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Nutrition in ICU patient

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Abstract
Critically ill patients need appropriate nutritional supplementation for their energy requirements during their intensive care unit (ICU) stay and even after ICU stay.
Any critical illness is a catabolic state. Adequate supplementation of nutrition attenuates the stress response and modulates immune responses. The aim of nutritional supplementation is to supplement both macro-and micronutrient requirements. Careful supplementation of protein and caloric intake can avoid under- and overfeeding and will decrease the hospital stay and morbidity. Route of supplementation, that is, oral, enteral, or parenteral depends on the patient's hemodynamic status and gastrointestinal functioning. Initiation of feeding within 24–48 hours of critical illness has been recommended. Nurses are having important role in providing and maintain nutritional level of the patient in ICU. So assessment of nutritional status, identification of needs and role of nurse in providing nutrition in ICU Patient these can improve quality of care and reduce Hospital stay of patient.

Keywords: Nutrition in ICU, critical illness, enteral, ESPN guidelines, multiorgan failure, parenteral

Introduction
Nutrition in ICU patient
Nutrition is required to maintain normal body function. Nutrition also use as a therapeutic tool for ICU Patient. Several studies on hospital malnutrition has been published and result of those study shown that appropriate nutrition in ICU patient lesser the complication. IT reduce the duration of hospital stay with increase survival rates in post-operative patients of major abdominal surgery. (Rachael B. et. al., 2011). The nutritional requirement calculation and prescription ideally done by dietician in ICU. The nutritional requirement calculation and prescription for patient should be done on daily bases to maintain metabolic need of patient body. Initiation of nutrition in ICU patient with in 24 hours is initial step in plan care of most of ICU patient. Medical nutrition therapy shall be considered for all patients staying in the ICU, mainly for more than 48 hours (ESPN Guideline).

Catabolism: Catabolism is the set of metabolic pathways that breaks down moleculs into smaller unit that are either oxides to release energy or used in other ex-fat burn and breakdown of body mass for fulfillment of energy need. Catabolism increase (energy need increase) in infection, inflammation, burn and trauma patient.

Insulin resistance: In critically ill patient increase hormonal level glucagon may contribute in insulin resistance. In septic patient long term increase cortisol (steroid hormone its release in stress response it increase blood sugar and decrease immune response) level over long term consistency increase glucogenesis from lever and pancreas keep struggling for high demand for insulin and glucose level in blood remain high.

Malnutrition
Malnutrition occurs when the body does not get enough nutrients according to body need. Under nutrition and over nutrition both include in malnutrition.

- Patients who are stressed from injury, infection, or chronic inflammatory illness are in a hypermetabolic state.
- The hypermetabolic patient undergoes rapid breakdown of body mass and is at high risk for developing PCM/kwashiorkor if nutritional needs are not met.

- Consequences
- Host defenses are compromised.
- Delayed healing or even failure to heal.
- Gastroparesis and diarrhea with enteral feeding.
  - Risk of GI bleeding from stress ulcers.
  - Overwhelming infection despite antibiotic therapy.
  - Ultimately death may occur.

Table 1: Difference between under nutrition and over nutrition

Under Nutrition	Over Nutrition
▪ Inadequate consumption, poor absorption or excessive loss of nutrients. ▪ Cancer, Inadequate oral intake, Anorexia nervosa.	▪ Excessive intake of specific nutrition. Its result of overeating. ▪ Overnutrition is common in developed countries like the United States.

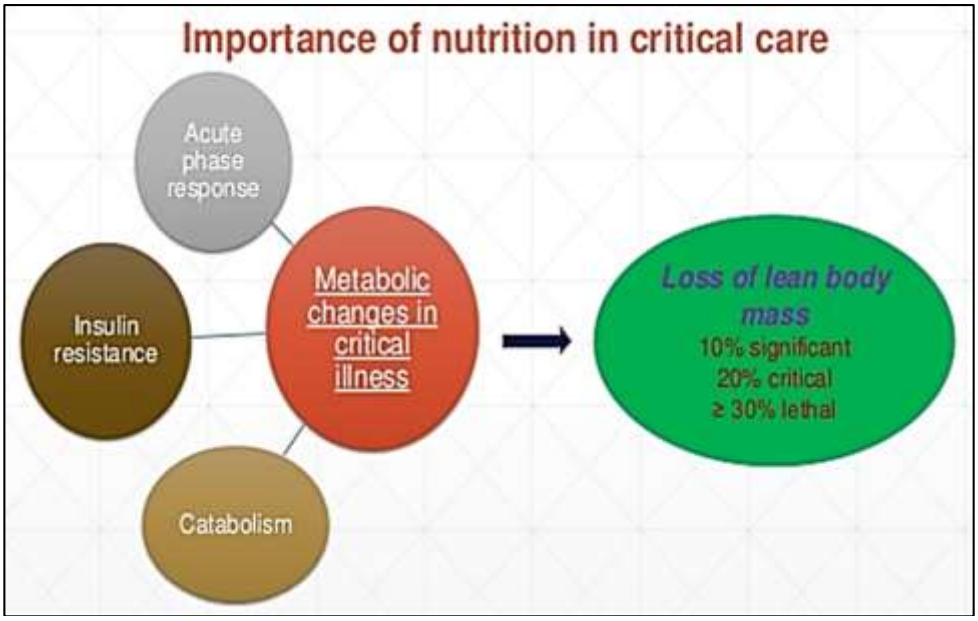


Fig 1: Importance of nutrition in critically ill patients

Goal of Nutrition in ICU

- Improve nutritional status.
- Maintain muscle mass.
- Improve immune function.
- Improve organ functions.
- Modify stress response.
- Prevent metabolic complication

Assessment of Nutritional Status

Nutritional status in critically ill patients can be difficult to assess. Anthropometric measurements (eg. skin fold thickness and mid-arm circumference) are commonly used to assess populations but are not particularly useful in individuals. Biochemical tests also have their limitations: albumin levels fall rapidly as part of the acute phase response and haemoglobin is affected by haemorrhage, haemolysis, transfusion and bone marrow suppression. Transferrin, prealbumin and lymphocyte counts can be useful however they are dependent on the patient being well hydrated.

Body Mass Index (mass [kg] / height [m] 2) is a frequently used tool (with a BMI < 18.5 classed as underweight) and has been shown to be an independent predictor of mortality in seriously ill patients. Nevertheless it does not reflect the acute changes in nutritional status important in critical illness and is used most for the assessment of long term health risks of obesity. A general clinical assessment should be performed to assess malnutrition in the ICU, until a specific tool has been validated. General clinical assessment could include anamnesis, report of unintentional weight loss or decrease in physical performance before ICU admission, physical examination, general assessment of body composition, and muscle mass and strength, if possible. (ESPN Recommendation) Probably the most useful measure of nutritional status is a targeted history and examination. One such method which is widely accepted is known as the Subjective Global Assessment.

Table 2: Subjective Globle Assessment Scale

SUBJECTIVE GLOBAL ASSESSMENT
This is a structured approach to taking a history that includes the following categories:
1. **Weight change** - both chronic (over 6 months) and acute (over 2 weeks)
2. **Changes in food intake**
3. **Gastrointestinal symptoms** - nausea, vomiting, diarrhoea and anorexia
4. **Functional impairment**
and is combined with a physical examination looking for evidence of the following:
1. **Loss of subcutaneous fat** - looking especially at the chest and triceps
2. **Muscle wasting** - looking especially at temporal region, deltoids & gluteals
3. **Oedema**
4. **Ascites**

Nutritional Requirement

To measure the actual need required to meet the metabolic requirement of person required sophisticate equipment so requirement are most commonly establish by using formula. One such formula is Harris Benedict Equation which help to identify patient basal metabolic rate (BMR) in Kcal/day.

- **For Male: BMR** = 13.75 x weight (kg) + 5 x height (cm) – 6.78 x age (years) + 66
- **For Female: BMR** = 9.56 x weight (kg) + 1.85 x height (cms) – 4.68 x age (years) + 65.5

This formula usually give a result of around 25 kcal/kg/day. The equation estimates BMR in a healthy individuals and need of nutrition need to be modified according to the situation to calculate resting energy expenditure (REE).

Nutrient classification

Macronutrient- protein, fat, carbohydrate Micronutrient- vitamin, minerals.

Micronutrients required in very small amounts to maintain health but not to provide energy. For maintenance of energy requirement amount of macronutrients increase according to disease factor and metabolic demand of the body.

Protein around 1.5 g/kg/day (range 1.2 to 2.0 g/kg/day for ICU patients) Use 2g/kg/day if severely catabolic eg. severe sepsis/burns/trauma Lipid Provides 9.3 kcal/g Carbohydrate Provides 3.75 kcal/g *in vivo* Calories from lipid should be limited to 40% of total calories. Give the remaining the energy requirements as carbohydrate to maintain patient energy need.

Resting Energy Expenditure (REE)

Resting energy expenditure help to calculate nutritional need of patient according to disease condition. The disease factor and temperature factor multiplied in basal metabolic rate.

Table 3: Guidelines for adjustment in energy requirement

DF = Disease factor	TF = Thermal factor	
1.06 surgery	1.1	38°C
1.3 Sepsis	1.2	39°C
1.6 Multiorgan failure	1.3	40°C
1.7 30-50% burns	1.4	41°C
1.8 50-70% burns		
2.0 70-90% burns		

Formula

Resting Energy Expenditure (REE) =BMR×DF(disease factor)×TF(Temperature factor)

This is most commonly used manual method for calculation of patients calorie need.

Ndirect Calorimetry: This is considered the gold standard for caloric assessment based on CO2 production and O2 consumption. this method most comely can not used.

Weir equation: REE (kcal/min) = (3.6 ×VO_2)+(1.1 × VCO_2)-61

Rotes of Nutrition

1. Oral
2. Enteral
3. Parenteral

Oral

If the patient eat orally then patient should encourage to take nutrients orally. It is important to identify how much patient is eating to see whether patient metabolic need is full fill or not according to demand. If not than patient need nutritional supplementation either orally or enternally.

Enteral Route: Nutritional support by placement through the nose, esophagus, stomach or intestines (duodenum or jejunum). Its tube feeding, patient have functional GI tract and exhausted all oral diet method**.**

The various methods of enteral feeding are discussed below:

i) ***Nasogastric:*** This is the most used in feeding intensive care patients in ICU. Most common problem face by nurses or health care providers includes malposition of tube, difficulty in swallowing and coughing, sinusitis and nasal tissue erosion. The insertion of NG tube is contra-indicated in a patients with base of skull fracture due to risk of intracranial penetration.
The insertion of a nasal tube is contra-indicated in a patient with a base of skull fracture due to the risk of intracranial penetration.

ii) ***Oral tubes:*** oral tube cannot use for awake patients however should be considered in intubated patients to reduce sinusitis (a risk factor for ventilator-associated pneumonia).

iii) ***Enterostomy:*** Gastrostomy or jejunostomy and can be placed at the time of surgery or as a separate procedure. Once inserted they are well tolerated, however there are risks associated with insertion, displacement and infection (including peritonitis). Evidence from non-ICU patients suggests that there are significant benefits for those who require nutritional support for over 4 weeks.

iv) ***Post-pyloric feeding:*** nasojejunal or jejunostomy. A nasojejunal tube should be over 120cm long to ensure correct placement. Feeding directly into small bowel avoids the problem of gastroparesis. Small bowel ileus is much less common than gastric ileus and tends to be less prolonged; the small bowel recovers normal function 4-8 hours post laparotomy. Post-pyloric feeding is recommended for patients at high risk of aspiration, those undergoing major intra-abdominal surgery and patients who are intolerant of gastric feeding.

Indication of Enteral Nutrition

1. Cancer

- Head and neck
- Upper GI

2. Critically ill or trauma patients

- Neurological and muscular disorders
  - CVA
- Gastro intestinal disorders
  - Enterocutaneous fistula

3. Mild pancreatitis Cancer

- Head and neck
- Upper GI

2. Critically ill or trauma patients

- Neurological and muscular disorders
  - CVA
- Gastro intestinal disorders
  - Enterocutaneous fistula
  - Mild pancreatitis

Enteral Feed

1. Hospital prepared feed: Hospital prepared food is not in use

. If the patient are poor and not able to afford formula feed than some dietician use these preparation Recipes vary according to country and available ingredients most commonly it can include hard-boiled eggs, milk powder, soya, maize oil, rice, squashes, flour, sugar and fruit.

2. Polymeric preparations: These contain intact proteins, fats and carbohydrates, which require digestion prior to absorption, in addition to electrolytes, trace elements, vitamins and fibre. It is also called as whole nutrition formula. All micronutrients and macronutrients are used in adequate amount.

3. Elemental preparations: These preparations contain the macronutrients in a readily absorbable form (i.e. proteins as amino acids, lipids as medium chain triglycerides and carbohydrates as mono- and disaccharides). This formula consider best for critically ill patient but they are expensive and only indicated for patients with severe malabsorption or pancreatic insufficiency.

4. Disease-specific formulae- They are usually polymeric and include feeds designed for:

1. **Liver disease** - low sodium and altered amino acid content (to reduce encephalopathy)
2. **Renal disease -** low phosphate and potassium, 2kcal/ml (to reduce fluid intake)
3. **Respiratory disease** - high fat content reduces CO2 production.

Again they are expensive and there is not enough evidence to justify widespread use. Most of hospital using this formula for patients with liver and renal failure.

Role of Nurse in Enternal Feeding

- Conform the placement of the tube before feeding.
- Use aseptic technique when preparing and delivering enteral feeding.
- Lable enteral equipment patient name, formula name, rate, date and time for initiation.
- Practice right patient, right formula, right tube.
- Elevate patient head 30˚ to 45˚ until contraindicated.
- Change the infusion drip and bag if patients on continuous feeding every 24 hours.
- Check gastric residual volume every 4 hours in patient at risk of aspiration.
- Check glucose level every 4 hour after initiation of feed.
- Observe respiratory status ex- increase rate decline SpO2 may indicate aspiration of tube feeding.
- Check skin integrity on incision site.
- Clean the feeding bag after each feed with hot water.

Unexpected Outcomes and Related Interventions

1. GRV exceed 250 ml for two consecutive assessment.

- Hold feeding and notify the health care provider
- Elevate the head of the patient 45˚C.
- Recheck residual in 1 hours.

2. Patient develop diarrhea 3 times or more in 24 hours.

- Notify health care provider.

3. Patient develop nausea, vomits and aspirate formula administered rapidly

- Provide side lying position
- Suction airway
- Obtain chest X-ray
- check patency of tube
- Aspirate for GRV

Parenteral nutrition

Parenteral nutrition is method of providing nutrients to the body by an IV route. Parenteral nutrition is most often given through a central vein as the solutions are usually hypertonic. Preparations for peripheral use are available however they have to be isotonic which means that very large volumes would have to be given to provide adequate nutritional support. Parentranl nutrition doses are recommended by physicians according to metabolic need of patients. Maintenance of patency of central catheter and

prevention from septicemia is major focused area for nurses working in ICU.

Indication of parenteral nutrition

1. Insufficent oral or enteral intake

- Malnutrition
- Severe burn

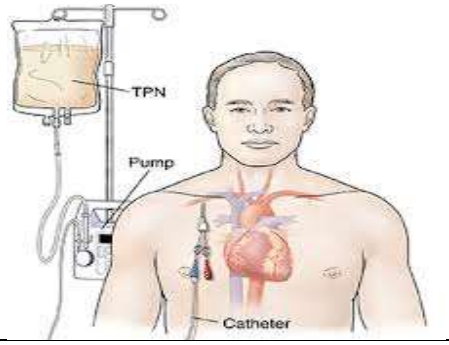
2. Impaired ability to ingest or absorb food orally or enterally

- Paralytic ileus
- Crohn's disease
- Radiation Enteritis
- Short Gut

Role of Nurse in Enternal Feeding

1. The solution must be inspect for oily appearance (also known as cracked solution).
2. Aseptic technique use any time when IV setup is manipulated.
3. Formulation with dextrose concentrations of more than 10% solution not be administered through peripheral veins because they irritate the intima and cause chemical phlebitis.
4. Dressing change every 48 hourly.

Table 4: Advantage and disadvantage of administration of nutrition through enteral and parental nutrition.

Enteral	Parenteral
• Lower infection Risk • Decrease cost • Lower incidence of hyperglycemia	• Higher risk infection • Increase cost • Higher incidence of hyperglycemia
	

References

1. Suddarth's & Brunner Textbook of Medical Surgical Nursing Volume 2 -12th edition Wolters Kluwer Publishers pg no. 1222 to 1230.
2. Recollections of pioneer in nutrition: Landmark in development of parenteral nutrition. J Am Coll of Nutrition 1992;11(4):366-73
3. Total parenteral nutrition in the surgical patient: a meta-analysis. Can J Surg 2001;44:102-11.
4. Potter and perry textbook of fundamental of nursing, 7th edition page no-1000-1020.
5. Kreymann KG, Berger MM, Deutz DE, Hiesmayr M, Jolliet P, Kazandjiev G, *et al*. ESPEN guidelines on enteral nutrition: intensive care. Clin Nutr 2006;25:210-23.
6. Singer P, Blaser AR, Berger MM, Alhazzani W, Calder PC, Casaer MP, *et al*. ESPEN guideline on clinical nutrition in the intensive care unit. Clinical nutrition 2019;38(1):48-79.
7. Barlow R, Price P, Reid TD, Hunt S, Clark GW, Havard TJ, *et al*. Prospective multicentre randomised controlled trial of early enteral nutrition for patients undergoing major upper gastrointestinal surgical resection. Clinical nutrition 2011;30(5):560-566.