

Optimal nutrition in critically ill children

MODULE 3: PART 1

Nutritional therapy implementation

Developed by

*The Asia Pacific – Middle East Consensus
Working Group on Nutrition Therapy in the
Paediatric Critical Care Environment*

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Learning objectives

- To understand the benefits, indications and contraindications of enteral nutrition (EN) and parenteral nutrition (PN)
- To know the feeding routes, regimens, and timing of EN initiation
- To be able to administer and manage EN feeding using different routes
- To be able to monitor feeding and manage complications arising from EN and PN feeding

Overview

1. *Enteral nutrition (EN)*

1.1. *Definition, indications, contraindications*

1.2. *EN feeding routes and regimens*

1.3. *Administration and management*

1.4. *Monitoring EN and managing related complications*

2. *Parenteral nutrition (PN)*

2.1. *Indications, contraindications, delivery*

2.2. *Administration, monitoring, managing related complications*

3. *Test your knowledge*

1 Enteral nutrition (EN)

1.1. Definition, indications, contraindications

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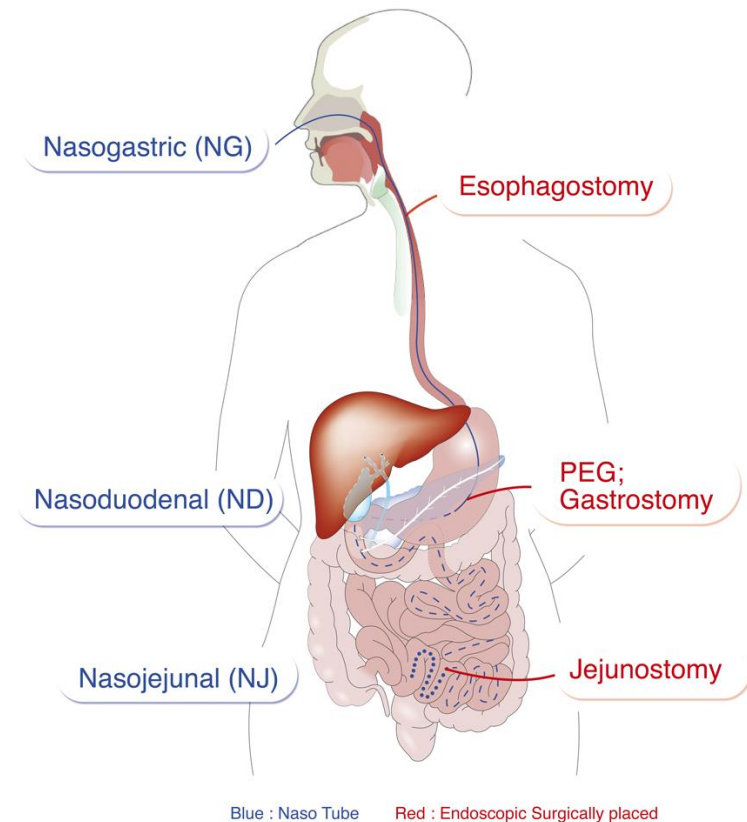
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Definition of EN support

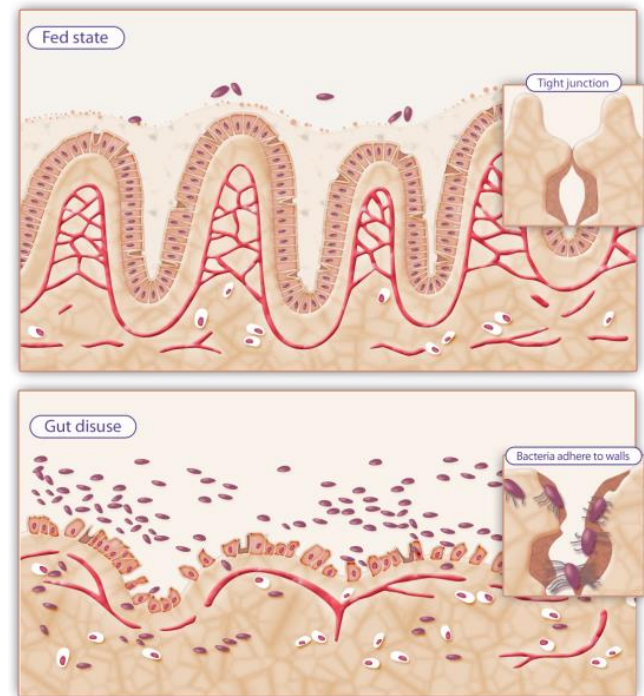
- Provision of nutrition into the gastrointestinal tract via a tube
 - **Gastric feeding:**
tube feeding into the stomach
 - **Intestinal feeding:**
where the tube is extended through the stomach into the small intestine, or enters the small intestine beyond the stomach

Diagram of central tube placement



Rationale for EN feeding

- More physiological, maintains normal intestinal structure and function
 - Promotes intestinal trophism
 - Stimulates insulin secretion, immune system
 - Reduces incidence of bacterial translocation, sepsis
 - Decreases risk of hepatobiliary dysfunction
 - Decreases incidence of hyperglycaemia
- More cost-effective
- Easier and safer than PN, fewer complications



If the gut works, use it!

Indications for EN

**Inability to eat
or drink**

**Mechanical
ventilation**

**Increased nutritional
requirements**

**Severe
respiratory illness**

EN is indicated in critically ill children with at least a partially functional gut, when energy and nutrient requirements cannot be met by regular food intake, and is the preferred mode of nutrition

EN is indicated in critically ill children with at least a partially functional gut, when energy and nutrient requirements cannot be met by regular food intake, and is the preferred mode of nutrition

Absolute contraindications for EN

**Intestinal
obstruction**

**Intestinal
perforation**

**Gut failure
secondary to
massive
resection**

**Necrotising
enterocolitis
or intestinal
ischaemia**

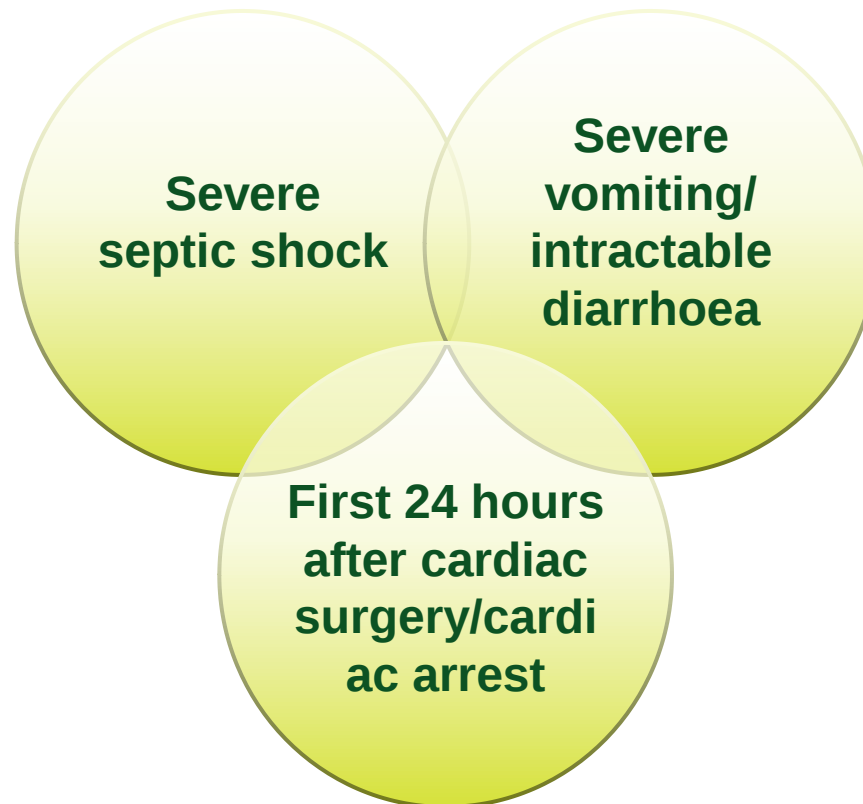
**Significant
gastrointestinal
bleeding**

**Known
severe
dysmotility
disorder**

**Escalating
vasoactive or
inotropic
support**

**Haemodynamic
instability**

Relative contraindications for EN



1 Enteral nutrition (EN)

1.2. EN feeding routes and regimens

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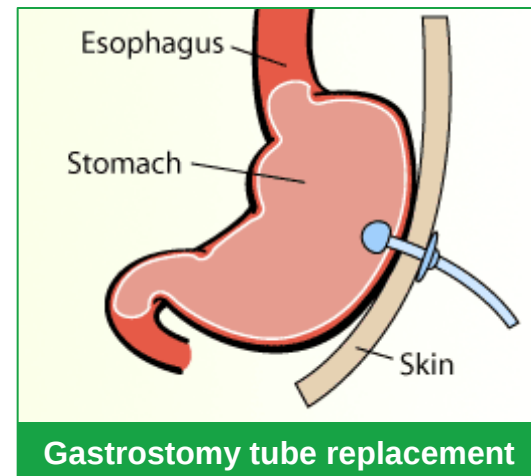
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EN feeding routes

- **Gastric feeding** – nutrition delivered directly into the stomach via:
 - Orogastric tube
 - Nasogastric tube
 - Gastrostomy*
- } Simplest; most common; route of choice for patients expected to resume oral feeding
- **Post-pyloric feeding** – nutrition delivered beyond the stomach via:
 - Nasoduodenal tube
 - Nasojejunal tube
 - Jejunostomy

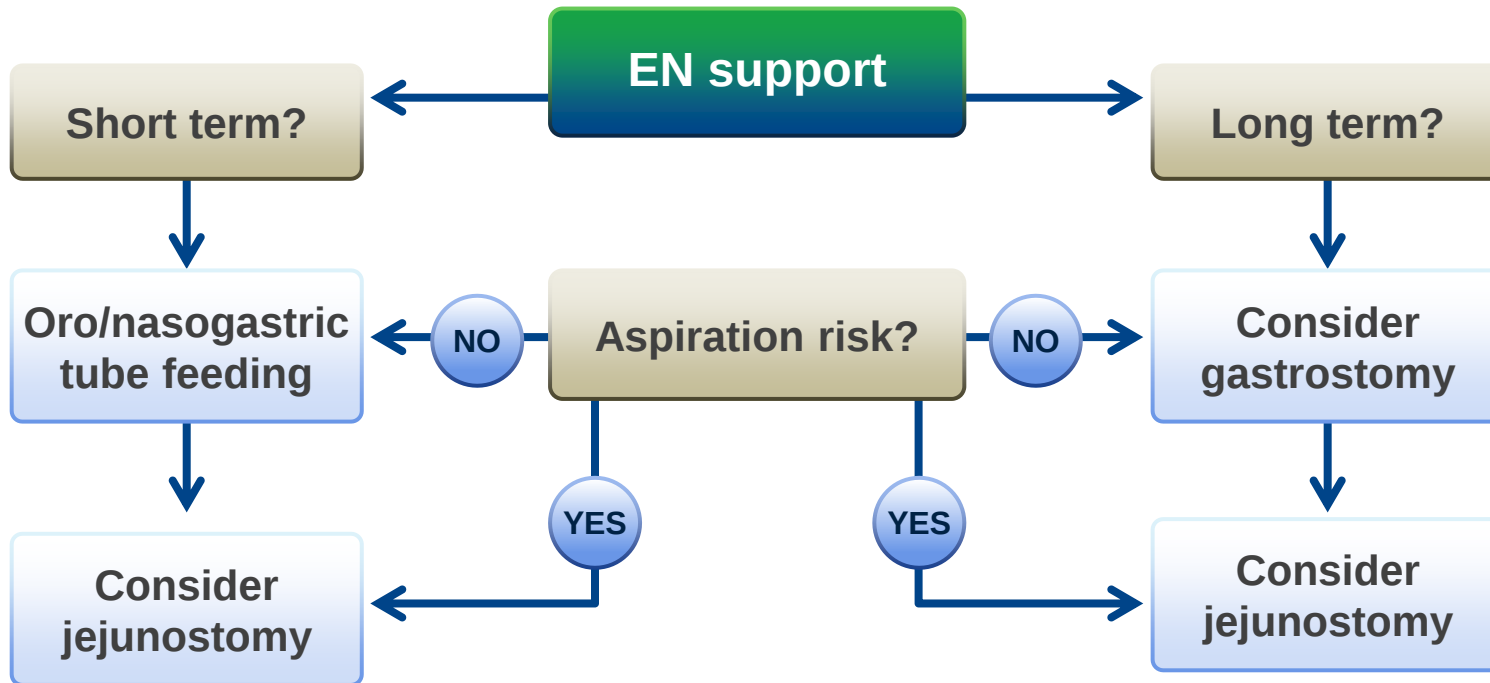


**When long-term tube feeding is anticipated, or nasal access obstructed*

Gastric versus post-pyloric feeding

Feeding route	Advantages	Disadvantages
Gastric	• Faster initiation • Easy tube placement • Well tolerated • Physiologic • More options for administration	• Increased risk of aspiration, especially in patients with delayed emptying, severe reflux or unprotected airway
Post-pyloric	• Improved intake • Shorter time to goal • Reduced fasting • Decreased PN use and cost • Well tolerated • May decrease pneumonia	• Delayed initiation • Increased radiographs • May not prevent aspiration

Choosing the EN feeding route



If long-term nasogastric feeding is anticipated, then gastrostomy/jejunostomy should be considered, depending on local expertise and availability.

EN feeding routes: Recommendations

- There are insufficient data to recommend gastric vs. post-pyloric feeding in critically ill children
 - Gastric feeding is well tolerated by most critically ill infants/children and is recommended as the first-line route
 - Post-pyloric feeding may be considered in those in whom gastric feeding is not tolerated, contraindicated, or in those at high risk of aspiration
 - Post-pyloric feeding may improve caloric intake compared with gastric feeding
- Long-term EN (>4–6 weeks) should be provided via gastrostomy

EN feeding regimens

Bolus

More physiological, total feeding volume usually given in 4–6 divided feeds during the day

Given via syringe or gravity over 10–15 mins

Volume >400ml and rapid infusion → abdominal distension and discomfort

Not always appropriate for critically ill patients due to rapid infusion rate

Intermittent

Given via gravity or pump over 30–60 mins

Continuous

Usually infused over 18–24 hours/day

Feeding pump required

Minimises amount of formula in the stomach at any given time (→ less discomfort, aspiration)

Recommended for critically ill patients and those who require trans-pyloric feeding/unable to tolerate intermittent feeding

May provide more energy, better weight gain in selected patients

Timing of EN initiation

- **Early initiation of EN (within 24–48 hours if possible) is encouraged**
- Early initiation is associated with:
 - reduced mortality
 - early attainment of nutrition goals
 - improved clinical outcomes
 - shorter lengths of hospital stay
 - decreased infection rates
 - enhanced immune function

Early initiation is particularly important for patients with malnutrition, who cannot afford further nutritional depletion

Trophic feeding

- Defined as a small volume of EN insufficient for nutritional needs, but producing a positive gastrointestinal or systemic benefit
 - Definitions vary from 5–20 ml/kg/day, or 10% of total energy requirement
- May maintain intestinal function during starvation and catabolic states, initiate release of enteral hormones, and improve gut barrier function
- Oral feeding should be encouraged where appropriate
- Can be used together with PN, which makes up nutritional deficit

1 Enteral nutrition (EN)

1.3. Administration and management

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Nasogastric tube placement and stabilisation

1

Estimate the length of the tube to be inserted by measuring from the tip of nose (or mouth, depending on insertion site) to the earlobe, and then from the earlobe to the xiphoid process

2

Gently check nostrils for **patency**

3

Insert tube to point obtained at measurement

4

Secure nasogastric tubes to the nose with tape

5

Document date, time and depth of insertion on observation chart

A video animation can be found here:

<http://openpediatrics.org/multimedia/nasogastric-tube-placement/>

Feeding tube displacement

- Children have a greater risk for tube displacement because of their age (younger children are at higher risk), increased activity, and non-purposeful movements
- Other reasons include change in/altered level of consciousness, vomiting, dysfunctional swallowing
- Consequences of misplacement:
 - A tube misplaced into the oesophagus increases the risk of aspiration
 - Misplacement/displacement of the tube into the trachea or lungs risks tracheal or pulmonary perforation and pneumothorax
 - Instilling enteral formula into the pulmonary bed results in aspiration with potential for chemical pneumonitis and pneumonia

Determining feeding tube placement

A combination of **aspirate appearance** and **pH testing** can be used to help make correct predictions about tube placement in the stomach

Use a 20–50 ml syringe to aspirate gastric content from nasogastric tubes that are 12F or less

Use **pH strips** to check the pH of aspirate

Using pH to determine feeding tube placement

pH of aspirate	Indications	Action
<5	Gastric placement	<i>Proceed to feed</i>
5–6	Check visual characteristics of aspirates	<i>If visual characteristics indicate gastric aspirates, proceed to feed. Otherwise, perform x-ray to confirm tube placement</i>
>6	Intestinal or respiratory placement	<i>Perform x-ray to confirm tube placement</i>

Using visual characteristics of feeding tube aspirates to check placement

Gastric

- Grassy green with sediment, or brown (if blood is present and has been acted on by gastric acid).
- May also be clear and colourless (often with shreds of off-white to tan mucus or sediment)

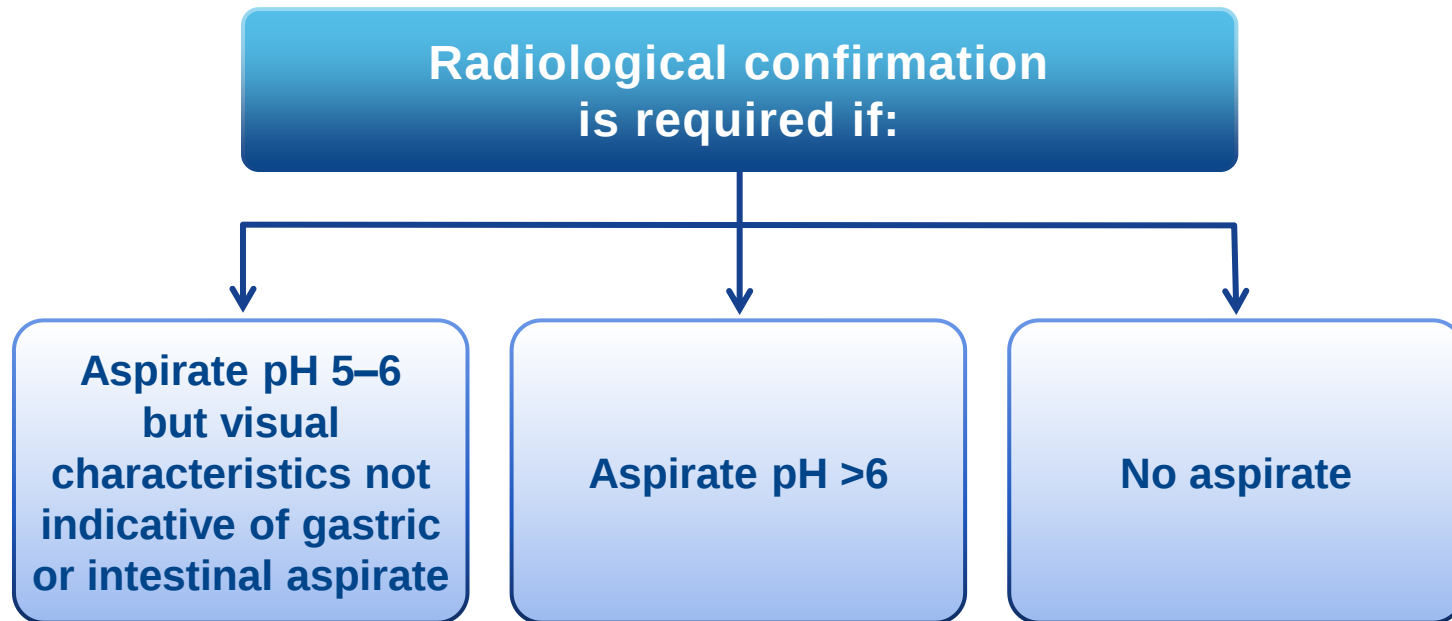
Intestinal

- Generally more transparent than gastric aspirates and may appear bile-stained, ranging in colour from light to dark golden yellow or brownish-green

Respiratory

- Tracheo-broncheal secretion may consist of off-white to tan sediment

Radiological determination of feeding tube placement



Auscultation method of checking tube placement

- Auscultation is listening for 'bubbling' when air is flushed through the tube (auscultation) over the epigastrium or the left upper quadrant of the abdomen
- **It should not be used as the sole method** to determine the location of the feeding tube, because it can be unreliable
 - Sounds emitted from the introduction of air through the tube can be transmitted to the epigastrium regardless of placement in the lung, oesophagus, or stomach

Indications and considerations for post-pyloric feeding

- Indications:
 - Gastric feed intolerance
 - Post-operative duodenal atresia
 - Increased risk of aspiration (e.g. GER)
- May induce symptoms of malabsorption because stomach is not able to aid in digestion e.g. frequent bowel motion, slow weight gain, necrotising enterocolitis (NEC)
- Consider where medication is absorbed prior to administration (i.e. stomach or small intestines)

Methods for placement of nasoduodenal/nasojejunal tubes

Self-propelled tubes

Fluoroscopic placement

Endoscopic placement

Magnetic-assisted placement

Gastric insufflation

(<http://openpediatrics.org/multimedia/post-pyloric-tube-placement>)

Combination of other techniques coupled with electromyographic guidance assisted placement

Frequency of checking tube placement

- **Mark the intersection** where the nasogastric tube enters the nostril and use this marking to check the tube placement at the following times:
 - After initial insertion, before each intermittent feeding, and 8-hourly during continuous feedings
 - If patients complain of discomfort, coughing, retching or vomiting and show sudden signs of respiratory difficulties
 - If the visible part of the tube changes in length

Prevention of clogging

Flush feeding tubes with water before and after intermittent feeding, every 4-hourly during continuous feeding, and after checking for gastric residuals

More frequent flushing might be ordered according to patient's condition

Flush feeding tube before and after administration of each medicine, and after checking for gastric residuals

If clogging persists, replace the tube

1 Enteral nutrition (EN)

1.4. Monitoring EN and managing related complications

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Monitoring impact of nutrition therapy

- Once nutrition goal is achieved, regular reassessment of nutrition requirements and response to therapy is required
 - **At least weekly**
- Serial weight/body composition assessment can indicate under- or overfeeding → **interpret in context of fluid balance**
- Assessment of urinary nitrogen excretion enables determination of protein balance and requirements
- Trend of increased serum prealbumin and decreased C-reactive protein may indicate:
 - return of anabolism post-surgery
 - healing of skin grafts in burn injuries

Signs and symptoms of EN intolerance

Vomiting

1

- Two or more episodes in 24 hours

Diarrhoea

2

- Three or more episodes of loose stool in 24 hours
- Patients on antibiotics should be monitored for symptoms of diarrhoea

Abdominal discomfort/pain

3

Abdominal distension

4

- 2 consecutive increases of abdominal girth (AG) in 24 hours, or
- AG increase >2cm in very low birth weight infants

Aspiration

5

- Feeding should only be stopped abruptly for those patients who demonstrate overt regurgitation or aspiration

The absence of bowel sounds alone is NOT an indicator of feed intolerance

an indicator of feed intolerance

Gastric residual volume (GRV)

Use of GRV alone to define feeding intolerance may lead to unnecessary feed interruptions

GRV should always be interpreted in the context of other signs of intolerance (abdominal distension, vomiting)

In children, there is no evidence that monitoring GRV prevents aspiration

Common reasons for EN interruption/inadequate intake

Routine interventions

Procedures that require fasting

Reluctance to feed haemodynamically unstable children

Concerns about risks of aspiration pneumonia

Perceived or actual EN intolerance

Physicians' ignorance of nutritional requirements

Lack of a uniform definition and inconsistency in managing EN intolerance

Failure to prioritise nutritional therapy during daily rounds

Managing EN intolerance

- In the absence of clear evidence with regard to optimal methods for managing feed intolerance:
 - Stop the feed and restart at the previously tolerated rate
 - Use prokinetic agents
 - Consider post-pyloric feeding if other methods remain unsuccessful after 24–48 hours

Feeding should be stopped abruptly only in those patients who demonstrate overt aspiration/abdominal distension/suspected NEC

demonstrate overt aspiration/abdominal distension/suspected NEC

Managing nausea/vomiting associated with enteral tube feeding

Cause	Prevention/treatment
Excessive feeding rate	Slowly build up feeding rate
Slow gastric emptying	Encourage lying on right side; give prokinetics
Constipation (common in PICU due to morphine use)	Maintain regular bowel habit with adequate fluid intake, use fibre-containing formula and/or laxatives
Medicines given at the same time as feed	Allow time between giving medicines and giving feed, or stop continuous feed for a short time
Delayed gastric emptying	Consider transpyloric route for feeding, continuous feeding, elevate head of bed 30–45 degrees during feeding, check residuals prior to feeding, consider prokinetics
Hyperosmolar formulas	Consider changing to isotonic formula
Gastrointestinal obstruction	Discontinue feeding

Risk factors for aspiration

**Previous history
of aspiration**

**Altered intestinal
motility**

**Delayed gastric
emptying**

**Witnessed
regurgitation or
aspiration of gastric
contents**

**Severe
gastro-oesophageal
reflux disease**

**Altered mental status
with depressed gag
and cough reflexes**

**Persistent vomiting
(2 or more episodes
in a 24-hour period)**

**Severe
bronchospasm**

**Non-invasive
ventilation (escalating
or high settings)**

Monitor for signs and symptoms of aspiration pneumonia

Managing aspiration associated with enteral tube feeding

Cause	Prevention/treatment
Gastro-oesophageal reflux	Correct positioning (elevate head of bed to 30 degrees), feed thickener, continuous feeding, jejunal feeding, fundoplication
Dislodged tube	Secure tube adequately and regularly review position
Excessive infusion rate/ intolerance of bolus feeds	Slower feeding rate Change to smaller, more frequent feeds or continuous feeding with pump

Managing diarrhoea associated with enteral tube feeding

Cause	Prevention/treatment
Unsuitable feed in a child with impaired gut function	Change to hydrolysed formula
Excessive infusion rate	Slow rate and increase as tolerated
Intolerance of bolus feeds	Give frequent, smaller feeds; change to continuous feeds
High feed osmolarity	Build up feed strength slowly, give by continuous infusion; or change to isotonic feed
Microbial contamination of feed	Use sterile, commercially produced feeds when possible; prepare other feeds in clean environment
Drugs (e.g., antibiotics, laxatives)	Review drug prescription, discontinue or reduce laxatives, eliminate sorbitol from medications

Use enteral feeds with soluble fibre but do not dilute standard feeds

Managing constipation

Check for signs of dehydration

Ensure adequate fluid is being given

Ensure adequate bowel regimen has been ordered
(e.g. fibre-containing feed, and/or softeners, laxatives, enema)

Review medications for
possible causes (e.g. opioids)

Carry out rectal examination
with disimpaction

Consider kidney-ureter-bladder (KUB)
radiograph to rule out obstruction

Facilitate toileting privacy

Managing abdominal distension

Treat constipation

Vent air from GI tract

Use lower volume, more concentrated formula

Use post-pyloric feeding route

Managing long-term complications of gastrostomy and enterostomy

Complication	Possible cause	Action
Local irritation, pain around site	Tight fixation, infection, leakage, friction	<i>Check fixation, treat infection, use proton pump inhibitor</i>
Local infection	Purulent discharge Cellulitis, abscess	<i>Cleaning and topical antibiotics Systemic antibiotics</i>
Enlarged stoma site	Large wall incision	<i>Use smaller tube sizes</i>
Leakage of nutrients or gastric juice	Large stoma	<i>Use smaller tube size, stop feeding and change to PN</i>

2 *Parenteral nutrition (PN)*

2.1. Indications, contraindications, delivery

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Considerations for PN

- PN provides the required nutrients in a solution that enters the bloodstream directly
- However, PN is associated with:
 - Increased risk of infection and mortality
 - Hyperglycaemia
 - Atrophy of intestinal mucosa
 - Hepatic injury
- Carries the risk of overfeeding
- PN is more expensive than EN

Indications for PN

- When EN is contraindicated or not tolerated
- When the use of EN alone is insufficient to achieve energy goals for 5 days (earlier for neonates and malnourished children)
- Can be combined with EN over 72 hours of critical illness when EN alone cannot meet nutritional demands

PN should only be considered when nutritional requirements cannot be met via the GI tract by EN alone, or when there is bowel dysfunction resulting in inability to tolerate EN, or after EN has been unsuccessful or poorly tolerated for 1–2 days in infants or malnourished children, and 5–7 days in previously well children without existing malnutrition

and 5–7 days in previously well children without existing malnutrition
or poorly tolerated for 1–2 days in infants or malnourished children

Contraindications for PN

- If the patient's nutritional needs can be met via enteral or oral nutrition
- If full nutritional needs could be met orally or enterally within the next 5 days (e.g. gut function is expected to improve), or if the expected PN duration is <5 days (e.g. when the only parenteral access available is short-term, or the current line is due to be removed and replacement might be difficult)

Modes of PN delivery

Central lines

External jugular, internal jugular,
subclavian, femoral veins

Enables provision of nutrients
at greater concentrations and
smaller fluid volumes

Preferred mode

Peripheral lines

Superficial veins, most often of
upper extremities

Limit osmolality
to <1000 mOs/L to avoid
irritating blood vessels

Should only be used for
short periods (few days at most)
because of limited patient tolerance
– PN solutions are very energy-dense

**One lumen of the venous access device should be reserved for PN only,
to reduce the risk of blocking or contaminating the line**

to reduce the risk of blocking or contaminating the line

2 *Parenteral nutrition (PN)*

2.2. Administration, monitoring, managing related complications

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Guidance on starting PN therapy

Designing a PN regimen should include:

Estimation of energy and protein needs
(daily requirements, Schofield)

Calculation of IV fluid requirement

Baseline laboratory values including full blood count,
urea-creatinine ratio, serum electrolytes, minerals and triglycerides

A starting goal of approximately 50% of estimated energy
requirement on day 1

Step by step advancement to energy goal based on
laboratory values and clinical condition of the patient

The need for PN monitoring

- Regular monitoring is essential
 - To ensure adequate nutrition
 - To identify and manage potential complications
 - To ensure safety
- Determine whether the patient is metabolically tolerating the required amount of PN
 - Anthropometry
 - Blood glucose levels, triglycerides (to assess lipids), other laboratory parameters

Potential complications of PN

Risk factors for sepsis associated with PN

- Weight
- Indwelling time/duration of central access
- Type of catheterisation (guide wire exchange)

Metabolic complications of PN

- Refeeding syndrome, bone disease, intestinal failure associated liver disease (IFALD), overfeeding and underfeeding, allergy, cholestasis
- Mineral, vitamin, trace element and electrolyte imbalances

Mechanical complications of PN

- Catheter-related, infusate-related and occlusions
-

Schedule for monitoring PN

Schedule	Parameter
Baseline (pre-commencement)	Urea & electrolytes, creatinine, glucose, liver function tests (LFT) including albumin, complete blood count, prealbumin, triglycerides
First three days or until stable	Urea & electrolytes, creatinine, glucose, triglycerides (when advancing lipid)
Daily	Weight, urinalysis, fluid balance
Weekly or as indicated	Urea & electrolytes, creatinine, acid/base, glucose, LFT, prealbumin, triglycerides, urinary sodium:potassium ratio to detect sodium depletion
Monthly	Anthropometry – weight, head circumference and length plotted on growth charts (corrected for prematurity if necessary).
Long term	Copper, zinc, selenium

Assessing tolerance to PN – Glucose

- Determine whether the patient is metabolically tolerating the required amount of PN
 - Check blood glucose levels to maintain blood glucose levels in the normal range (80–180mg/dL) to avoid hypo/hyperglycaemia*

Usually 4–6 hourly
in acute care
situation
(hourly when starting
and stopping)

Every time
nutrient rate is
increased

2–3 times
weekly in stable
patient

Weekly to
monthly in long
term care

**The role of intensive insulin therapy in avoiding hypo- and hyperglycaemia has not yet been established.*

Assessing tolerance to PN – Triglycerides

Interpretation	Remarks
• Triglycerides are increased in overfeeding, glucose intolerance, hyperlipidaemia, hypothyroidism, pancreatitis, poor tolerance of PN, carnitine deficiency (allowed 'normal' range is doubled if blood samples were taken during lipid infusion) • Triglycerides are decreased in malabsorption or very low fat intake, hyperthyroidism	Obtain baseline level prior to commencing lipid-containing PN, monitor daily when up-grading to recommended level and weekly, once stable

Stopping PN/transitioning to EN

Use a **ml for ml** exchange of EN as PN is decreased

Concentrated PN should be weaned more slowly than a more dilute PN solution

Monitor closely, with hourly blood glucose testing, for several hours after stopping PN, because metabolic effects do not cease immediately. Rebound hypoglycaemia may occur rarely, due to on-going action of insulin, particularly if solution was high in glucose or if blood glucose levels were difficult to control

Module summary

- EN is preferred to PN in children with a functional GI tract, because it is more physiological and promotes faster implementation
- Early EN initiation (within 24–48 hours) reduces mortality, improves attainment of nutritional goals, improves clinical outcomes and reduces length of PICU stay
- Gastric feeding is well tolerated by most critically ill children and is recommended as the first-line route
- Use of gastric residual volume (GRV) alone to define EN intolerance may lead to unnecessary feed interruptions and sub-optimal intake
- PN is indicated when EN is contraindicated or when the use of EN alone is insufficient to achieve energy goals for 5 days (earlier for neonates and malnourished children)
- Patients on EN and PN should be monitored carefully for intolerance and mechanical, metabolic and infective complications

3 *Test your knowledge*

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Test your knowledge

1. Which of these statements does NOT form part of the rationale for EN feeding?

A

More cost-effective than PN

B

Promotes intestinal trophism

C

Used when the GI tract is not functional

D

More physiological

E

Stimulates insulin secretin and immune system

1. Which of these statements does NOT form part of the rationale for EN feeding?

- **Answer:**

C. Used when the GI tract is not functional

EN is contraindicated when the GI tract is not functional. All the other statements listed form part of the rationale for EN feeding.

Test your knowledge

2. PN should only be considered when nutritional requirements cannot be met via the GI tract by EN alone

A

True

B

False

2. PN should only be considered when nutritional requirements cannot be met via the GI tract by EN alone

- **Answer:**

A. True

- EN is the preferred mode of nutrition in the PICU. PN should only be considered when nutritional requirements cannot be met via the GI tract by EN alone; when there is bowel dysfunction resulting in inability to tolerate EN; or after EN has been unsuccessful or poorly tolerated for 1–2 days in infants or malnourished children, and 5–7 days in previously well children without existing malnutrition.

Test your knowledge

3. Compared to post-pyloric tube feeding, what are the advantages of gastric feeding?

A

Physiologic

B

Shorter time to goal

C

Decreased PN use and cost

D

May decrease pneumonia

E

All of above

3. Compared to post pyloric tube feeding, what are the advantages of gastric feeding?

- **Answer:**

A. Physiologic

Feeding to the stomach is more physiological than feeding through intestine.

Test your knowledge

4. Which of the following statements about feeding route is incorrect?

A

Post-pyloric feeding may improve caloric intake compared with gastric feeding

B

Gastric feeding is well tolerated by most critically ill children

C

There is insufficient data to recommend gastric vs. post-pyloric feeding in critically ill children

D

Jejunostomy is the route of choice when patients are expected to resume oral feeding within a short period

4. Which of the following statements about feeding route is incorrect?

- **Answer:**

D. Jejunostomy is the route of choice when patients are expected to resume oral feeding within a short period.

- All the other statements shown are correct. Jejunostomy is only recommended in a patient who is expected to require EN over the long term (>4–6 weeks) and who is at risk of aspiration.

Test your knowledge

5. Early enteral nutrition initiation is recommended within:
(Select all that apply)

A

0–3 hours of admission

B

3–12 hours of admission

C

12–24 hours of admission

D

24–48 hours of admission

E

>48 hours of admission

5. Early enteral nutrition initiation is recommended within:

- **Answer:**

D. 24–48 hours of admission

It may not be possible or practical to initiate EN within the first few hours after admission, because accurate anthropometric and nutritional assessments must first be carried out to ensure accurate energy goals can be calculated, or the patient may require urgent treatment or stabilisation. In the 2009 A.S.P.E.N. paediatric nutrition support guidelines, it was stated that current practice involves the initiation of feeding within 48–72 hours. The Asia Pacific – Middle East Consensus Working Group on Nutrition Therapy in the Paediatric Critical Care Environment encourages initiation of EN within 24–48 hours of admission to the PICU. Early EN initiation has been found to be associated with numerous benefits, such as early attainment of nutrition goals, improved clinical outcomes, shorter lengths of hospital stay, decreased infection rates, and enhanced immune function.

Test your knowledge

6. Which methods should be used to determine nasogastric feeding tube placement? *(Select all that apply)*

A

Aspirate appearance

B

pH testing of gastric aspirate

C

pH testing of stool

D

Auscultation

6. Which methods should be used to determine gastric feeding tube placement?

- **Answer:**

- A. Aspirate appearance
- B. pH testing of gastric aspirate

A combination of aspirate appearance and pH testing can be used to help make correct predictions about tube placement in the stomach. Use a syringe to draw the contents back up through the tube (this is termed as aspirate), so that it can be examined visually and tested with pH strips. A pH of <5 indicates that the tube is correctly located in the stomach. Auscultation (using a stethoscope to listen for 'bubbling' when air is flushed down the tube) is unreliable because bowel and bronchial or pleural sounds are indistinguishable.

Test your knowledge

7. When should feeding tube placement be checked?
(Select all that apply).

A

After initial insertion

B

If the patient has been coughing

C

8-hourly during continuous feeding

D

Every 2 hours

E

Once every 24 hours

7. When should feeding tube placement be checked?

- **Answer:**

A. After initial insertion

B. If the patient has been coughing

C. 8-hourly during continuous feeding

Checking feeding tube placement every 2 hours may not be practical or necessary, but once every 24 hours is too seldom. Checking after initial insertion, if the patient has been coughing (because they could have dislodged it), and at every shift change i.e. every 8 hours is recommended.

Test your knowledge

8. Which of these events is NOT a sign of EN intolerance?
(Select all that apply)

A

Vomiting three times within 24 hours

B

Absence of bowel sounds, no other symptoms

C

Two loose stools within 24 hours

D

Aspiration

E

Abdominal distention measured three times in the past 24 hours

8. Which of these events is NOT a sign of EN intolerance?

- **Answer:**

B. Absence of bowel sounds, no other symptoms

C. Two loose stools within 24 hours

The absence of bowel sounds alone is not an indicator of feed intolerance, and for diarrhoea to be considered as an indicator of EN intolerance, the patient should have had at least three loose stools in a 24-hour period.

Test your knowledge

9. If a patient is at risk of aspiration, management strategies include: *(Select all that apply)*

A

Trophic feeding

B

Post-pyloric feeding

C

Gastric feeding

D

Head of bed elevation

E

Continuous feeding

9. If a patient is at risk of aspiration, management strategies include:

- **Answer:**
 - B. Post-pyloric feeding
 - D. Head of bed elevation
 - E. Continuous feeding
- Aspiration is defined as the inhalation of food or liquid into the lungs. It can be caused by gastro-oesophageal reflux, for which head of bed elevation and continuous feeding can help. Jejunal (post-pyloric) feeding can be a strategy to avoid aspiration.