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Chapter 7

Nutritional Support in Dysphagia

Vishal G. Shelat and Garvi J. Pandya

Additional information is available at the end of the chapter

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1. Introduction

Dysphagia is defined as difficulty in swallowing. It is commonly caused due to neuromuscular (stroke, dementia, Parkinson's disease, myasthenia gravis, etc.), mechanical (oral cancer, oesophageal cancer, etc.), or other causes (radiotherapy treatment, gastroesophageal reflux disease, thrush, etc.). It risks aspiration and associated bronchopulmonary infections, fluid depletion, and under nutrition. It can alter nutritional equilibrium and can affect organ function and ultimately clinical outcome. To improve clinical outcomes, it is important to screen all at risk patients in order to identify patients at nutritional risk due to dysphagia [1–4]. Most dysphagia resolves within few weeks, but in some cases it may persist. This may affect the nutritional state of the individual who is already facing an illness or injury in first instance [5, 6]. Dysphagia and accompanying malnutrition is associated with excess morbidity and increased mortality rates [7, 8]. This chapter will focus on general principles of nutritional management in any patient including patients with dysphagia.

2. Nutritional screening and assessment

Up to 30% of all acute hospital admissions are malnourished and this is further deepened during hospitalisation [9]. Hence, all the patients should be screened for risk of malnutrition.

There are various scoring systems available to screen a patient at nutritional risk. Screening is based on history (weight loss, etc.) and physical examination (height, weight, and body mass index (BMI)).'Malnutrition universal screening tool' ('MUST') [Figure 1], rapid nutrition screen for hospitalised patients, nutrition risk index (NRI), Mini Nutritional Assessment-Short Form (MNA-SF), Short Nutritional Assessment Questionnaire (SNAQ©) (Table 1) and Nutrition Risk Screening (NRS-2002) are some of the commonly available and used composite tools

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in clinical practice [10–15]. An ideal screening tool should be easy to implement, accurate, reliable, inexpensive, and reproducible. NRS-2002 is the best instrument today because it is robust, simple, quick, validated, and based from an analysis of 128 controlled clinical trials. Patients with the risk criteria had a higher likelihood of a better clinical outcome from nutritional support than patients who did not fulfill the criteria [15]. NRS 2002 has also been used by nurses and dietitians in three hospitals of Denmark. Its reliability was validated by inter-observer variation between a nurse, a dietitian, and a physician with a k = 0.67. Its practicability was shown by the finding that 99% of 750 newly admitted patients could be screened [16]. Supplement 1 shows the 'TTSH Nutrition Screening Tool' (TTSH NST) used by the Nutrition and Dietetics department at Tan Tock Seng Hospital, Singapore. TTSH NST was developed from a cohort of younger hospitalised patients. This was later validated in a cohort of elderly patients using subjective global assessment (SGA) as a comparator. In 281 acute admissions to Tan Tock Seng Hospital with age range of 61–102 years, prevalence of malnutrition was 35% based on SGA. Risk of malnutrition as determined by TTSH NST with a cut-off of 4 had sensitivity, specificity, positive, and negative predictive values of 84%, 79%, 68%, and 90%, respectively, with area under the curve of 0.87. The optimal cut-off remained at 4 even for patients aged >85 years (AUC = 0.85). Risk of malnutrition was predictive of 6-month mortality (adjusted OR: 2.2, $P = 0.05$) and hospital length of stay ($P < 0.05$) [17].

Question	Score
Did you lose weight intentionally?	
• 6 Kg in past 6 months	3
• 3 Kg in the past month	2
Did you experience a decreased appetite over the past month?	1
Did you use supplemental drinks or tube feeding over the past month?	1

[a] Patients who scored 0 or 1 points were classified as well-nourished and did not receive intervention. Patients who scored 2 points were classified as moderately malnourished and received nutritional intervention. Patients who scored 3 points were classified as severely malnourished and received nutritional intervention and treatment by a dietician.

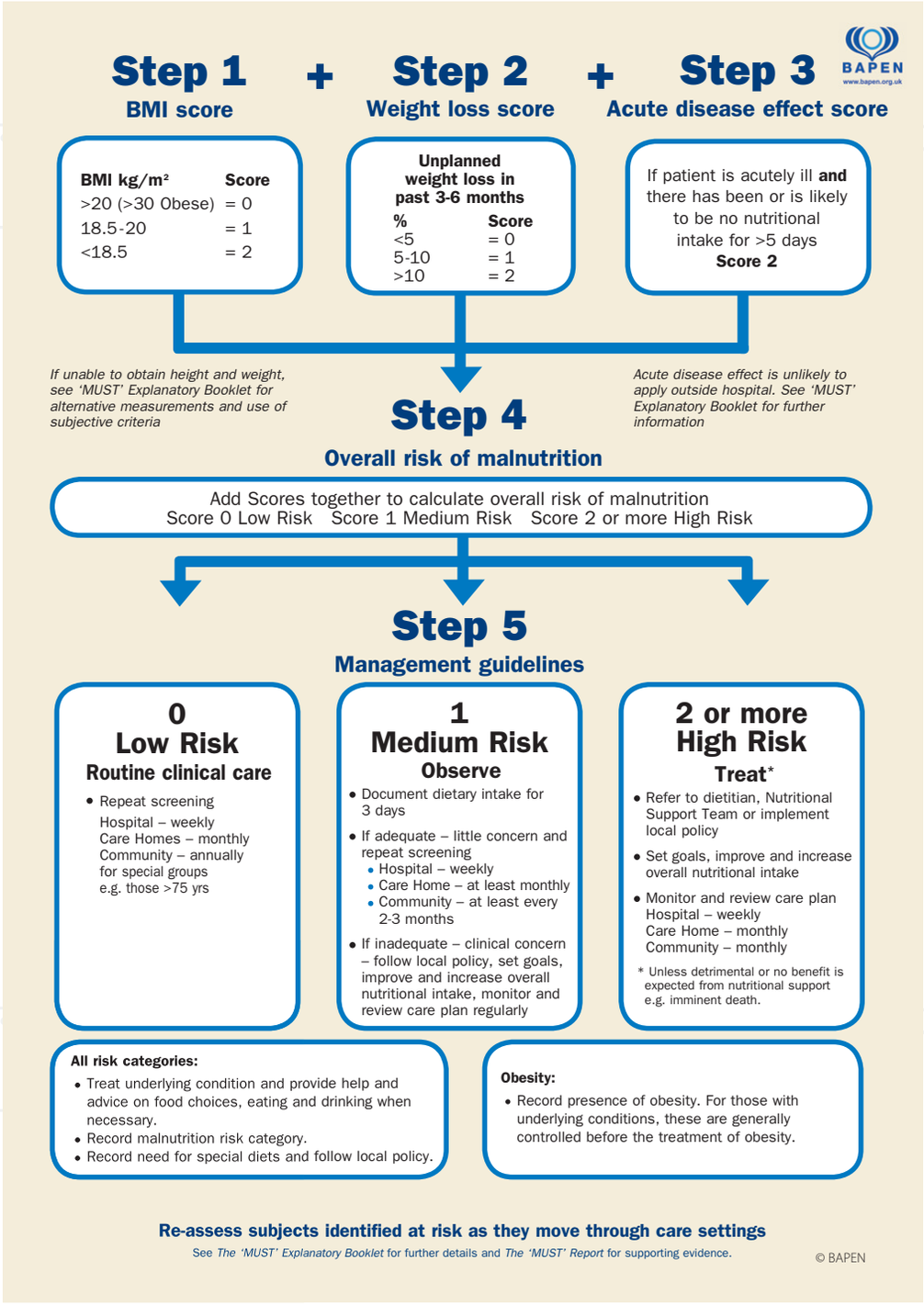
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Table 1. Short Nutritional Assessment Questionnaire [a]

Nutritional assessment is a more detailed process and is done in patients screened at risk or when metabolic or functional problems prevent a standard plan being carried out. There are few tools for evaluating the nutritional status of hospitalised patients. SGA, short nutritional assessment questionnaire, mini nutritional assessment (MNA), and corrected arm muscle area (CAMA) are tools used for nutritional assessment [18]. The assessment of nutritional status includes a nutritional history and physical examination in conjunction with appropriate laboratory studies [Figure 2]. Regurgitation, hoarse voice, coughing during or after swallowing, globus sensation, nasal regurgitation, recurrent chest infections, and frequent throat clearing symptoms may indicate dysphagia [19]. In all patients with dysphagia, a complete

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evaluation of the cause of dysphagia must be performed and for the purpose of this chapter we will only discuss nutrition-related assessment.



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Figure 1. 'MUST' flowchart

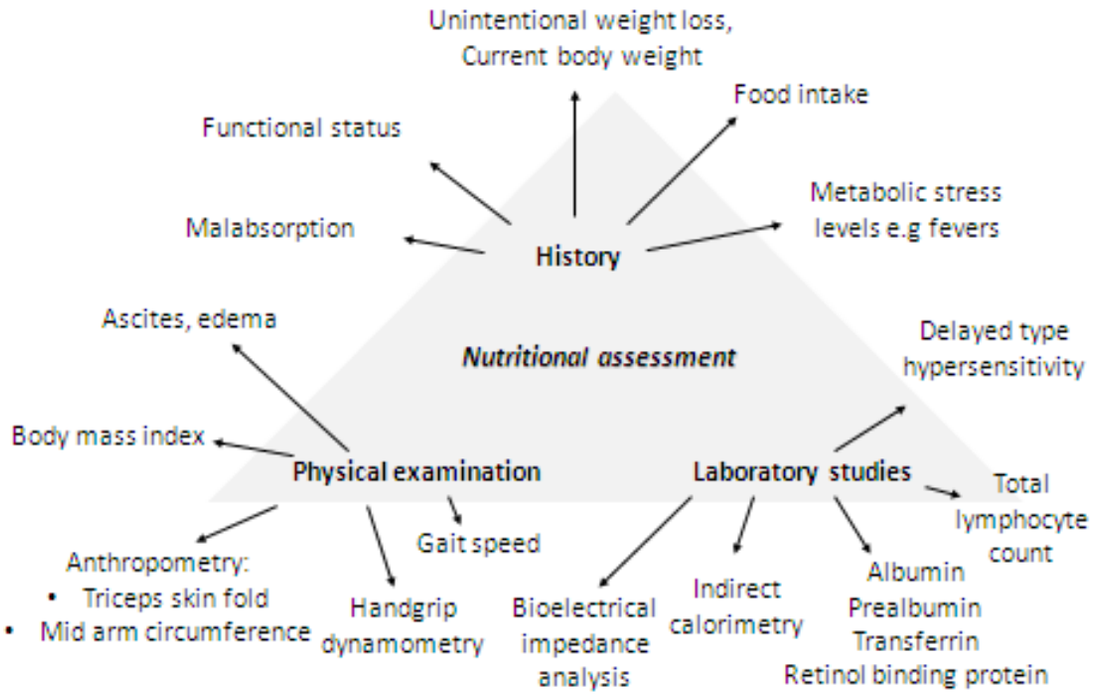


Figure 2. Nutritional assessment

The nutritional history should evaluate the following:

1. *Food intake*

A change in the dietary pattern due to dysphagia should be ascertained.

2. *Body weight*

The presence of unintentional weight loss over past six months should be ascertained. 10% or greater unintentional weight loss over the past six months is categorised as severe weight loss and is associated with a poor clinical outcome. In a study involving 3,047 patients enrolled in 12 chemotherapy protocols of Eastern Cooperative Oncology Group, Dewys WD, et al. has shown that chemotherapy response rates and median survival rates were lower in patients with weight loss [20]. The *functional status* of the patients (e.g., bedridden) and *metabolic stress* due to accompanied illness or injury also need to be ascertained.

3. *Physical examination*

Body mass index (BMI): Patients are classified by BMI as underweight (<18.5 kg/m^2), normal weight (18.5–24.9 kg/m^2), overweight (25.0–29.9 kg/m^2), class I obesity (30.0–34.9 kg/m^2), class II obesity (35.0–39.9 kg/m^2), or class III obesity (≥40.0 kg/m^2) [21].

Hand grip strength, gait speed, triceps skin fold thickness, mid-arm circumference, mucosal xerosis, and *edema* are some of the physical signs which could help establish malnutrition in patients with dysphagia. Handgrip strength reflects, in part, the association of muscle strength and lean body mass with malnutrition [22]. In a study conducted by the International Academy on

Nutrition and Aging (IANA) Task Force, gait speed at usual pace is found to be a consistent risk factor for disability, cognitive impairment, falls, institutionalisation, and/or mortality and at least as sensitive as composite tools [23].

4. *Laboratory studies*

Measurements of serum albumin, prealbumin, retinol-binding protein, transferrin, createnine height index, createnine extretion in urine and total lymphocyte count have been shown to correlate with clinical outcome. In a study involving 17 critically ill patients, Apelgren KN et al. have shown that a serum albumin <2.5 g/dL concentration is associated with an increased incidence of medical complications and death and it correctly separated 93% of patients in terms of survival prognosis [24]. Serum albumin levels are often used as a surrogate for preoperative nutritional assessment, but it is confounded by coexisting inflammation [25, 26]. Injury and inflammation decreases synthesis, increases degradation and transmembrane losses from the plasma compartment. In addition, albumin is also lost from open wounds (burns, etc.), peritonitis and through the gastrointestinal tract and/or kidneys in certain diseases. The association between hypoalbuminemia and poor clinical outcome is independent of both nutritional and inflammatory status [27]. Serum albumin is a good predictor of clinical outcomes but is a poor marker for nutritional assessment.

3. Nutritional pharmacology

If a patient is identified as at risk of malnutrition, appropriate intervention should be done to improve outcomes. Nutritional pharmacology is an emerging science over the last two decades. Nutrients such as arginine, glutamine, and long chain fatty acids (both omega 3 and omega 6) have been shown to improve clinical outcomes in diverse group of patients [28]. Arginine exhibits diverse effects including wound healing, protects against ischemia-reperfusion, improves macrophage function after injury, blocks adhesion molecules, inhibits lipid peroxidation, and improves cerebral and myocardial perfusion [28]. In a double blind randomised controlled trial involving 32 malnourished patients with head and neck cancer, Buijs N et al. concluded that perioperative arginine-enriched enteral nutrition improved long term overall survival and long term disease specific survival [29]. Glutamine is the most abundant amino acid and is a fuel of neutrophils, lymphocytes, and enterocytes. Glutamine is a conditionally essential amino acid in situations of stress. A recent Cochrane review including 4,671 patients with critical illness or elective major surgery concluded that glutamine supplementation reduced the infection rate and days on mechanical ventilation in critically ill or surgical patients [30]. Long chain fatty acids are important in function of cell membranes and act as intracellular messengers.

4. Enteral nutrition

Enteral route is physiologic and *'A functioning gastrointestinal system should be used to prevent its malfunction'*. Oral nutritional is ideal. Patients with dysphagia are at risk of aspiration

pneumonia. Authors recommend a swallowing history and assessment prior to oral feeding. Until safety of oral feeding is established, tube feeding should be considered. Figure 3 outlines a simplistic approach in decision making for nutritional supplementation.

4.1. Formula feeds

There are various feeding formulas and selection should be based on fluid electrolyte and metabolic needs, digestion and absorption capacity, caloric and protein density of formula, physical characteristics of formula (osmolality, viscosity etc.), and cost. General purpose feeding formulas contain intact proteins and need an intact digestive and absorptive function of gastrointestinal system. Semi-elemental feeds contain free amino acids with minimal fat and are used in patients with compromised gastrointestinal function. There are also various disease-specific feeds available for patients with hepatic, renal, or pulmonary dysfunction. In addition, nutrient composition of the formulas can be altered to tailor individual patients need and such modular feeds require mixing by local pharmacy and are costly [31]. Once the feeding formula is decided and the nutritional requirement calculated, the rate and delivery of the feeding is established.

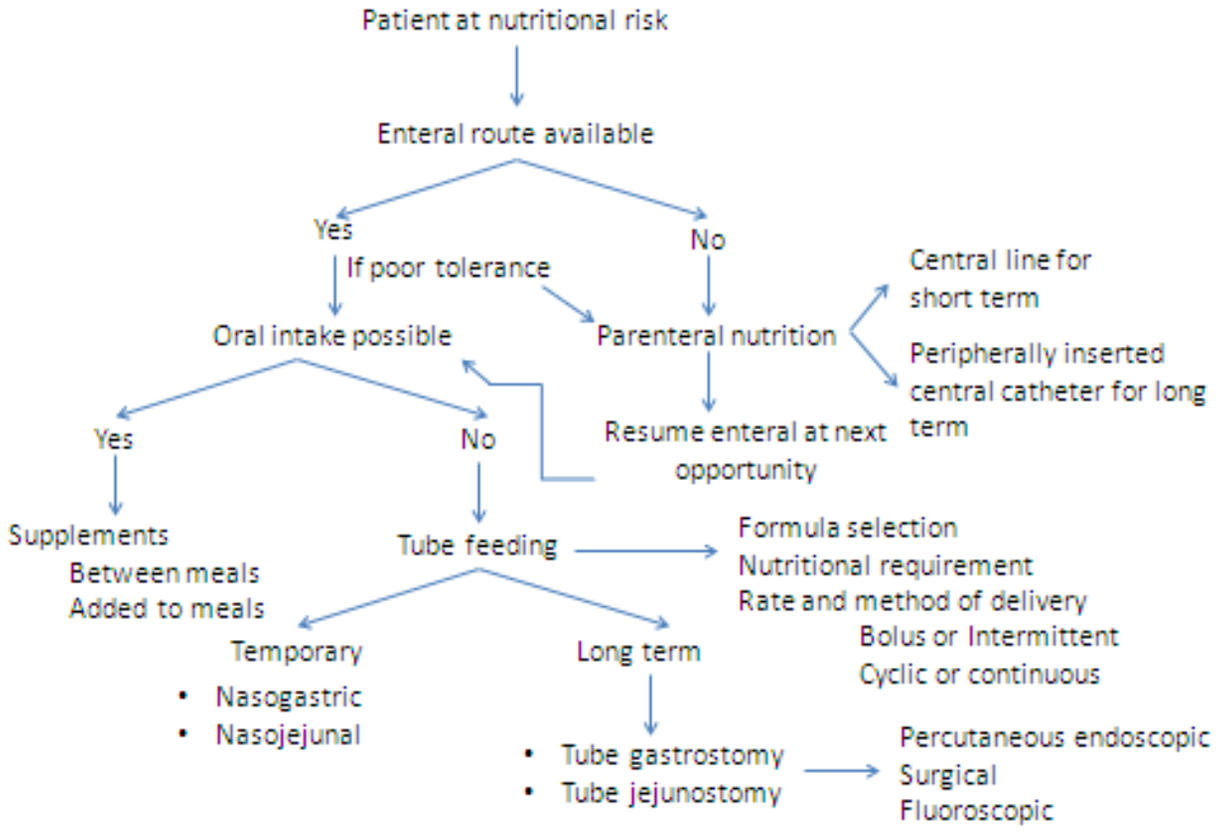


Figure 3. Algorithm of nutritional supplementation

4.2. Feed delivery

Intermittent bolus feeding is convenient to administer by nasogastric or percutaneous gastric tube and is suitable in ambulatory patients. Although there are no definitive studies, bolus feeding reduces lower esophageal sphincter pressure and may increase the chance for reflux and aspiration [32]. Intermittent cyclic feeding is indicated during weaning from tube feeding to oral feeding. It can be pump-assisted or gravity-assisted and feeding cycles of varying duration of period can be planned. This feeding is advantageous when an overnight tube feed is administered and the patient continues his normal oral intake during the day. Constant feeding infusion assisted by pump or gravity is indicated in bedridden patients with critical illness. Nasal tubes are associated with discomfort, excoriation and bleeding, and anosmia. Hence, when long-term feeding is required, percutaneous gastrostomy or jejunostomy tubes should be used. In a United Kingdom study involving 1,327 patients including 1,027 patients with gastrostomy tube insertion, Kurien M et al. has demonstrated that patients who undergo gastrostomy have significantly lower mortality than those who defer the procedure (11.2% vs. 35.5% at 30 days and 41.1% vs.74.3% at 1 year, $p<0.0001$) [33]. The most common indication of feeding gastrostomy remains inadequate swallowing as a result of a neurological event, oropharyngeal or esophageal cancer, or facial trauma [34]. Traditionally, tube feeding is delayed until the next day after the procedure. Authors' personal preference is to institute the feeding at the next opportunity. In a meta-analysis of six randomised controlled trials involving 467 patients, Bechtold ML et al. has shown that early feeding (defined as within 4 hrs) after percutaneous endoscopic gastrostomy placement was safe [35]. In patients with restricted mouth opening, oral cavity is inaccessible and a surgical gastrostomy needs to be created. Feeding gastrostomy is associated with the risk of aspiration and is not possible in patients with gastric outlet obstruction, gastroparesis, or gastric resection. In such patients, feeding jejunostomy is an alternative. Percutaneous feeding jejunostomy can also be inserted via the existing gastrostomy site. Percutaneous placement of feeding jejunostomy is technically difficult compared to gastrostomy. In a study involving 150 patients without a previous history of major abdominal surgery, Shike M et al. found that direct percutaneous endoscopic jejunostomy was successful in 129 procedures (86%) and aspiration occurred in 3% of patients [36]. Enteral nutrition preserves the gut integrity, reduces bacterial translocation, maintains the gut immune function, is easily administered and monitored, and cheaper compared to parenteral nutrition. However, it can also lead to complications.

4.3. Enteral nutrition: Common issues

Enteral nutrition causes mechanical problems with tube placement (migration, clogging etc.), metabolic problems (osmotic diarrhoea, overhydration, etc.), and is labour intensive (tube management, infusion pump device usage, etc.). In patients with tube feeding, prior to commencing feeding, a radiological confirmation of tube placement must be checked. Tube clogging could be prevented by using a wide tube, flushing the tube with water after medicine administration, minimising gastric aspirates to keep pH levels low, and using pancreatic enzymes mixed with bicarbonate [37]. Peristomal wound infections and leakage are also common problems associated with tube feeding and add to patient and family anxiety along

with the nursing care burden [38]. In a Cochrane review with a pooled analysis of 1,271 patients from 12 randomised controlled trials, Lipp A et al. have shown that administration of prophylactic systemic antibiotics for percutaneous endoscopic gastrostomy tube placement reduces peristomal infection rates (OR 0.36, 95% CI: 0.26–0.50) [39]. Peristomal leakage can be reduced by appropriate fixation technique and antisecretory agents. In patients with persistent leakage, the tube should be withdrawn and replaced after few days or a new tube placed at the separate site, but no attempt should be made to control the leakage with a wider tube as it may exacerbate the leakage [40–42]. Diarrhoea remains the commonest gastrointestinal side effect of enteral tube feeding [43, 44]. Addition of fibre and probiotics has shown to reduce diarrhoea in enteral feeding. In a systematic review and meta-analysis including 51 studies, 43 randomised control trials and 1,762 subjects (1,591 patients and 171 healthy volunteers), Elia M et al. have shown that fibre supplementation was generally well tolerated and the incidence of diarrhoea reduced (OR 0.68, 95% CI: 0.48–0.96; 13 randomised control trials) [45]. In a randomised double blind placebo controlled trial involving 62 patients, Heimburger DC et al. have shown that most cases of diarrhoea in tube fed patients are caused by factors extraneous to tube feeding and lactobacillus treatment did not alter the risk of diarrhoea [46]. Patients on enteral feeding are also at risk of aspiration pneumonia. There are various strategies recommended to reduce the risk of aspiration namely head end of bed elevation, gastric residual volume measurement and postpyloric feeding. In a prospective randomized study involving 38 patients in medical and surgical intensive care units, endoscopically placed feeding jejunal tube-fed patients had a lower rate of pneumonia (nil vs. 10.5%) compared to patients fed by continuous gastric tube feeding [47]. In a literature review of 45 studies including patients with neurogenic oropharyngeal dysphagia over a period of 1978 to 1989, authors were not able to derive any meaningful conclusions with regard to superiority of postpyloric feeding due to limitations of individual studies with small sample size, inconsistent definitions of aspiration, varying feeding protocols, unspecified time frames, and heterogeneous populations [48]. Monitoring enteral nutrition involves fluid electrolyte balance, weight chart, serum electrolyte and glucose measurement, and stool charting. Refeeding syndrome is characterised by electrolyte depletion, fluid shifts, and glucose derangements that occur on reinstitution of nutrition in malnourished patients [49]. Chronically malnourished patients (e.g., patients with dysphagia) are at high risk of refeeding syndrome. In a study involving 321 patients with 92 patients at risk of refeeding hypophosphataemia, Zeki S et al. has shown that refeeding hypophosphataemia is more common in enteral-fed patients compared to parenteral nutrition [50]. Gradual introduction and progression of feeding over a few days with close monitoring of fluid and electrolytes can help in the prevention and early recognition of refeeding syndrome.

National Institute of Clinical Excellence (NICE) guidelines recommend that in an acute setting, if patients are unable to swallow safely or meet caloric needs orally, they should have an initial 2–4 week trial of nasogastric enteral tube feeding. Health care professionals with relevant skills and training in the diagnosis, assessment, and management of swallowing disorders should assess the prognosis and options for future nutrition support [19]. Before modifying nutritional support in a patient with dysphagia, level of alertness, need for feeding assistance, mobility, recurrent chest infections, metabolic needs, etc. should be considered [19].

5. Parenteral nutrition

In patients with short bowel or gastrointestinal intolerance, total parenteral nutrition is required. In general, parenteral nutrition should be considered if energy intake has been, or is anticipated to be, inadequate (<50% of daily requirements) for more than 7 days and enteral feeding is not feasible. Total parenteral nutrition requires labour-intensive monitoring for infection and haemodynamic stability. Metabolic complications, such as fluid overload, hypertriglyceridemia, hypercalcemia, hypoglycaemia, hyperglycaemia, and specific nutrient deficiencies, are usually caused by overzealous or inadequate nutrient administration. Catheter-related blood-borne infection is the most common life-threatening complication in patients who receive total parenteral nutrition and is commonly caused by *Staphylococcus epidermidis* or *Staphylococcus aureus* [51]. In a study involving 331 central venous catheters used for home parenteral nutrition with a median duration of 730 days, Buchman AL et al. have demonstrated increased rates of catheter-related blood-borne infections in patients receiving lipid emulsions, obtaining blood from catheter and administering medications via the catheter [52]. The incidence of most complications associated with the use of total parenteral nutrition is reduced with careful management and supervision, preferably by an experienced nutrition support team if available [53].

6. Nutrition support team

An interdisciplinary nutrition support team could include physicians, dieticians, pharmacists, and nurse clinicians. In a study involving 209 parenteral nutrition starts, Trujillo EB et al. have showed that non-indicated and preventable parenteral nutrition initiation, short-term (defined as less than 6 days) parenteral nutrition use and metabolic complications are less likely (34% vs. 66%, $p = 0.04$) when patients receive consultation by a multidisciplinary metabolic support service [54]. Nutritional support teams closely work with speech and swallowing assessment teams locally at Tan Tock Seng Hospital. In patients with non-obstructive dysphagia, video-fluoroscopy swallowing study is conducted prior to determining the route of feeding. It is possible that patients may be permitted oral feeds and in addition enteral tube feeding to ensure their caloric requirements are met.

7. Conclusion

Dysphagia patients are at risk of malnutrition. Malnutrition worsens during hospitalisation. Nutritional screening and assessment are paramount to improve outcomes. There are various tools to assist in nutritional screening and assessment and it is advisable to use the locally validated tool in clinical practise. Patients with dysphagia have special needs and this need to be considered during initiation and modification of nutrition therapy. Enteral nutrition is recommended wherever feasible. Nutrition support teams and swallowing therapy experts should be involved in all patients with dysphagia who require nutrition therapy.

Supplement

Tan Tock Seng HOSPITAL

Ward	Bed	Unit
Patient Details		

TTSH-Nutrition Screening Tool

Indicators *Refer to instructions overleaf*	**Scoring**	
Diagnosis nutritional risk level	Low	0
	Moderate	1
	High	2
Physical appearance	Normal	0
	Moderately underweight	1
	Severely underweight	2
Diet intake adequacy over past 5 days or more	Normal	0
	Reduced moderately	1
	Reduced severely	2
	Not available	--
Unintentional weight loss over past 6 months	No	0
	Unsure	1
	Yes, 0.5 – 3.0kg	2
	Yes, >3.0-7.0kg	3
	Yes, >7.0kg	4
	Yes, Unsure	2
Total Score*		

***IF SCORE IS 4 OR MORE, REFER TO THE DIETITIAN.**

Name /Sign _____

Date _____

Dietitian contacted _____

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Instructions:. Score the patients for each criterion by referring to the tables below

	High risk = 2		**Moderate risk = 1**		**Low risk = 0**	
Diagnosis	AIDS		Alzheimer' s disease /dementia		Angina	
Nutritional	Burns, major		Cardiomyopathy		Cancer All others	
Risk Level	Cancer GI Tract/ Head & Neck		Chemotherapy		Cardiac disease	
	COPD- unstable		Congestive Heart Failure		COPD stable	
	Dysphagia		Diabetes (Newly Diagnosed)		DM (controlled)	
	Gastro- intestinaI (GI) disease malabsorption/ maldigestion /Ileus GI obstruction /stricture/fistula		Diabetes (Uncontrolled)		Fractures, others	
	Hepatic Coma/encephalopathy		Fractures, major		HIV +	
	Infection -Prolonged/severe		GI diseases all others		Hypertension	
	Neurological severe deficits/coma		Infection with fever		Neurological no deficits	
	Pulmonary disease: Failure requiring ventilation		Liver diseases-other		Peripheral vascular disease	
	Radiation Therapy GI Tract		Nutritional anaemia		Psychological-Others	
	Renal Disease -ARF		Pneumonia		Radiation Therapy: all others	
	Sepsis		Skin ulcers-diabetic, pressure ulcers - stage II		Surgeries all not mentioned	
	SLE flare		Psychological -Eating Disorders			
	Spinal Cord Injury- new		Pulmonary Disease O2 dependant			
	Surgery-GI major		Radiation Therapy H & N			
	Trauma-Head/Multi		Renal Disease- CRF			
	Wounds, non healing		SLE stable			
			Substance abuse			
			Tuberculosis			
	Severely underweight = 2		**Moderately underweight =1**		**Normal = 0**	
Physical Appearance	• Severe loss of fat from triceps (minimal space between fingers) • Hollowing, depression of temples, facial muscle wasting • Protruding, prominent bones		• Mild or moderate loss of fat from triceps and deltoid region • Slight depression of temples, moderate facial muscle wasting • Bones may show slightly		At least normal muscle bulk and fat stores: • Large space between fingers • Rounded shoulders	
	Reduced severely = 2		**Reduced moderately = 1**		**Normal = 0**	
Diet intake adequacy over past 5 days	• Takes less than ½ normal intake or has been NBM • Does not take a diet supplement • Less than 750 to 1000ml of a 1-calorie/ml formula per day via feeding tube or orally		• Takes ½ -3/4 normal intake • Occasionally takes a diet supplement • 1000-1200ml of a 1-calorie /ml formula per day via feeding tube or orally		• No change • Takes formulas to supplement diet • 1200-2000 ml of a 1-calorie/ml formula per day via feeding tube or orally	
Unintentional weight loss	**2**	**4**	**3**	**2**	**1**	**0**
	Yes, Unsure	Yes > 7 kg	Yes > 3- 7 kg	Yes 0.5 - 3kg	Unsure	No

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