

NUTRITION

Malnutrition is common, it occurs in about 30% of surgical patients with gastrointestinal disease and in up to 60% of those in whom hospital stay has been prolonged because of postoperative complications.

The aims of nutritional support are to identify those patients at risk of malnutrition and to ensure that the most appropriate route meets their nutritional requirements and in a way, that minimizes complications.

CAUSES OF MALNUTRITION

1- Preoperative

A- Starvation

- Poverty, difficulty in obtaining food
- Dysphagia, difficulty in swallowing food
- Vomiting, difficulty in retaining swallowed food

B- Failure of proper digestion

2- Post-Operative

In most cases it is transient and the patient returns to normal feeding, any delay in return to normal diet means that malnutrition is likely to occur.

3- Hyper Catabolic State

Severe sepsis & severe trauma are accompanied by an accelerated and profound breakdown of tissue proteins.

METABOLIC RESPONSE TO STARVATION

1. Low plasma insulin
2. High plasma glucagon
3. Hepatic glycogenolysis
4. Protein catabolism
5. Hepatic gluconeogenesis
6. Lipolysis: mobilisation of fat stores (increased fat oxidation)– overall decrease in protein and carbohydrate oxidation
7. Adaptive ketogenesis
8. Reduction in resting energy expenditure (from approximately 25–30 kcal/kg per day to 15–20 kcal/kg per day).

NUTRITIONAL ASSESSMENT

Severe malnutrition with marked wasting of proximal limb and temporalis muscles, pressure sores and apathy is easy to detect.

Milder degree of nutritional impairments is frequently overlooked.

1- Body Weight & Anthropometric Techniques

A simple method of assessing nutritional status is to estimate weight loss. Measured body weight is compared with ideal body weight obtained from tables or from the patient's usual or premorbid weight. Unintentional weight loss of more than 10 per cent of a patient's weight in the preceding six months is a good prognostic indicator of poor outcome.

Body mass index (BMI): defined as body weight in kilograms divided by height in metres squared. A BMI of less than 18.5 indicates nutritional impairment and a BMI below 15 is associated with significant hospital mortality.



BMI Formula
thecalculatorsite.com

METRIC
BMI = weight (kg) / [height (m)]²

The graphic includes a small calculator icon with 'BMI' on its display.

BMI < 18.5: Below normal weight
BMI >= 18.5 and < 25: Normal weight
BMI >= 25 and < 30: Overweight
BMI >= 30 and < 35: Class I Obesity
BMI >= 35 and < 40: Class II Obesity
BMI >= 40: Class III Obesity

Anthropometric techniques incorporating measurements of skinfold thicknesses and mid-arm circumference permit estimations of body fat and muscle mass, and these are indirect measures of energy and protein stores.



2- Clinical Techniques

- **Clinical History:** weight changes, dietary intake, gastrointestinal symptoms.
- **Physical Signs:** muscle-wasting, loss of subcutaneous fat, edema, alopecia.

3- Laboratory Techniques

There is no single biochemical measurement that reliably identifies malnutrition. Albumin is not a measure of nutritional status.

Serum albumin less than 30g/L is an indicator of poor prognosis.

Malnutrition is associated with defective immune function, and measurement of lymphocyte count and skin testing for delayed hypersensitivity frequently reveal abnormalities in malnourished patients.

Immunity is not a precise or reliable indicator of nutritional status.

NUTRITIONAL REQUIREMENTS

1- Energy

The total energy requirement of stable patient with normal or moderately increased need is approximately **20-30 kcal/kg/day**

2- Carbohydrate

There is an obligatory glucose requirement to meet the needs of the central nervous system and certain haematopoietic cells, which is equivalent to about 2 g/kg per day.

3- Fat

4- Protein

The basic requirement for nitrogen in patients without pre-existing malnutrition and without metabolic stress is **0.1-0.15 gm/kg/day**.

In hyper metabolic patients, the nitrogen requirements increase to **0.2- 0.25 gm/kg/day**.

5- Fluid

The daily fluid requirement is calculated from the following formula:

Maintenance fluid requirements

Weight	Daily fluid requirement (mL/kg/day)	(mL/kg/hour)
Neonate	120-150	5
Older child and Adult		
First 10 kg	100	4
Second 10 kg	50	2
Each subsequent kg	20	1

6- Vitamins

Water-soluble vitamins (B, C) act as coenzymes in collagen formation and wound healing.

Postoperatively, the vitamin C requirement increases

And Supplemental vitamin B12 is often indicated in patients who have undergone intestinal resection or gastric surgery and in those with a history of alcohol dependence.

Fat-soluble vitamins (A, D, E, and K): their absorption is reduced in steatorrhea and the absence of bile.

7- Minerals & Trace Elements

Minerals like Sodium, Potassium, and phosphate: their levels need monitoring and appropriate replacement particularly in patients with diarrhoeal illness.

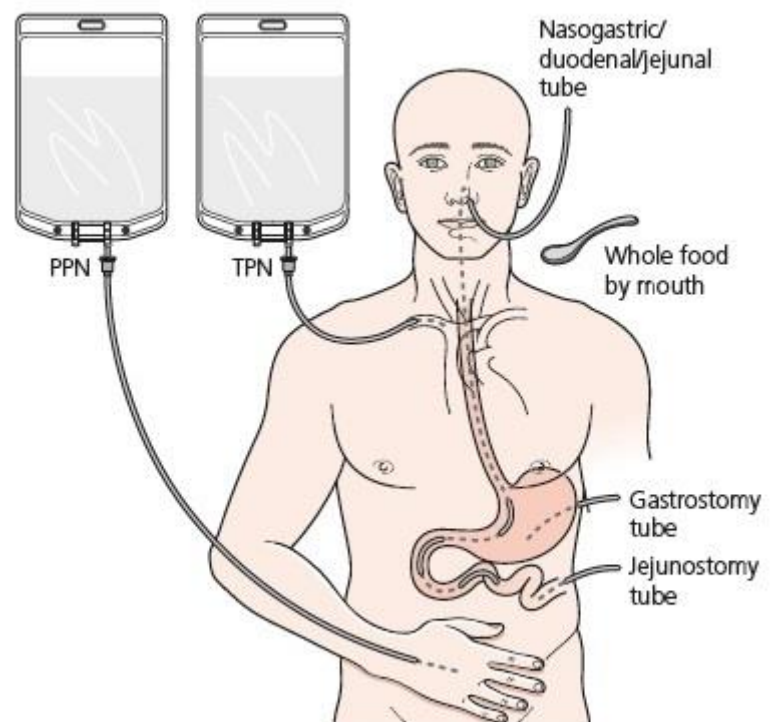
Trace elements act as cofactors for metabolic processes.

Magnesium, Zinc, Iron, Copper levels may be decreased as part of the inflammatory response.

METHODS of ARTIFICIAL NUTRITIONAL SUPPORT

Any patient who has sustained 5-7 days of inadequate intake or who is anticipated to have no intake for this period should be considered for nutritional support. The periods may be less in patients with pre-existing malnutrition.

1. Enteral nutrition
2. Parenteral nutrition



Techniques used for adjuvant nutritional support. PPN, partial parenteral nutrition; TPN, total parenteral nutrition.

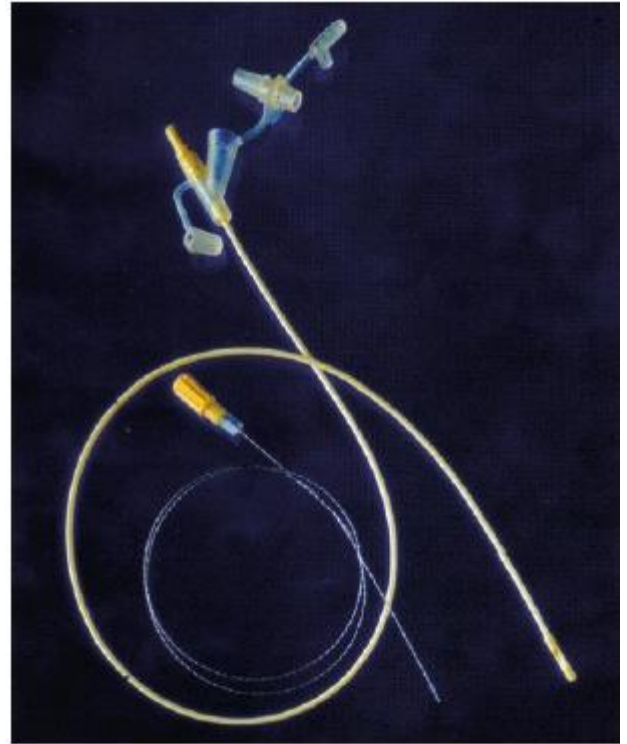
1- ENTERAL NUTRITION

It means delivery of nutrients into the gastrointestinal tract. The alimentary tract should be used whenever possible. This can be achieved with:

A- Oral Feeding (Sip Feeding): it is used in patient who can drink but whose appetites are impaired or in whom adequate intakes cannot be maintained with ad libitum intake.

B- Tube Feeding Techniques:

- 1- Naso--gastric tube feeding
- 2- Fine-bore feeding tubes inserted into the stomach.
- 3- Surgical or percutaneous endoscopic gastrostomy tube feeding.
- 4- Post pyloric feeding
 - a- Naso-jejunal tube feeding
 - b- Jejunostomy tube feeding.



A fine-bore feeding tube with its guidewire.

Indications for Enteral Feeding

- 1- Protein- Energy Malnutrition with inadequate oral intake
- 2- Dysphagia, except for fluids
- 3- Major Trauma (including surgery) when return to required dietary intake is prolonged
- 4- Inflammatory Bowel Disease
- 5- To enhance adaptation after massive enterectomy.

Contra indications

- 1- Small Bowel Obstruction or Ileus
- 2- Severe Diarrhea
- 3- Proximal Small Intestinal Fistula
- 4- Severe Pancreatitis

Complications of enteral nutrition

- Tube-related
 - Malposition
 - Displacement
 - Blockage
 - Breakage/leakage
 - Local complications (e.g. erosion of skin/mucosa)
- Gastrointestinal
 - Diarrhoea
 - Bloating, nausea, vomiting
 - Abdominal cramps
 - Aspiration
 - Constipation
- Metabolic/biochemical
 - Electrolyte disorders
 - Vitamin, mineral, trace element deficiencies
 - Drug interactions
- Infective
 - Exogenous (handling contamination)
 - Endogenous (patient)

2- PARENTERAL NUTRITION (P.N.)

Total parenteral nutrition (T.P.N.) is the provision of all nutritional requirements by means of the intravenous route (without the use of the GIT).

Indications of Parenteral Nutrition

- 1- Proximal intestinal fistula
- 2- Inflammatory bowel disease (especially in peroperative period)
- 3- Massive intestinal resection (particularly if <100cm of small bowel remains)
- 4- Ileus
- 5- Severe pancreatitis

Route of Delivery of Parenteral Nutrition

1- Peripheral Venous Access- for short term feeding, for up to 2 weeks

A- Peripheral Inserted Central Venous Catheter (PICC)

B- Conventional Short Cannula in wrist veins

Peripheral feeding is not indicated if patients already have an indwelling central venous line or in those in whom long-term feeding is anticipated.

2- Central Venous Route, the catheter can be inserted via:

A- Subclavian vein

B- Internal jugular vein

C- External jugular vein

Complications of parenteral nutrition

- Related to nutrient deficiency

Hypoglycaemia/hypocalcaemia/ hypophosphataemia/
hypomagnesaemia (refeeding syndrome)

Chronic deficiency syndromes (essential fatty acids, zinc,
mineral and trace elements)

- Related to overfeeding

Excess glucose: hyperglycaemia, hyperosmolar
dehydration, hepatic steatosis, hypercapnia, increased
sympathetic activity, fluid retention, electrolyte
abnormalities

Excess fat: hypercholesterolaemia and formation of
lipoprotein X, hypertriglyceridaemia, hypersensitivity
reactions

Excess amino acids: hyperchloraemic metabolic acidosis,
hypercalcaemia, aminoacidaemia, uraemia

- Related to sepsis

Catheter-related sepsis

Possible increased predisposition to systemic sepsis

- Related to line

On insertion: pneumothorax, damage to adjacent artery,
air embolism, thoracic duct damage, cardiac perforation or
tamponade, pleural effusion, hydromediastinum

Long-term use: occlusion, venous thrombosis