Nutrition in the hospital setting

Emily Felicia Jan Ee SHEN
Department of Gastroenterology, Tan Tock Seng Hospital, Singapore

ABSTRACT

Nutrition is essential for human health. Malnutrition in the hospital setting is common, and often under-recognised. Malnutrition increases morbidity, length of stay and mortality in patients, and increases postoperative complications. Patients' nutritional status should be screened upon admission and if there is evidence of a poor nutritional state, the patient should be referred for further evaluation and management. Nutritional requirements may vary in disease states and the route of feeding is dependent on the patient's disease and organ function. These issues will be addressed in this review.

Keywords: Dietary requirement, feeding, malnutrition, stress factor

INTRODUCTION

The "father" of Western medicine, Hippocrates, first emphasized the importance of nutrition to human health in the fifth century BC. Globally, malnutrition is an important problem but often under-recognised in the hospital population (Table 1). Many patients present to hospital malnourished, and some patients develop a degree of iatrogenic malnutrition, due to repeated fasting for tests and procedures, and a lack of nutritional knowledge by hospital staff.

Starvation can result in serious consequences. Experimental semi-starvation of normal volunteers was shown to result in apathy, depression and fatigue. [1] The volunteers developed decreased muscle power, affecting respiratory and cardiac function. Numerous studies have shown that malnutrition results in increased length of hospital stay, increased home care costs and higher hospitalisation costs. [2-4] Cancer cachexia patients have been shown to have poorer outcomes due to increased complications, decreased overall survival and decreased quality of life. [5-8]

Malnutrition is not limited to the general ward patients. Intensive care patients are often malnourished, which can result in increased infectious complications, poor wound healing, prolonged ventilation dependence with increased morbidity and mortality. [9, 10] By implementing appropriate and adequate nutritional support there can be improved clinical outcomes with decreased length of

Correspondence author: Emily SHEN
Division of Gastroenterology,
Tan Tock Seng Hospital, Jalan Tan Tock Seng,
Singapore.
E mail: efshen@hotmail.com

Table 1: Prevalence of malnutrition in hospitalised patients.

Authors (years)	Country	Prevalence
Bistrian (1974)	United States	50%
McWhirter (1994)	Scotland	40%
Fernando (1995)	Philippines	48%
Krishna (2005)	Netherlands	32%
De Luis (2006)	Spain	24%
Shen (2006) *	Singapore	34.5%

* unpublished data

stay. [9-11]

Patients who are malnourished are more likely to have poor outcomes post-operatively. As the nutritional state worsens, not only are there increased complications, the severity of complications can also increase in patients after operation. [12]

DEETCTION OF MALNURTITION

Early detection of malnutrition in hospitalised patients and nutritional intervention can result in decreased morbidity such as decreased pneumonia and infections and decreased length of hospital stay. [2, 3, 13] Detection of malnutrition is also important for evaluation of the exact incidence and allow accurate coding. In some settings, this has implications in cost and financial reimbursement or claims for the institution, especially in an insurance based health care system. [14]

It is known that certain diseases predispose to decreased nutritional state, such as cancers, dementia, Parkinson's disease chronic infectious diseases, and any end stage organ disease. Most of these conditions results in reduced oral intake either through reduced appetite, disordered swallowing or digestion or catabolic/cachexia state. With increased awareness of the importance of detecting and treating malnutrition in hospital patients, various screening forms have been designed. These forms also integrated the patient's recent oral intake and unintentional weight loss prior to hospital admission. Currently, there are many nutrition screening tools, which are commonly used; some of these include the Malnutrition Universal Screening Tool (MUST), Nutrition Risk Index (NRI) and the Nutritional Risk Screening tool (NRS). However, not all screening tools have been validated, and of those that have been validated, most have been validated in a non-Asian population. Once patients have been screened and found to be at nutritional risk, a full assessment should be performed.

An example of a well known and widely used assessment tool is the Subjective Global Assessment (SGA). The SGA which was initially reported in 1982 has been used and validated in many patient population groups and in different ethnicities. [15-18] The SGA takes into account weight changes, nutrition intake, gastrointestinal symptoms, patient's functional capacity, including a link between disease state and nutritional requirements. The SGA includes a limited physical examination focused on nutritional aspects.

Men: 66.47 + (13.75 x weight) + (5 x height) – (6.78 x age)

Women: 65.55 + (9.56 x weight) + (1.85 x height) - (4.68 x age)

Variables – gender, weight (kg), height (cm), age (years)

Fig 1: Harris Benedict Equation (Basal Energy Expenditure - BEE).

After this assessment, patients are categorised as SGA A (well nourished), SGA B (moderately malnourished) or SGA C (severely malnourished).

Often in clinical practice, a simplified assessment of the patient's nutritional state is necessary. A patient with temporal muscle wasting, unintentional weight loss and/or decreased intake pre-hospital admission, with a disease state is at risk of malnutrition and patient will usually be at least moderately malnourished. If this is recognised, further assessment for nutritional therapy can be implemented.

Referral to a dietitian is the minimum requirement for patients in poor nutritional states. In patients with complex nutritional disorders, this may not be adequate and input from various disciplines may be necessary. Numerous hospitals are starting to understand the importance of Nutrition Support Teams (NST), not just for patients on parenteral nutrition but also in the management of patients with severe malnutrition or complicated nutritional disorders. [19, 20] NSTs are often composed of a physician or surgeon, dietitian, pharmacist and nursing staff. As a multidisciplinary group, a more thorough approach to the nutritionally deplete patient may be instigated.

NURTITION REQUIREMENT

A combination of lipids, carbohydrates, protein, water, vitamins (water and fat soluble) and minerals (electrolytes and trace elements) are essential for patients' dietary requirements. For the malnourished patient, the patient's actual weight is used to calculate required calories, whereas in the obese patient, the patient's ideal weight should be used. To calculate the basal energy expenditure, many use the Harris-Benedict equation (Figure 1). Once the basal energy expenditure has been calculated, the calorie requirements can be calculated factoring in the activity and stress factor (Figure 2 and Table 2). [21] If the calculations seem quite complex, then the quick rule of thumb would be, each patient requires 25-30 kcal per kilogram of weight per day. The higher end would be in patients with disease and activity states that result in increased metabolism.

In healthy people, we generally require our diet to consist of 50-60% carbohydrate, 15% protein and 30% fat. In a patient who is catabolic, the ratios differ. A minimum of 100 gm per day of carbohydrates are required to prevent ketosis. When giving lipids, they are used both for energy requirements but also as a source of essential fatty acids such as linoleic acid. Increased protein is required to help prevent muscle loss due to catabolism.

Daily calorie requirement = BEE x activity factor x stress factor

Fig. 2: Formulae for calculation of daily calorie requirement (BEE: Basal energy expenditure).

Micronutrients are an important part of the patient's dietary requirements. These include thirteen essential vitamins and minerals and trace minerals such as selenium, zinc and manganese. Vitamins are either water or fat soluble. The fat soluble vitamins include Vitamins A, D, E and K. More recently, it has been shown that micronutrients may be involved in the function of the immune system, have a role in combating oxidative stress and many other functions. [22-24]

When commencing feeding in patients it is important to be aware of possible complications. Refeeding syndrome is a crucial complication to recognise. This is a metabolic syndrome that occurs when a severely malnourished patient undergoes rapid nutritional repletion. It may occur in patients on parenteral nutrition, enteral nutrition or even if oral feeding is commenced in a severely nutritionally depleted patient. This can result in hypernatremia, hypophosphatemia, hypokalemia, hypomagnesemia and hypercapnia. To monitor for this, electrolytes, and in particular potassium, magnesium and phosphate are performed daily in a patient who is at risk of refeeding syndrome. Often 50% of required calories will be commenced and only increased if there is no evidence of refeeding syndrome. If unrecognised, and feeding is escalated too rapidly, muscle weakness, respiratory failure, convulsions, cardiac decompensation and even death can ensue. [25, 26]

METHODS OF FEEDING

If the gastrointestinal tract is functioning, then this is the best route to feed. If possible feeding via the mouth is the most ideal. Eating not only fulfills nutritional requirements, but may also give the patient pleasure and often has psychological benefits too. If a patient is unable to obtain adequate calories via his/her usual diet then adding supplements may be necessary. There are many supplements on the market, including specialty supplements for diabetic patients, and patients that require increased protein and even supplements that claim to improve immune system function. Many of these supplements are

Table 2: Conditions and stress factor levels.

Injury	**Stress factor**
Minor surgery	1.0 to 1.1
Long bone fracture	1.15 to 1.3
Cancer	1.1 to 1.3
Peritonitis / sepsis	1.1 to 1.3
Severe infection / multi trauma	1.2 to 1.4
Multi-organ failure	1.2 to 1.4
Burns	1.2 to 2.0
Activity	
Confined to bed	1.2
Out of bed	1.3

expensive, and unfortunately may not be palatable to the patient. Alternatively, one can use normal food normally taken food to supplement the diet. This includes adding extra eggs or egg whites to a patient's meal to increase protein, making milkshakes with ice-cream and fruit in lactose tolerant patients to increase protein, fat, fibre and vitamin intake. Adding calcium enriched milk powders or commercially available chocolate powders, (which are enriched with vitamins and have added calories) to the patient's breakfast oats maybe beneficial.

In patients who are unable to eat, for example stroke patients, consideration for nasogastric tube feeding is important. If there is a high risk of reflux and aspiration or if high aspirates are obtained from the nasogastric tube, and yet the gastrointestinal tract is functional then a naso-enteric tube can be considered for feeding. If the patient requires long term feeding via nasogastric or nasoenteric tube then insertion of a percutaneous endoscopic gastrostomy (PEG) or jejunostomy (PEJ) tube may be appropriate (Figure 3).

Some patients are unable to be fed via the gastrointestinal tract. If this is the case, parenteral nutrition can be commenced. In the hospital, common indications for parenteral nutrition include post-operative ileus, short gut syndrome, enterocutaneous fistula and severe inflammatory bowel disease. Implementing parenteral nutrition is quite complicated. There are minimum and maximum infusion rates of lipids, dextrose and amino acids. Correct osmolality is important or can result in severe complications for the patient. Addition of specific micronutrients is essential and dependent on the patient's condition. Monitoring for electrolyte disturbances, and for other possible complications such as hypertriglyceridemia, hepatotoxicity, dehydration, renal impairment, hyperglycemia and coagulopathy as well as appropriate acid base balance is mandatory. Apart from these, patients should also be closely monitored for other complications of parenteral nutrition such as infection, catheter related complica–

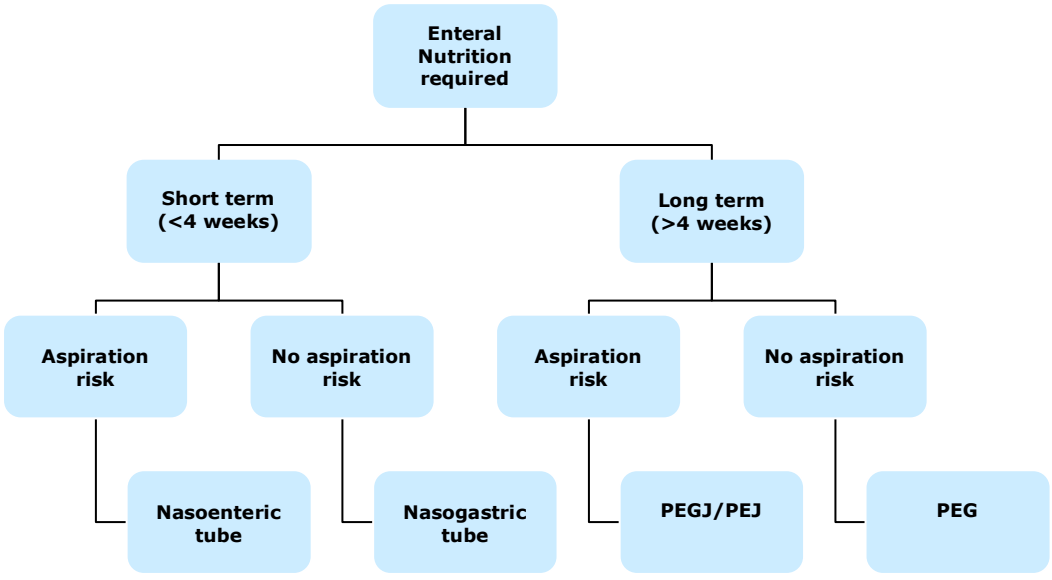

Fig. 3: Flow chart showing the choice of feeding (PEJ: percutaneous endoscopic jejunostomy and PEG: percutaneous endoscopic gastrostomy, PEGJ: percutaneous endoscopic gastrojejunostomy).

tions, renal, hepatobiliary, metabolic and skeletal complications. Thus, it is recommended that usage of parenteral nutrition be limited to healthcare staff that are educated in this sub-specialty field.

FROM SUPPORT TO THERAPY

In the past decade, numerous studies have been performed looking at nutrition as a form of therapy. With increased understanding of oxidative stress and the complications of this, numerous anti-oxidants have been trialed to see if they can decrease morbidity and mortality, particularly in intensive care patients. One such candidate is glutamine. Glutamine is an amino acid that is a regulator of heat shock proteins, a substrate for gluconeogenesis, a primary fuel for rapidly dividing cells and an anti-oxidant. Numerous studies have supported the use of intravenous glutamine in the intensive care setting to decrease inflammatory response, protect cells and tissues from injury and preserve metabolic function. [27] The guidelines of many nutrition societies around the world support the use of glutamine in the intensive care setting. However some recent data suggests glutamine may some recent data suggests glutamine may not be as beneficial as previously suggested. Therefore, further studies are required to assess the role and benefits of glutamine before it can be routinely used in clinical practice.

CONCLUSION

Malnutrition is a common and underappreciated cause of morbidity and mortality in hospitalised patients. Malnutrition in patients can occur in all areas of the hospital and is not limited to specific disciplines. Recent studies have suggested nutrition may be used as a form of therapy. It is important to look at the patient's basic nutritional status and address this if inadequate, before looking at components that may or may not have a therapeutic benefit. It is imperative that nutrition awareness and education is improved amongst hospital staff, to ultimately lead to improved detection and treatment of nutritionally deplete patients.

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