile ducts. Important constituents include conjugated bile salts, cholesterol, phospholipid, bilirubin diglucuronide, and electrolytes.
Biliary colic	Paroxysms of pain and other severe symptoms resulting from the passage of gallstones along the bile duct.
Billroth I procedure	Surgical procedure sacrificing the distal portion of the stomach, pylorus, and duodenal bulb. The duodenum is then reattached by anastomosis with the gastric remnant.
Billroth II procedure	Surgical procedure sacrificing the distal portion of the stomach and a

	portion of the proximal duodenum. The proximal duodenum is closed, and a segment of proximal jejunum is attached to the gastric remnant with end-to-end or side-to-side anastomosis.
Biopsy	The removal and examination, usually microscopic, of tissue from the living body, performed to establish a precise diagnosis.
Cardia	The portion of the stomach surrounding the oesophagogastric junction which contains cardiac glands but lacks parietal and chief cells.
Cardiac sphincter	See lower oesophageal sphincter
Catabolism	Any destructive process by which complex substances are converted by living cells into more simple compounds.
Cholangiogram	A roentgenogram of the gallbladder and bile ducts, following intravenous injection of contrast medium. See also percutaneous transhepatic cholangiogram.
Cholecystitis	Inflammation of the gallbladder.
Choledocholithiasis	The presence of gallstones in the common bile duct.
Cholelithiasis	The presence or formation of gallstones
Cholestasis	Stoppage or suppression of the flow of bile, having either intrahepatic or extrahepatic causes.
Chyme	A relatively homogenous semiliquid combination of food and digestive juices found in the stomach and small bowel.
Cirrhosis	A liver disease characterised pathologically by loss of the normal microscopic lobular architecture, with fibrosis and nodular regeneration.
Colonoscopy	Endoscopic examination of the colon.
Constipation	Infrequent or difficult evacuation of faeces; passage of unduly hard or dry faecal material.
Contrast roentgenography	Roentgenography performed after the administration of a contrast medium, often barium sulphate, which facilitates interpretation of the film by accentuating differences in the densities of different regions and structures.
Corticosteroid	Any of the steroids elaborated by the adrenal cortex (excluding sex hormones of adrenal origin) in response to the release of corticotropin by the pituitary gland, or any of the synthetic equivalents of these steroids.
Crohn's colitis	Crohn's disease confined to the colon.
Crohn's disease	A chronic granulomatous inflammatory disease involving any part of the GI tract, but commonly involving the terminal ileum, with scarring and thickening of the bowel wall. It frequently leads to intestinal obstruction and fistula and abscess formation and has a high rate of recurrence after treatment. Also known as regional enteritis.
Cryoprecipitate	Any one of a group of serum proteins including factors VIII, XIII, and fibrinogen, that settle out of solution at temperatures below 20°C.
Crypt of lieberkuhn	A simple tubular gland in the mucous membrane of the intestine,

	opening between the bases of the villi and containing argentaffin cells.
Carling's ulcer	A stress ulcer that appears in patients with serious burn injuries.
Cushing's ulcer	A stress ulcer that appears in patients with intracranial trauma.
Cystic duct	The passage connecting the neck of the gallbladder and the common bile duct.
Cystic fibrosis	A hereditary disorder of infants, children, and young adults, in which there is widespread dysfunction of the exocrine glands. It is characterised by signs of chronic pulmonary disease caused by excess mucus production in the respiratory tract, pancreatic deficiency, abnormally high levels of electrolytes in the sweat, and occasionally by biliary cirrhosis.
Decompression	The removal of pressure, as in the removal of excess gas from the intestinal tract.
Decontamination	The removal of gross soils and the reduction of the number or micro-organisms to the point where an item may be considered safe for handling.
Descending colon	The portion of the colon between the splenic flexure and the sigmoid colon at the pelvic rim.
Desiccation	The act of drying up, especially the treatment of a tumour or other disease by drying up the part by the application of laser or electrical energy.
Dextrose	D-Glucose monohydrate. A monosaccharide that occurs as colourless crystals or as a white, crystalline or granular powder; used chiefly as a fluid and nutrient replenisher usually administered by IV infusion. Also used as a diuretic and alone or in combination with other agents for other clinical purposes.
Diaphragmatic hiatus	An opening in the diaphragm where the oesophagus enters the abdominal cavity.
Diarrhoea	Abnormally frequent and liquid faecal discharges.
Diffuse oesophageal spasm	Repetitive prolonged simultaneous contractions along the length of the oesophagus, with intermittent normal peristalsis.
Dilator	An instrument that is used to enlarge an orifice or canal by stretching.
Disaccharide	Any of a class of sugars that yield two monosaccharides on hydrolysis.
Diverticulitis	Inflammation of a diverticulum, especially inflammation related to colonic diverticula, which may undergo perforation with abscess formation.
Diverticulosis	The presence of diverticula, particularly colonic diverticula, in the absence of inflammation.
Diverticulum	An outpouching of one or more layers of the wall of a tubular organ. See also Meckel's diverticulum.
Duct	A passage with well-defined walls, especially a tube for the passage of excretions or secretions. See also common bile duct, duct of Santorini,

duct of Wirsung, and hepatic duct.

Duct of Santorini	The minor pancreatic duct, draining a part of the head of the pancreas into the minor duodenal papilla.
Duct of Wirsung	Pancreatic duct; the main excretory duct of the pancreas, which usually unites with the common bile duct before entering the duodenum at the major duodenal papilla (papilla of Vater).
Dumping syndrome	A group of disabling symptoms associated with rapid gastric emptying that mimic the symptoms of hypoglycaemia.
Duodenum	The first, or proximal, portion of the small bowel, extending from the pylorus to the jejunum.
Dyspepsia	Impairment of the power or function of digestion, usually applied to epigastric discomfort following meals.
Dysphagia	A sensation of difficulty in swallowing.
Endoscopic retrograde cholangiopancreatography (ERCP)	An endoscopic technique for radiological visualisation of the biliary and/or pancreatic ducts.
Endoscopic variceal ligation (EVL)	The endoscopic introduction of rubber bands or O-rings for the treatment of bleeding varices.
Endoscopy	Visual inspection of any cavity of the body by means of an endoscope.
Enteral nutrition	Administration of a prescribed diet by means of a flexible tube inserted into the stomach or small bowel transnasally, surgically, or endoscopically.
Enteric plexus	A plexus of autonomic nerve fibres within the wall of the digestive tube, and made up of the submucosal, myenteric, and sub-serosal plexuses.
Enteritis	Inflammation of the intestine, especially of the small bowel. See also radiation enteritis and regional enteritis.
Enterochromaffin cell	A basal granular cell whose granules stain readily with silver and chromium salts and which is a site of synthesis and storage of serotonin.
Enteroclysis	The injection of a nutrient or a medicinal liquid into the bowel.
Erythrocyte	A red blood cell; one of the elements found in peripheral blood; normally in humans, the mature form is non-nucleated, yellowish, biconcave disk, adapted by virtue of its configuration and its haemoglobin content to transport oxygen.
Familial polyposis	Multiple adenomatous polyps with high malignant potential lining the mucous membrane of the intestine, particularly the colon, beginning about puberty.
Fatty acid *Fine-needle aspiration*	Any monobasic aliphatic acid containing only carbon, hydrogen, and oxygen and made up of an alkyl radical attached to the carboxyl group. There are also several series of unsaturated fatty acids having one or more double bonds, and a few cyclic acids. Sampling of pancreatic tissue for the purpose of cytological examination. Used in the diagnosis of pancreatic cancer.

Fistula	An abnormal passage between two internal organs. See also pancreatic fistula.
French	A system used to indicate the outer diameter of catheters. Each unit is approx. 1/3mm.
Fulminant hepatic failure	Massive liver cell death that occurs within 2 months of the development of acute hepatitis.
Fundus	The proximal portion of the stomach, which lies above and to the left of the lower oesophageal sphincter.
G cell	A cell type located in the pyloric glands of the stomach: G cells secrete gastrin.
Gallbladder	The pear-shaped reservoir for bile on the postero-inferior surface of the liver, between the right and the quadrate lobe; from its neck the cystic duct projects to join the common bile duct.
Gardner syndrome	Familial polyposis of the colon (with malignant potential), supernumerary teeth, fibrous dysplasia of the skull, osteomas, fibromas, and epithelial cysts.
Gastric baseline	Manometric tracing showing a relatively flat, smooth tracing with a small pressure increase on inspiration or abdominal pressure. Indicates all catheter recording ports are in the patient's stomach.
Gastric ulcer	Ulcer of the gastric mucosa
Gastritis	An inflammation of the gastric mucosa.
Gastroesophageal reflux disease (GERD)	Backward flow of gastric contents into the oesophagus when the pressure is greater than in the oesophagus. Associated with pregnancy, obesity or incompetence of the lower oesophageal sphincter.
Gastroesophageal sphincter	See lower oesophageal sphincter
Gastrostomy	A tube going directly through the skin into the stomach
Giardiasis	Infection with the flagellate protozoan *Giardia lamblia*, characterised by protracted, intermittent diarrhoea with symptoms suggesting malabsorption and by abdominal pain, distension and flatulence, light infections are usually asymptomatic.
Gland	An aggregation of cells, specialised to secrete or excrete materials not related to their ordinary metabolic needs.
Glucose	A monosaccharide found in certain foodstuffs, especially fruits and in the normal blood of all animals. It is the chief source for living organisms, its utilisation being controlled by insulin.
Glutaraldehyde	A high level disinfectant that is effective against vegetative gram-positive, gram-negative, and acid-fast bacteria, some bacterial spores, some fungi and viruses.
Glycerol	A trihydric sugar alcohol that is the alcoholic component of the fats; it is soluble in water and alcohol and is an intermediate in the metabolism of fatty acids.
Goblet cell	A unicellular mucous gland found in the epithelium of various mucous

	membranes, especially in the respiratory passages and the intestines. Droplets of mucigen collect in the upper part of the cell and distend it, while the basal end remains slender and the cell assumes the shape of a goblet.
Greater curvature	The lower lateral border of the stomach.
Greater omentum	A layer of visceral peritoneum that hangs from the greater curvature of the stomach over the anterior side of the abdominal viscera.
Haustrum	Sacculation in the wall of the colon produced by adaptation of its length to that of the tenia coli, or by the arrangement of the circular muscle fibres. Plural: haustra
Heartburn	A retrosternal sensation of warmth or burning that occurs in waves and tends to rise toward the neck. Also known as pyrosis.
Helicobacter pylori	A gram-negative curved or special rod that is microaerophilic. Formerly Campylobacter pylori.
Haematochezia	The passage of bloody stools.
Haemocrit	The volume percentage of red blood cells in whole blood.
Hemoccult	Trademark for a modification of the guaiac test for occult blood, in which guaiac-impregnated filter paper is used; the test is positive if the specimen turns blue.
Haemochromatosis	A disorder of iron metabolism characterised by excess deposition of iron in the tissues, especially in the liver and pancreas, and by bronze pigmentation of the skin, cirrhosis, diabetes mellitus, and associated bone and joint changes.
Haemoglobin	The oxygen carrying pigment of the red blood cells.
Haemolysis	The liberation of haemoglobin from the red blood cells and its appearance in the plasma.
Haemorrhage	Bleeding; the escape of blood from the blood vessels.
Hepatic duct	The duct that is formed by the union of the right and left hepatic ducts and in turn joins the cystic duct to form the common bile duct.
Hepatic encephalopathy	A condition usually occurring secondary to advanced liver disease but also seen in the course of any severe disease or in patients with portacaval shunts. Marked by disturbances of consciousness that may progress to deep coma (hepatic coma), psychiatric changes, flapping tremor and fetor hepaticus. Also called portal-systemic encephalopathy.
Hepatic flexure	The right flexure of the colon; the bend in the large intestine at which the ascending colon becomes the transverse colon.
Hepatocyte	A parenchymal liver cell.
Hepatorenal syndrome	A syndrome characterised by functional renal failure, oliguria, and low urinary sodium concentration, without pathological renal changes, associated with cirrhosis and ascites or with obstructive jaundice.

Hiatal hernia	Occurs when a portion of the stomach protrudes through the diaphragmatic hiatus into the thoracic cavity.
Highly selective vagotomy	Surgical procedure interrupting the nerve fibres to the antrum but preserving the innervation of the pyloric region.
Hirschsprung's disease	Megacolon caused by congenital absence of myenteric ganglion cells in a distal segment of the colon. The resultant loss of motor function causes massive hypertrophic dilatation of the normal proximal colon; the aganglionic segment usually remains narrowed but may dilate passively. The condition appears soon after birth, is more common in males, and causes extreme constipation, abdominal distension, sometimes vomiting, and when severe, growth retardation. Also known as congenital megacolon or aganglionic megacolon.
Histamine	A decarboxylation product of histidine found in all body tissues. Cellular receptors of histamine include H1receptors, which mediate the effects of histamine on smooth muscle and capillaries: and H2 receptors, which mediate the acceleration of heart rate and the promotion of gastric acid secretion.
Histamine2 (H2) blocker	An agent that blocks the cellular receptor site for histamine that is responsible for stimulating the heart rate and gastric secretion.
Hypoalbuminaemia	An abnormally low albumin content in the blood.
Hypoglycaemia	An abnormally low glucose content in the blood, which may lead to tremulousness, cold sweat, piloerection, hypothermia and headache accompanied by confusion, hallucinations, bizarre behaviour and ultimately convulsions and coma.
Hypopharyngeal sphincter	See upper oesophageal sphincter
Ileocaecal valve	A functioning valve at the junction of the ileum and caecum, consisting of circular muscle of the terminal ileum.
Ileum	The distal portion of the small intestine extending from the jejunum to the caecum.
Infantile hypertrophic pyloric stenosis	Congenital obstruction of the pyloric lumen caused by pyloric muscular hypertrophy.
Inflammatory bowel disease	A general term for inflammatory diseases of the bowel of unknown aetiology, including Crohn's disease and ulcerative colitis.
Insufflation	The act of blowing a vapour, gas, or air into a body cavity.
Intestinal pseudo-obstruction	A condition characterised by constipation, colicky pain and vomiting but without evidence of organic obstruction.
Intrahepatic biliary dysplasia	A rare autosomal-dominant liver disease that incorporates a combination of anomalies in conjunction with chronic cholestasis.
Intussusception	The prolapse of one part of the intestine into the lumen of an immediately adjoining part.
Irritable bowel Syndrome	A chronic non-inflammatory disease characterised by excessive secretion of mucus and disordered colonic motility with consequent colic, constipation and/or diarrhoea with the passage of mucus. It is a

common disorder with a psychophysiological basis.

Ischaemic colitis	Acute vascular insufficiency of the colon usually involving the portion supplied by the inferior mesenteric artery. The classic radiological sign is thumb printing caused by localised elevation of the mucosa by submucosal haemorrhage or oedema. Ulceration may follow.
Islet of Langerhans	One of the irregular microscopic structures scattered throughout the pancreas and comprising the endocrine portion of the pancreas.
Jaundice	A syndrome characterised by hyper-bilirubinaemia and deposition of bile pigment in the skin, mucous membranes and sclera with resulting yellow appearance of the patient.
Jejunostomy	A tube going directly through the skin into the jejunum, bypassing the stomach
Jejunum	The portion of the small bowel that extends from the duodenum to the ileum.
Kupffer cell	A large, star shaped or pyramidal cell with a large oval nucleus and a small prominent nucleolus. These intensely phagocytic cells line the walls of the sinusoids of the liver and form part of the reticuloendothelial
Lactase deficiency	A deficiency in the brush-border enzyme lactase which causes malabsorption of the disaccharide lactose; patients typically experience distension, flatulence, cramping, and diarrhoea within minutes of ingesting milk or mild products.
Lamina propria	The connective tissue coat of a mucous membrane
Laparoscope	A fibreoptic instrument that permits inspection of the peritoneal cavity.
Laparotomy	A surgical incision made through the abdomen.
Lavage	The irrigation or washing out of an organ, such as the stomach or bowel.
Laxative	An agent that acts to promote evacuation of the bowel.
Lesser curvature	The upper lateral border of the stomach.
Lesser omentum	A layer of visceral peritoneum that attaches the lesser curvature of the stomach to the underside of the liver.
Ligament of Treitz	Suspensory muscle of the duodenum; a flat band of smooth muscle originating from the diaphragm and continuous with the muscular coat of the duodenum at its junction with the jejunum.
Linton tube	A three-lumen tube used for oesophageal gastric tamponade; it has a gastric balloon but no oesophageal balloon, and ports for both gastric and oesophageal aspiration.
Lipid	A fat or fatlike substance that is easily stored in the body and serves as a source of fuel. They include the fatty acids, neutral fats, waxes, and steroids; compound lipids include glycolipids, lipoproteins and phospholipids.
Lithotripsy	The crushing of gallstones or bladder calculi, either by using a

	mechanical lithotripter or by focusing shock waves on the stone.
Lower oesophageal sphincter (les)	A group of thickened circular muscles at the distal end of the oesophagus, which regulate the entry of food into the stomach. Also known as the cardiac sphincter or gastroesophageal sphincter.
Macronutrient	Nutrients present in the body and required in the greatest amount, eg carbohydrates, proteins, lipids.
Malabsorption	Impaired intestinal absorption of nutrients.
Maldigestion	Impaired digestion
Mallory-Weiss tear	A mucosal rent at the gastroesophageal junction that is associated with prolonged forceful vomiting.
Malnutrition	Any disorder of nutrition whether caused by unbalanced or insufficient diet or by defective assimilation or utilisation of food.
Maloney bougie	One of a series of mercury-filled bougies similar to the Hurst bougies but with a conical tip.
Malrotation	Failure of normal rotation of an organ, as of the gut, during embryonic development.
Meckel's diverticulum	An occasional sacculation or appendage of the ileum derived from an obliterated yolk stalk.
Megacolon	Abnormally large or dilated colon; the condition may be congenital or acquired, acute or chronic.
Meissner's plexus	The part of the enteric plexus that is situated in the submucosa. Also called the submucosal plexus.
Micronutrient	Nutrients present and required in the body in minute quantities, eg vitamins, trace elements.
Microorganism	A minute living organism, usually microscopic, including bacteria, viruses, fungi and protozoa.
Microvillus	A minute cylindrical process on the free surface of a cell, especially in the intestinal epithelium.
Mineral	A nonorganic, homogeneous solid substance, usually a constituent of the earth's crust.
Modified Whipple's procedure	Pylorus-preserving pancreatic-duodenectomy.
Monosaccharide	A simple sugar; a carbohydrate that cannot be decomposed by hydrolysis. The monosaccharides are colourless crystalline substances with a sweet taste and which have the general formula CH2O.
Nasogastric tube	A soft rubber or plastic tube that is inserted through a nostril and into the stomach, for instilling liquid foods or other substances, or for withdrawing gastric contents.
Nissen fundoplication	Open abdominal surgical anti-oesophageal reflux procedure.

Nitrogen balance	A state of the body in regard to ingestion and excretion of nitrogen. In negative nitrogen balance the amount of nitrogen excreted is greater than the quantity ingested; in positive nitrogen balance the amount excreted is smaller than the amount ingested.
Nutrition assessment	A comprehensive evaluation to define nutrition status, including medical history, dietary history, physical examination, anthropometric measurements and laboratory data.
Nutrition therapy	The provision of nutrients and any necessary adjunct therapeutic agents to patients orally or by administration into the stomach, intestine, and/or by intravenous infusion for the purpose of improving or maintaining a patients nutrition status.
Occult blood	Blood present in such small quantities that it can be detected only by chemical tests of suspected material, or by microscopic or spectroscopic examination.
Odynophagia	Painful swallowing.
Oesophageal atresia	Birth defect characterised by a markedly dilated blind upper oesophageal pouch, a variable oesophageal defect, and a lower pouch terminating as a fistula communicating with the posterior trachea.
Oesophageal reflux	Reflux of gastric or duodenal contents back into the oesophagus.
Oesophageal rings and webs	Thin, circumferential mucosal shelves appearing in the oesophagus. See also Schatzki's ring.
Oesophagus	The musculomembranous tubular portion of the GI tract that extends from the pharynx to the stomach.
Oesophagitis	An inflammation of the oesophageal mucosa.
Oesophagogastroduodenoscopy (egd)	Endoscopic examination of the oesophagus, stomach and duodenum.
Oral	Pertaining to the mouth; taken through or applied in the mouth.
Pancreas	A large, elongated gland situated transversely behind the stomach, between the spleen and the duodenum. See also annular pancreas and pancreas divisum.
Pancreas divisum	A developmental anomaly in which the pancreas is present as two separate structures, each with its own duct.
Pancreatic enzyme insufficiency	A deficiency in pancreatic exocrine function, leading to malabsorption of fats and other nutrients.
Pancreatic fistula	An abnormal passage between the pancreas and another organ or, more often, between the pancreas and the exterior, often following pancreatic trauma, external drainage or a pseudocyst or pancreatic surgery.
Pancreatico-duodenectomy	Surgical procedure indicated as therapy for chronic pancreatitis and its inherent complications and as a therapy for pancreatic cancer.
Pancreatitis	Acute or chronic inflammation of the pancreas.

Paneth's cell	A narrow, pyramidal or columnar epithelial cell with a round or oval nucleus close to the base of the cell, occurring in the fundus of the crypts of Lieberkuhn; Paneth's cells contain large secretory granules that may contain peptidase.
Papillotome	A cutting instrument for incising the papilla of Vater.
Papillotomy	Incision of a papilla.
Paracentesis	Surgical puncture of a cavity for the aspiration of fluid, especially the abdominal cavity.
Paralytic ileus	Obstruction of the intestines resulting from inhibition of bowel motility, which may be produced by numerous causes, most frequently by peritonitis.
Parenteral	Administration of medications or nutrition by an injection route, such as subcutaneous, intramuscular, or intravenous.
Parietal cell	A cell type located in the parietal glands of the stomach and that secretes hydrochloric acid and intrinsic factor. Also known as oxyntic cells.
Pedunculated polyp	A polyp that is attached to the mucosa by a stemlike pedicle or stalk.
Peptic ulcer	An ulceration of the mucous membrane of the oesophagus, stomach or duodenum, caused by the action of the acid gastric juice.
Percutaneous endoscopic gastrostomy (peg)	A technique for the endoscopic insertions of a gastrostomy feeding tube, for the purpose of providing enteral feeding.
Percutaneous endoscopic jejunostomy (pej)	A technique for the endoscopic insertion of a feeding tube through a PEG tube into the jejunum for the purpose of providing enteral feeding.
Percutaneous liver biopsy	Aspiration biopsy of the liver by using a needle that has been inserted through a small incision in the skin.
Perforation	A hole made through a body part.
Peripheral parenteral nutrition (ppn)	Intravenous administration of a prescribed diet by means of a catheter inserted into a peripheral vein.
Peristalsis	A distally progressive band of circular muscle contraction that causes the gradual progression of digestive contents through the GI tract.
Peritoneoscopy	Examination of the peritoneal cavity by an instrument (laparoscope) that is inserted through the abdominal wall.
Peritoneum	The serous membrane that lines the abdomino-pelvic walls and holds the viscera in place.
Pernicious anaemia	A megaloblastic anaemia occurring in children or more commonly in later life characterised by histamine-fast achlorhydria; laboratory and clinical manifestations are based on malabsorption of vitamin B12 because of a failure of the gastric mucosa to secrete adequate and potent intrinsic factor.
Peutz-Jeghers	A hereditary syndrome characterised by gastrointestinal polyposis

syndrome	associated with excessive melanin pigmentation of the skin and mucous membranes; gastrointestinal bleeding and intussusception are common complications.
Peyer's patch	An oval elongated area of lymphoid tissue on the mucosa of the small intestine, composed of many lymphoid nodules closely packed together.
Pigtail stent	A stent that is coiled at one or both ends. The coiled shape straightens out when the stent is pulled taut but returns when it is allowed to relax.
Plasmolysis	Contraction or shrinking of a cell caused by the loss of water by osmotic action.
Polyp	A protruding growth from any mucous membrane; includes gastric polyps.
Polypectomy	Surgical or endoscopic removal of a polyp.
Polypectomy snare	A sheathed wire loop that can be passed through the instrument channel of an endoscope; it may be attached to an electrosurgical unit and used to apply coagulation current for removal of gastrointestinal polyps or it may be used to remove foreign bodies.
Polyposis	The development of multiple polyps on a part. See also familial polyps.
Porphyria	Any of a group of disturbances of porphyrin metabolism, characterised by marked increase in formation and excretion of porphyrins or their precursors.
Portal hypertension	Abnormally increased blood pressure in the portal venous system, a frequent complication of cirrhosis of the liver.
Portal triad	The grouping of the tributaries of the hepatic artery, hepatic vein, and bile duct at the angles of the lobules of the liver.
Primary sclerosing cholangitis	A rare and serious condition in which inflammation involves the entire biliary tract; often related to GI or biliary tract infection.
Proctoscopy	Inspection of the rectum with a speculum or tubular instrument with appropriate illumination.
Proctosigmoidoscopy	Examination of the rectum and sigmoid colon with an instrument designed for illuminating and viewing those areas.
Prostaglandin	A group of naturally occurring, chemically related, long-chain hydroxy fatty acids that stimulate contractility of smooth muscle and have the ability to lower blood pressure, regulate acid secretion of the stomach, regulate body temperature and platelet aggregation and control inflammation and vascular permeability; they also affect the action of certain hormones. There are six types: A, B C, D, E, and F, with the degree of saturation of the side chain of each being designated by subscripts 1, 2, and 3.
Protein	Any of a group of complex organic compounds, which contain carbon, hydrogen, oxygen, nitrogen, and usually sulphur, the characteristic element being nitrogen. Proteins are of high molecular weight and consist essentially of combinations of ∀-amino acids in peptide linkages.

Pseudocyst	An abnormal or dilated space resembling a cyst but not lined by epithelium as is a true cyst. A pancreatic pseudocyst is an encapsulated collection of pancreatic juice and cellular debris that has escaped from the pancreas, the wall being formed by inflammatory fibrosis of serosal surfaces of adjacent organs; pseudocysts most commonly occur in the lesser sac of the peritoneum.
Pseudo-membranous colitis	An acute inflammation of the bowel mucosa with the formation of pseudomembranous plaques overlying an area of superficial ulceration and the passage of the pseudomembranous material in the faeces; may result from shock and ischaemia or be associated with antibiotic therapy. Also called necrotising enterocolitis.
Pyloric gland	A gland located in the antrum or pylorus of the stomach; contains mucous cells and G cells.
Pyloric sphincter	The thickened muscular sphincter that controls the passage of food from the stomach into the duodenum.
Pyloric stenosis	Obstruction of the pyloric sphincter at the outlet of the stomach.
Pylorus	The most distal portion of the stomach, lying between the antrum and the duodenum.
Pyrosis	See heartburn
Radiation enteritis	Radiation injury to the intestines, usually occurring as a result of radiotherapy for pelvic, intraabdominal, or retroperitoneal malignancies.
Recto-sigmoidoscopy	Endoscopic visualisation of the lower portion of the sigmoid colon and the upper portion of the rectum.
Rectum	The distal portion of the colon, beginning anterior to the third sacral vertebra as a continuation of the sigmoid and ending at the anal canal.
Regional enteritis	See also Crohn's disease.
Regurgitation	A backward flowing of undigested food.
Role delineation	A statement of behaviours that are expected of an individual in a certain position, as of a gastroenterology nurse or associate.
Roux-en-Y gastric bypass	Surgical procedure performed to treat morbid obesity.
Schwachman-Diamond syndrome	Pancreatic insufficiency, cyclic neutropenia, metaphyseal dysostosis, and growth retardation. Second most common cause of pancreatic insufficiency in children.
Secretin	A strongly basic polypeptide hormone secreted by the mucosa of the duodenum and jejunum when acid chyme enters the intestine. Carried by the blood it stimulates the secretion of a watery pancreatic juice high in salt content but low in enzymes. It has a lesser stimulatory effect on bile and intestinal secretion.
Sengstaken-Blakemore tube	A three-lumen tube used for oesophageal-gastric tamponade; it has both gastric and oesophageal balloons and a port for gastric aspiration.
Sessile polyp	A polyp that is attached to the mucosa by a broad base.

Short bowel syndrome	Any of the malabsorption syndromes resulting from massive resection of the small bowel. The degree and kind of malabsorption depending on the site and extent of the resection; characterised by diarrhoea, steatorrhoea, and malnutrition.
Sigmoid colon	The S-shaped part of the colon, lying in the pelvic, extending from the pelvic brim to the third segment of the sacrum, and continuous above with the descending (iliac) colon and below with the sacrum.
Sigmoidoscopy	Inspection of the sigmoid colon through the use of an endoscope.
Sinusoid	A form of terminal blood channel consisting of a large, irregular anastomosing vessel; found in the liver, suprarenals, heart, parathyroid, carotid gland, spleen, haemolymph glands and pancreas.
Sliding hiatal hernia	Common type of hiatal hernia in which the gastroesophageal junction and a portion of the stomach slide upward into the mediastinum.
Small bowel	The proximal portion of the intestine.
Small bowel enteroscopy	Visualisation of the small bowel with a long, thin, extremely flexible endoscope.
Sphincter	A ring-like band of muscle fibres that constricts a passage or closes a natural orifice.
Sphincter of Oddi	The sheath of muscle fibres surrounding bile and pancreatic ducts as they pass through the wall of the duodenum.
Sphincterotome	An electrosurgical instrument for cutting through a sphincter, specifically the sphincter of Oddi.
Sphincterotomy	Division of a sphincter, especially division of the sphincter of Oddi during ERCP.
Splenic flexure	The left flexure of the colon; the bend at which the transverse colon becomes the descending colon.
Sprue	A chronic form of malabsorption syndrome that occurs in tropical and coeliac forms.
Steatorrhoea	Excessive amounts of fat in the faeces, as in malabsorption syndrome.
Stoma	An opening established in the abdominal wall by colostomy, ileostomy, etc.
Stress ulcer	A form of acute gastritis that is related to a severe trauma, illness or chronic ingestion of certain drugs.
Stricture	A narrowing of a canal, duct or other passage as a result of scarring or deposition of abnormal tissue.
Tenesmus	Straining, especially ineffectual and painful at a stool or in urination.
Tenia coli	Three thickened flat bands, about one-sixth shorter than the colon, formed by the longitudinal fibres in the muscular tunic of the colon and extending from the root of the vermiform appendix to the rectum, where they spread out and form a continuous layer encircling the tube.
Total parenteral	

nutrition (tpn)	The intravenous administration of the total nutrient requirements of a patient with gastrointestinal dysfunction, accomplished via a central venous catheter, usually inserted in the superior vena cava.
Toxic megacolon	Acute dilatation of the colon associated with amoebic or ulcerative colitis, it may precede perforation of the colon.
Tracheoesophageal fistula	Abnormal passage between the trachea and the oesophagus.
Transitional feeding	Progression from one mode of feeding to another, while continuously administrating estimated nutrient requirements.
Transverse colon	The portion of the colon that runs transversely across the upper part of the abdomen, from the right to the left colic flexure.
Triglyceride	A compound consisting of three molecules of fatty acid esterified to glycerol; it is a neutral fat synthesised from carbohydrates for storage in animal adipose tissues. On enzymatic hydrolysis, it releases free fatty acids in the blood.
Trocar	A sharp-pointed instrument contained in cannula, used to puncture the wall of a body cavity; usually used for insertion of the cannula.
Tropical sprue	A malabsorption syndrome occurring in the tropics and subtropics. Protein malnutrition is usually precipitated by malabsorption and anaemia caused by folic acid insufficiency is particularly common.
Ulcerative colitis	Chronic, recurrent ulceration in the colon, chiefly of the mucosa and submucosa, of unknown cause, manifested clinically by cramping, abdominal pain, rectal bleeding, and loose discharges of blood, pus, and mucus with scanty faecal particles.
Vagotomy	Surgical de-enervation of the vagus nerve.
Valsalva manoeuvre	Forcible exhalation against a closed glottis, resulting in an increase in intrathoracic pressure.
Vasovagal reaction	A transient vascular and neurogenic reaction marked by pallor, nausea, sweating, bradycardia, and rapid fall in arterial blood pressure which when below a critical level results in loss of consciousness and characteristic EEG changes. It is most often evoked by emotional stress associated with fear or pain.
Vermiform appendix	A worm-like diverticulum of the caecum ranging from 3 to 6 inches in length.
Villus	A small vascular process or protrusion especially such a protrusion from the free surface of a membrane; the intestinal villi are the numerous threadlike projections that cover the surface of the mucosa of the small bowel and serve as the sites of absorption of fluids and nutrients.
Volvulus	Intestinal obstruction caused by a knotting and twisting of the bowel.
Whipple's disease	A malabsorption syndrome characterised by diarrhoea, steatorrhoea, skin pigmentation, arthralgia and arthritis, lymphadenopathy, and central nervous system lesions.

Whipple's procedure	Pancreatico-duodenectomy.
Wilson's disease	Hepatolenticular degeneration. A rare progressive disease, inherited as an autosomal-recessive trait, and caused by a defect in the metabolism of copper; a pigmented ring at the outer margin of the cornea is pathognomonic.
Zollinger-Ellison syndrome	A triad comprising intractable, sometimes fulminating and in many ways atypical peptic ulcers; extreme gastric hyperacidity; and gastrin-secreting, non-beta islet cell tumours of the pancreas.

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