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## **Nutritional diet plan for patients with dysphagia**

doi: 10.6133/apjcn.202105/PP.0005

Published online: May 2021

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## ABSTRACT

**Background and Objectives:** To present a new method of text-modified food management for patients with dysphagia that integrates the idea of food exchange. In addition to prioritizing nutrition in each recipe, the diet plan emphasizes straightforward preparation methods that balance nutrition and palatability. **Methods and Study Design:** On the basis of the recommended intake in the Expert Consensus, the design of the texture-modified food incorporates the concept of equivalent food exchange. The plan consists of a staple food, a meat, a vegetable, a snack, and a fruit as the base units, and the volume and nutrient density of each unit is modified to meet the needs of patients with dysphagia. **Results:** Five categories of standard portions were established, the standard portion of staple foods, milk should be used instead of water during preparation, and carbohydrate components (dextrin) should be added so that each portion provides approximately 200 Kcal of energy. The standard portion of meat, protein components (90% whey) should be added to provide approximately 14 g of protein and 150 Kcal of energy per portion. Two types of standard snacks are recommended, each serving provides 250 Kcal of energy. Vegetables and fruits provide 70 Kcal and 90 Kcal of energy. We compiled 19 recipes representative of the food exchange system and our recipe design priorities (texture modification, sufficient nutrition, color, fragrance and taste). **Conclusions:** The method is combined theory and practice and can be applied to clinical nutrition work to promote the nutritional intake of patients with dysphagia.

**Key Words:** texture-modified food, food exchange for dysphagia, taste, appearance, dietary nutrition management

## INTRODUCTION

Older adults often experience physiological function impairments, especially in their ability to chew and swallow. The European Society for Swallowing Disorders and the European Society of Geriatrics classify dysphagia as a geriatric symptom, and dysphagia in older adults has gradually become a subject of wider study.<sup>1</sup> Several conditions, such as stroke, traumatic brain, head and neck cancer, and neurodegenerative diseases, can prevent patients from eating normally. The incidence of dysphagia is high, and the condition can lead to aspiration, aspiration pneumonia, malnutrition, and other complications. Both malnutrition and dysphagia affect patients' functional status and prognosis, and patients with both conditions have poor outcomes.<sup>2</sup>

When planning rehabilitation treatment for patients with dysphagia, dietary management must be addressed first. A proper understanding of appropriate foods for patients with dysphagia can improve the safety and effectiveness of treatment. Texture-modified is an effective method and is recommended by major guidelines worldwide. Several developed nations have created preliminary standards for addressing swallowing disorders, such as the classification of foods created by the Japanese Society of Dysphagia Rehabilitation in 2013.<sup>3</sup> In 2019, China issued the Chinese Expert Consensus on Food and Nutrition Management for Dysphagia (Expert Consensus)<sup>4</sup> which recommended that patients with dysphagia receive standardized dietary nutrition management to improve their nutritional status by easing oral intake, reducing residue left after swallowing, preventing aspiration, and achieving oral intake as quickly as possible.

Texture-modified foods are usually softened by being cooked with a relatively large amount of water and therefore provide lower nutritional content than conventional diets, possibly contributing to the undernutrition of patients with dysphagia.<sup>5-10</sup> Patients may need to consume a volume of food that exceeds the tolerance of their gastrointestinal tract to achieve the same nutrient level as a regular diet would.

The purpose of this study is to provide a new pureed diet management system for patients with dysphagia under the guidance of expert consensus. In addition to focusing on the nutritional content of recipes, the diet plan also prioritizes manageable preparation methods that balance nutrition and palatability (texture, taste, and appearance). This method can be used by hospitals, institutional canteens, and patients and their families to plan a balanced menu.

## **MATERIALS AND METHODS**

### ***Standard portions for food exchange***

#### **Classification of foods**

The food exchange method is centered on the idea of diverse and balanced nutrition, which is reflected in the recipes provided. Foods are divided into five categories: staple foods, meats, vegetables, snacks, and fruits.

#### **Representative foods**

One or two representative foods are chosen from each category. The representative foods should be commonly consumed in daily life and be in the same food sorting area near the median.

### **Determination of standard portion size**

The ingredients for one portion of each type of texture-modified food is be determined according to the patient's eating habits and the volume of each meal. The weight of each portion is similar to that of conventional food, and the nutritional content of a standard portion of each type of food is calculated.

### ***Design and preparation of standard recipes for each category***

#### **Cereal recipes**

According to the recommendations of the Expert Consensus, each portion of cereal should be 25 g, and the representative food is rice.

Preparation method: The most commonly used cereal is porridge. With a 1:2 ratio of rice to water, the appropriate amount of food texture modifier is added and blended with a food processor.

#### **Meat recipes**

According to the recommendations of the Expert Consensus, each portion of meat should weigh 50 g, and the representative food is lean pork.

Preparation Method: Add water or soup to the cooked dish with a food to water (or soup) ratio of 1:1. Add the appropriate amount of food texture modifier and blend with a food processor. The thickness of the pureed food is usually determined by the weight of the commercial thickener.

#### **Vegetable recipes**

According to the recommendations of the Expert Consensus, a portion of vegetables should weigh 125 g, and the representative food is spinach.

Preparation Method: Use traditional vegetable dishes as a model and change the texture of the food. Because the moisture content differs for each vegetable, the ratio of food to water (or vegetable juice) should be adjusted according to the moisture content of the vegetable (generally 1 to 0.6–0.8). Add the appropriate amount of food texture modifier and blend with a food processor.

#### **Fruit Recipes**

According to the recommendations of the Expert Consensus, a portion of fruit should weigh 200 g, with oranges being the representative fruit.

Preparation Method: Because fruits have a high water content, no additional water is required when making fruit purees. Add the appropriate amount of food texture modifier and blend with a food processor.

### **Snack recipe A**

According to the recommendations of the Expert Consensus, 160 mL of milk, 60 g of eggs, or 25 g of mixed beans should be added to the recipe for each snack. Add the appropriate amount of food texture modifier and blend with a food processor.

### **Snack recipe B**

Design a high energy density oral nutritional supplement (ONS) formula using foods for special medical purposes (FSMPs) and use 50 g of FSMPs per portion.

### **Sensory traits**

Color, fragrance, and flavor are essential when cooking food for patients with dysphagia. Both the taste and appearance of a dish are crucial. Imitating the appearance of traditional dishes can increase the patient's appetite as well as their enjoyment of the food.

The amount of food and satiety of each meal must also be considered when designing recipes.

## **RESULTS**

### ***Standard portions of texture-modified food***

In the formula for the standard portions of staple foods, milk should be used instead of water during preparation, and carbohydrate components (dextrin) should be added to the formula so that each portion of staple food provides approximately 200 Kcal of energy.

In the formula for the standard portion of meat, protein components (90% whey) should be added to provide approximately 14 g of protein and 150 Kcal of energy per portion.

Two types of standard snacks are recommended. Type A recipes consist of between-meal desserts made of cereals, eggs, or mixed beans. Type B recipes consist of ONS made from FSMPs, with each serving providing 250 Kcal of energy.

Vegetables and fruits provide 70 Kcal and 90 Kcal of energy, respectively.

### ***Food exchange for each caloric intake level***

Table 2 lists the exchange portion for each food group that satisfy the requirements of various caloric intake levels.

### ***Recipes for standard portions***

The diet was designed to offer portions of texture-modified food similar in volume to regular foods that satisfy both nutritional and textural requirements, do not sacrifice the taste and appearance of dishes, highlight the flavor of the original ingredients, and arouse patients' appetites. The diet consists of three basic staple food recipes, five meat recipes, four vegetable recipes, five dessert recipes, and one FSMP recipe (Figure 1-6).

#### **Recipes for standard portions of staple foods**

The recipes for staple foods are based on Chinese recipes. Each recipe can be adapted to multiple recipes according to the patient's tastes.

#### **Recipes for standard portions of meat**

The meat dishes are based on Chinese recipes. Each recipe can be adapted to multiple recipes according to the patient's tastes. For example, curry chicken nuggets can be adapted to braised beef, curry beef, or chicken curry. Shredded pork with green pepper can be adapted to shredded beef with green pepper, chicken with green pepper, or shredded beef with onion.

#### **Recipes for standard portions of vegetables**

The recipes for leafy vegetables, root vegetables, solanaceous fruits, fresh beans, fungi, and algae are based on Chinese recipes. Each recipe can be adapted to multiple recipes according to the patient's tastes. For example, leafy vegetables such as lettuce can be replaced with spinach and other leafy vegetables. Solanaceous such as towel gourd can be replaced with cucumbers and tomatoes. Root vegetables such as lotus root can be replaced with potatoes and yams.

#### **Recipes for standard portions of fruits**

The recipes for fruits are based on Chinese recipes. Each recipe can be adapted to multiple recipes according to the patient's tastes.

#### **Recipes for standard portions of snacks (A)**

The recipes for snacks (A) are based on Chinese traditional snacks.

### **Recipes for standard portions of snacks (B)**

The recipes for snacks (B) are based on ONSs. The ONSs are made with FSMPs.

### ***Preparing a menu using the dysphagia food exchange method (1800 Kcal)***

Table 9 shows a sample meal plan following the standard food exchange portions (1800 Kcal).

## **DISCUSSION**

Dietary management for patients with dysphagia involves designing standardized recipes, improving the appearance and taste of food, improving the quality of meals, and logically organizing their meals. These steps can prevent patients with dysphagia from having insufficient nutritional intake and ensure the maintenance of a healthy nutritional status.

### ***Design of pureed recipes with food exchange system***

The food exchange method can be used in dietary management for patients with diabetes as well as other conditions involving restrictions on certain foods.<sup>11</sup> The diet described in this report uses the idea of food exchange to cater to the needs of patients with dysphagia by creating a faster and easier system for preparing a menu of dishes that balance both nutrition and texture.

### ***Design of standardized recipes with high energy density***

The amount of food in each meal should be similar to that in a regular diet. In addition, the energy density of each meal should be increased to ensure an adequate supply of energy and macronutrients. Studies have shown that the body's ability to regulate energy intake is more sensitive to volume and weight than to that of energy density.<sup>12-13</sup> In other words, because food intake remains the same regardless of energy density, increasing energy density is a beneficial and feasible strategy, especially when patients have a low appetite and require nutritional support.<sup>12-14</sup>

Other strategies include adding energy-rich supplements such as dextrin, fat and whey protein. A high-energy diet containing natural ingredients has several advantages:<sup>5</sup> (1) easy adjustability for elderly patients not consuming other nutritional supplements, (2) easy preparation of meals in any hospital or nursing home kitchen, (3) inexpensively increasing the energy content of food.

In addition, adding fat as a means of nutritional fortification can also improve the taste of food. Although a diet's fat to energy ratio should generally not exceed 50%, patients who require more energy may benefit from this diet in the short-term. Fats with an excellent fatty acid composition, such as coconut oil rich in medium-chain fatty acids, linseed oil rich in n-3, and olive oil rich in monounsaturated fatty acids, can increase energy density. Furthermore, certain nutrient deficiencies caused by insufficient intake can be resolved by adding nutritional supplements directly to foods, thus ensuring the maintenance of a proper nutritional status.

### ***Improving flavor and texture***

Food intake has two purposes: nutrition and enjoyment. The first is a physiological need, and the second is a psychological one. Usually, food intake is positively correlated with the degree of hunger. Several existing diets allow patients to choose from a wide range of ingredients, preparation methods, and flavors to suit their preferences. However, because patients with dysphagia may even need more taste than appetite (i.e., the better the food tastes, the more you eat).<sup>15</sup> Therefore, in addition to softness, uniformity of texture, richness, viscosity, and ease of chewing and swallowing, the appearance of a dish should also stimulate appetite and allow the patient to anticipate a dish's flavor. A report by Cassens et al. compared standard pureed food with 3-D and molded purees. After modification, the molded purees better resembled the original appearance of that food. The taste, texture, and appearance markedly improved, making such food more palatable to patients and more convenient for nurses to feed such patients. The results of the report indicated that food intake increased by 15%, energy intake increased by 41%, and protein intake increased by 36%.<sup>16</sup> A study by Germain et al. also found that the average weight of patients in the treatment group increased by 3.9 kg, whereas the control group lost an average of 0.8 kg.<sup>17</sup> The recipes in this study incorporated the patients' tastes in the design of the color, aroma, taste, and shape of the food.

### ***Designing between-meal snacks and ONS to ensure sufficient daily energy and nutrition***

The time between patients' breakfast and lunch is often too short (approximately 3–4 h), and the time between dinner and breakfast can be more than 12 h. Therefore, high-energy between-meal snacks with proper textures are crucial to satisfying nutritional requirements.<sup>18</sup> Normally, morning and afternoon snacks consist of small cakes and fruits, and the evening snack may consist of a glass of milk or yogurt and biscuits. However, for patients with



dysphagia, eating small and energy-rich snacks between meals can promote maximal nutritional intake, especially for patients with poor appetite.<sup>18-19</sup>

If a patient's daily dietary intake does not reach 60% of the target requirement, ONS should be used. The recommended amount of ONS should be sufficient to achieve the recommended daily intake of energy and protein, or at least 400–600 Kcal more than the required daily caloric intake.<sup>4</sup>

In summary, this report describes a diet created to meet the needs of patients with dysphagia that incorporates the idea of food exchange to provide a balanced menu of safe-to-eat, nutritional, and delicious dishes. The menu is the result of combining theory and practice and can be applied to clinical nutrition work to promote the nutritional intake of patients with dysphagia.

## **ACKNOWLEDGEMENTS**

We are very grateful to all the participants who have participated in this study.

## **CONFLICT OF INTEREST AND FUNDING DISCLOSURE**

The authors declare that there are no conflicts of interest exist in relation to the publication of this paper.

This study was funded by the Shanghai Municipal Health System Important and Weak Discipline (Clinical Nutrition) Project (No. 2019ZB0102).

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**Table 1.** Composition and nutritional content of the five food categories

Group, food category	Representative food	Weight per portion (g)	Energy (Kcal)	Protein (g)	Fat (g)	Carbohydrate (g)
Staple			200	5.0	3.2	37.0
Cereals	Rice <sup>†</sup>	25				
Milk	Milk	100				
Component	Dextrin	15				
Snack A			250	16.0	11.0	26.0
Cereal	Bread <sup>†</sup>	35				
Eggs/beans	Egg/ red bean	60/25				
Milk	Milk	160				
Snack B (ONS)			250	8.0	8.0	30.4
FSMP	Commercial powder	50				
Meat			150	14.0	11.0	0
Meat	Lean pork <sup>†</sup>	50				
Component	Protein powder	5				
Oil	Olive oil	5				
Vegetables			90	1.3	7.0	4.3
Vegetables	Cabbage <sup>†</sup>	125				
Oil	Olive oil	7				
Fruits			90	1.0	-	21.0
Fruits	Orange <sup>†</sup>	200				




<sup>†</sup>The same type of food shall be substituted using the food exchange method.

**Table 2.** Food exchange portions according to caloric intake



Energy (Kcal)	Staple (portion)	Meat (portion)	Vegetable (portion)	Fruit (portion)	Snack A (portion)	Snack B (portion)
1400	3	2	2	1	1	0
1600	3.5	2.5	2	1	0.5	0.5
1800	4	3	2	1	0.5	0.5
2000	4.5	3.5	2	1	0.5	0.5

**Table 3.** Recipe plan for 1800 Kcal intake





Time of meal	Food category	Food portion	Description of formula
Breakfast	Staple	1	Rice 50 g, milk 100 ml, dextrin 30 g
	Snack A	0.5	Red beans 15g, milk 80 g, sugar 15 g
In-between-meals	Fruit	1	Orange 200 g
Lunch	Staple	1.5	Rice 75 g, milk 150 ml, dextrin 45 g
	Meat	1.5	Shrimp 75 g, whey 7.5 g, olive oil 7.5 g
	Vegetable	1	Cabbage 125 g, olive oil 7 g
In-between-meals	Snack B	0.5	Commercial powder 25 g
Dinner	Staple	1.5	Rice 75 g, milk 150 ml, dextrin 45 g
	Meat	1.5	Fish 75 g, whey 7.5 g, olive oil 7.5 g
	Vegetable	1	Cucumber 125 g, olive oil 7 g

Menu (portion)	Description of formula
Rice Porridge(1.0) 	rice 50 g, milk 100 ml, dextrin 30 g commercial thickener: 0.8 g
Powdered Rice Porridge (1.0) 	baby rice powder 25 g, milk 150g, dextrin 15 g commercial thickener: 0.8 g
Noodle (1.0) 	noodle 100 g, milk 50 ml, dextrin 25 g commercial thickener: 1.5 g

**Figure 1.** Recipes for standard portions of staple foods. All weights represent the weights of cooked food.

Menu (portion)	Description of formula
chicken curry (1.0) 	chicken 50 g, water 50 g, whey 5 g; commercial thickener:1.5 g olive oil 5 g, salt: pinch, curry: pinch
pork, green pepper and Carrot stir fry (1.0) 	lean pork 50 g, water 50 g, whey 5 g; commercial thickener:1.5 g green pepper 25 g, water 15 g; commercial thickener:0.4 g carrot 25 g, water 15 g; commercial thickener:0.4 g olive oil 5 g, salt: pinch
cabbage wrapped meat (1.0) 	cabbage 50 g, water 30 g, commercial thickener:1.0 g lean pork 50 g, water 50 g, whey 5 g; commercial thickener:1.5 g olive oil 5 g, salt: pinch
shrimp (1.0) 	shrimp 50 g, water 50 g, whey 5 g; commercial thickener:1.5 g olive oil 5 g, salt, sugar, tomato sauce: pinch
tomato fish (1.0) 	fish 50 g, water 50 g, whey 5 g; commercial thickener:1.5 g tomato 50 g, water 50 g; commercial thickener:1.0 g olive oil 5 g, salt: pinch

**Figure 2.** Recipes for standard portions of meat. All weights represent the weights of cooked food.

Menu (portion)	Description of formula
towel gourd with edamame (1.0)	towel gourd 100 g, water 80 g; commercial thicker:1.5 g green soybean 10 g, water 10 g; commercial thicker:0.15 g olive oil 5 g, salt: pinch
	
spinach (1.0)	spinach 125 g, water 100 g commercial thicker:1.5 g olive oil 5 g, salt: pinch
	
bamboo shoots (1.0)	bamboo shoots 125 g, water 100 g; commercial thicker:1.5 g olive oil 5 g, salt: pinch
	
lotus root with fungus (1.0)	Lotus root 40 g, water 40 g; commercial thicker:0.8 g fungus 10 g, water 10 g; commercial thicker:0.2 g olive oil 5 g, salt: pinch
	

**Figure 3.** Recipes for standard portions of vegetables. All weights represent the weights of cooked food.


Menu (portion)	Description of formula
Orange (1.0)	Orange 200 g commercial thicker:4.5 g
	

Figure 4. Recipes for standard portions of fruits.






Menu (portion)	Description of formula
glutinous rice balls (0.5)	grain 25 g, milk 80 ml, peanut butter 5 g commercial thicker 1.3 g
	
Sandwich (0.5)	bread 20 g, milk 80 ml, egg 30 g commercial thicker :1.5 g
	
bean paste (0.5)	read bean 15 g, milk 80 g, water 20 g, sugar 15 g commercial thicker:1.2 g
	
sushi (0.5)	rice 50 g, milk 80 ml; commercial thicker:0.9 g beef 25 g, water 25 g; commercial thicker:0.8 g
	
Cookies(0.5)	bread 20 g, milk 80 g, egg 30 g; commercial thicker:1.0 g
	

Figure 5. Recipes for standard portions of Snacks (A).

Menu (portion)	Description of formula
FSMP(0.5)	ensure 25 g, water 80 g commercial thicker:3.0 g



**Figure 6.** Recipes for standard portions.

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