Progress in Nutrition 2024; Vol. 26, N. 3-4: e2024022 DOI: 10.23751/pn.v26i3-4.15871

A difficult bite: An overview of dysphagia

Elsa Veronica Mignini, Milena Catani, Marco Ferrara, Marina Taus
Dietology and Clinical Nutrition Unit, Azienda Ospedaliero Universitaria delle Marche, Ancona, Italy

Abstract. Dysphagia describes the difficulty in swallowing during the passage of a bolus from the mouth to the stomach or the perception of obstruction during swallowing. It is a symptom of several oncological, neurological or neuromuscular pathologies. Dysphagia can also be found in sarcopenic patients, as a clinical feature of loss of strength and function of swallowing muscles. Diagnosis can be challenging due to the non-specificity of symptoms and the heterogeneity of aetiology and requires a multidimensional approach, comprising screening tools and instrumental assessment. Dysphagia is an issue of nutritional interest since predisposes to malnutrition and dehydration. Dysphagic patients, indeed, are usually not able to cover their nutritional and fluid needs both because of the change in swallowing mechanics and because the nutritional value of texture-modified diets. A well-structured nutrition plan needs a multidimensional approach developed by a multidisciplinary tea, who firstly define the nutritional needs, work on the adequate nutritional plan, then predispose a well-organized follow-up. Food fortification, in-between-meal nutritious snacks and oral nutritional supplements, artificial nutrition, preferably enteral nutrition through nasogastric tube or gastrostomy are the essential steps of nutritional management of dysphagic patients.

Key words: dysphagia, artificial nutrition, malnutrition, dehydration, texture-modified diets, oral nutritional supplements

Introduction

Dysphagia is a common clinical problem, which usually describes the subjective awareness of difficulty in swallowing during the passage of a bolus from the mouth to the stomach or the perception of obstruction during swallowing. It is not a pathology itself but a symptom, which negatively affects the life and the general functioning of those who suffer from it. Dysphagia is a common manifestation of oncological, neurological or neuromuscular pathologies but can also be a clinical feature of "unsuccessful" ageing so that we can talk about dysphagia also as a geriatric syndrome (1). Indeed, with aging, physiological changes in swallowing function can be accentuated by sarcopenia, that is the age-related decline in muscle mass and strength (2). Plus, dysphagia can be further worsened by disease like stroke or Parkinson's disease common to the aging population (3). Epidemiological data are not unanimous, since the prevalence of dysphagia varies widely depending on age, clinical setting, definition criteria, measurement tools. A review from the Journal of nutrition, health and aging found a prevalence of dysphagia ranging from 5% to 72% in the community-dwelling elderly population (age > 60 years), although if only good quality studies were considered, prevalence was 15% (4). Another systematic review by Takizawa on specific disease population showed that dysphagia affects 8–45% of patients after stroke, 11–60% of patients with Parkinson's disease and 27–30% of patients with traumatic brain injury (5). Rivelsrud and colleagues pointed out the lack of clear data about the prevalence of dysphagia in hospitals, rehabilitation, nursing home, or palliative healthcare settings. Revealing that data

could increase healthcare professionals' awareness of the likelihood of dysphagic patients/residents and aid policy makers when assessing the allocation of interdisciplinary resources to meet the needs of these patients. From these premises, they recently published a meta-analysis showing a prevalence of 36.5% in the hospital setting, 42.5% in the rehabilitation setting and 50.2% in nursing home (6). Dysphagia, if downplayed and undertreated, has several serious medical consequences, such as malnutrition, dehydration and pneumonia (7). Indirectly, it results in increased institutionalization; increased length of hospital stays or hospital re-admissions (8); decreased quality of life issues, social isolation (9) and poorer survival outcomes (8).

Classification

Dysphagia may be the consequence of functional or structural abnormalities of the oral cavity, pharynx, oesophagus, and/or gastric cardia. Dysphagia can be classified in oropharyngeal and oesophageal according to aetiology, radiologic evaluation and more importantly to its potential treatment (10) (Table 1).

- Oropharyngeal dysphagia can be referred as the patient's sensation of blockage or discomfort in the throat. It can be functional or structural (due to tumor, webs, extrinsic masses, or cervical spine disease). Most common causes are pathological conditions of pharynx (for example, Zenker diverticulum), esophagus, or gastric cardia, as well as neurological disorders (stroke), head and neck surgery, radiotherapy (11).
- Conversely, patients affected by oesophageal dysphagia may experience a sensation of discomfort or blockage in the region of the thoracic oesophagus), as well as odynophagia, chest pain, heartburn. Substernal dysphagia may be due to an oesophageal motility abnormality (functional) or due to organic defect of extrinsic mass (structural) (12). Gastro-Esophageal Reflux Disease (GERD) may also be present.

Furthermore, even some infections - herpesvirus, human immunodeficiency virus (HIV), cytomegalovirus (CMV), candidiasis –may lead to dysphagia. Dysphagia may also be drug-induced, for example by opioids, tricyclic antidepressants, muscle relaxants, anxiolytics (13).

Table 1. Dysphagia classification (53).

Dysphagia	
Oropharyngeal	**Oesophageal**
Structural	*Structural*
Zenker's diverticulum Congenital abnormities Post head and neck surgery Chemotherapy mucositis Radiation Corrosive injury Infection	Esophagitis (infectious, eosinophilic) Caustic injury Chemotherapy mucositis Sclerotherapy Chron's disease Bechet's syndrome Bullous pemphigoid Lichen planus Esophageal web/strictures Hiatal hernia Extrinsic compression Surgical stenosis Congenital oesophageal stenosis
Neurogenic Cerebral vascular accident Parkinson's disease Amyotrophic lateral sclerosis Guillain-Barré syndrome Huntington's chorea Post polio syndrome Multiple sclerosis Cerebral palsy Sarcopenia	
Myogenic Myasthenia gravis Mixed connective tissue disorders Paraneoplastic syndrome Myotonic dystrophy Sarcoidosis	 GERD with weak peristalsis Achalasia Diffuse oesophageal spasm Scleroderma

Diagnosis

Diagnosis of dysphagia can be challenging due to the non-specificity of symptoms and the heterogeneity of aetiology and requires a multidimensional approach (14). In some countries, diagnosis – or at least, the diagnostic suspicion – can be made by general practitioners (GP) and screening tests can be administered also by trained nurses. The entire act of swallowing

Table 2. Dysphagia and Outcome Severity Scale (DOSS) - adapted from Nishimura K et al.: Accuracy of DSS rating without VE (20).

Level	Description	
7 within normal limits	No symptoms of dysphagia	No diet modifications No compensatory strategies
6 minimum problems	Some symptoms of dysphagia but no need for rehabilitation or exercise	No diet modifications Longer mealtime may be needed Independent and spontaneous compensations
5 oral problems	Significant symptoms in the pre-oral anticipatory stage or oral stage without aspiration	Minimum supervision Diet modification with soft or paste foods
4 occasional aspiration	Possible aspiration or aspiration is suspected due to pharyngeal residue.	Compensatory strategies Dietary modifications for one or two consistencies
3 water aspiration	Aspiration of thin liquids; change in food consistency is effective.	Need for assistance, supervision and strategies Dietary modifications for two or more consistencies Food retention in pharynx or mouth Clinical signs of aspiration/penetration
2 food aspiration	Food aspiration with no effect from compensatory techniques or food consistency change	Severe food retention Aspiration for two or more food textures No cough reflex
1 saliva aspiration	Unstable medical condition due to severe saliva aspiration.	Nihil per os – need for artificial nutrition Severe food retention Silent aspiration for two or more food textures Intentional cough is not functional Inability to swallow

should be examined, and this is made possible by clinical evaluation and by instrumental assessment. The former is comprehensive of inquiry of quality and sound of patient's voice, the inspection of soft palate and mouth, tongue and lips to detect potential abnormalities in motor function, observation of patient's jaw, masticatory and swallowing capacity, sialorrhea or hypersalivation (15). Another important part of clinical evaluation is the "bedside swallowing examination" (BSE), which analyse the level of consciousness, trunk and neck control, some movements, sensitivity, some reflexes (16) and it is completed by the water swallow test (17).

Furthermore, other assessment tools to screen, evaluate and quantify the dysphagia are:

- Swallowing Disturbance Questionnaire (18)
- Eating Assessment Tool (EAT-10) (19)
- Dysphagia Outcome and Severity Scale (DOSS), a 7-point scale developed to systematically rate the functional severity of dysphagia based on objective assessment (20) (Table 2). Instrumental assessment can be radiological through videofluoroscopy and more often by endoscopy through fiberoptic endoscopic evaluation of swallowing (FEES), which is cheaper and does not require radiation (21). FEES has several advantages since it allows classifying the degree of aspiration based on the 8-point penetration and aspiration scale (PAS) (22) and it identify the silent aspiration, which is particularly dangerous because it consists of aspiration without triggering the cough reflex (23).

Other diagnostic tools are high-resolution manometry (HRM), oral-pharyngo-oesophageal scintigraphy (OPES), pH-metry and manometry in case of suspected gastroesophageal reflux (24).

Another important step for dysphagia evaluation is the recognition of the patient's insight on the burden of living with specific symptoms and this is made

possible using patient-reported outcome measures (PROMs) (25). To date, there are upwards of 30 tools currently available in literature applicable to dysphagia. They are useful to explore the impact of dysphagia on quality of life and evaluate the effectiveness of treatment and intervention approaches (26). Recent research on the International Journal of Language & Communication Disorders showed that participants considered that dysphagia and its interventions reduced their quality of life, due to reduced physical safety, reduced choice and control, poor mealtime experiences, poor social engagement. Article concluded that health professionals should engage in open communication with their clients, recommending interventions that are more acceptable and finding facilitator factors to enhance their quality of life (i.e. enhancing autonomy and control in designing mealtime, adaptability of mealtime, coping with swallowing difficulties so that they do not interfere with social life) (27).

Management of Dysphagia

Treatment of dysphagia consists of either compensatory or rehabilitative approaches. The former includes modification of food texture or feeding posture, the latter includes behavioural exercises or sensory stimulation. The goals of dysphagia management are to maintain adequate nutritional intake preventing malnutrition and dehydration and to avoid respiratory sequelae related to aspiration (28). We will obviously focus our attention on nutritional intervention. The first attempts of improve swallowing safety through modification of food and liquid consistency date back to 1970s. These studies underlined that proper dimension, and viscosity may reduce the risk of misdirection of bolus during swallowing, changing the duration, extent and timing of movements of oropharyngeal structures as well as the dynamics of bolus flow (29). Other data confirm that increasing bolus viscosity can reduce the risk of airway penetration in patients with dysphagia (30). However, food consistency adaptation can result in lowered palatability and increased pharyngeal residue, which may subsequently increase the risk of post-swallow aspiration (31). In elderly, modifying taste (e.g. with spice) and temperature (e.g cold drink) has been found to stimulate a more effective swallowing reflex. Speech and language therapists, after accurate evaluation, advice patients about proper modifications of food and drinks to make swallowing safer. Thickened fluids and soft food are easier to swallow and those have been the milestones of the so-called "dysphagia diet". However, until few years ago, there was a great heterogeneity in defining and describing food textures since no specific guideline or internationally accepted definition had been shared nor food industry had not been guided in the production of texture-modified food. Therefore, that huge differences exist among every country and even among hospitals, rehabilitation and nursing home within the same country. Lack of standardization had been a limit for patient safety, proper communication within and between health professionals, healthcare providers and patients and for facilitation of better outcomes. Nonetheless, "speaking different languages" hindered the clinical research in dysphagia field and the evaluation of nutritional treatments (32). To overcome this scenario, in 2012 the International Dysphagia Diet Standardization Initiative (IDDSI) was founded and finally in 2016 the efforts of the group culminated in the dysphagia diet framework, consisting of a continuum of 8 levels (0-7), describing both liquids (from levels 0-4) and foods (from levels 3-7). The IDDSI framework is a visual representation of each level, which is represented by a distinct name, colour and number. It shows different texture-modified food and thickened drink levels that are easily measurable by using eyes, a fork or a spoon (33) (Figure 1).

Nutritional Status and Dysphagia

Patients with dysphagia have a high nutritional risk. Before diagnosis and treatment, difficulties in feeding, chewing or swallowing, longer mealtime led to poor oral intake and weight loss. A Brazilian monocentric study on hospitalized patients found a positive correlation between malnutrition (detected with Mini Nutritional Assessment) and dysphagia, despite there were no statistical differences in energy and protein intake (34). Those data were recently confirmed by Saleedaeng et al who revealed that in their sample

group older adults with dysphagia were 4.8 times more likely to experience undernutrition than those without dysphagia (35). Conversely, some studies affirm that texture-modified diets have lower energy profile since broth or other non-nutritionally complete fluids are used to obtain the right consistence. It means that, with equal volumes, energy and protein content is reduced (36). Moreover, patients may have negative perceptions of meal experience with this type of diet and may be less compliant to healthcare professionals' prescriptions (37). It is essential to carefully evaluate the effective nutritional intake of patients with texture-modified diets in order to optimise nutrition and prevent the risk of unintentional weight loss and malnutrition. Favourable interventions are modifying meal aesthetics by adjusting flavour, texture and consistency (38, 39); meal fortification with nutrient-dense ingredients (40), nutritious in-between meals (41, 42).

With special regard to meal aesthetics and how the organoleptic properties can help increase intake, a recent study highlighted how foods modelled with shapes/moulds or using 3D printers are associated with an increased daily calorie-protein intake, specifically +204 kcal/day ($p = 0.011$) and +18.3 g of protein/day ($p < 0.001$) over a 6-week period (39). If patients fail to achieve adequate protein-calorie intake with texture-modified diets, meal fortification is the additional dietary strategy. Enrichment makes possible to increase energy-protein density and at the same time contains volumes without changing satiety or appetite. This strategy is realized by adding calorie-dense foods such as whole milk, Parmesan, cream, sauces, ice cream, butter, olive oil, or protein powders, glucose polymers, or MCT oil (40). The use of Oral Nutritional Supplements (ONS) is another valid strategy to fill the gap between actual oral consumption and real nutritional

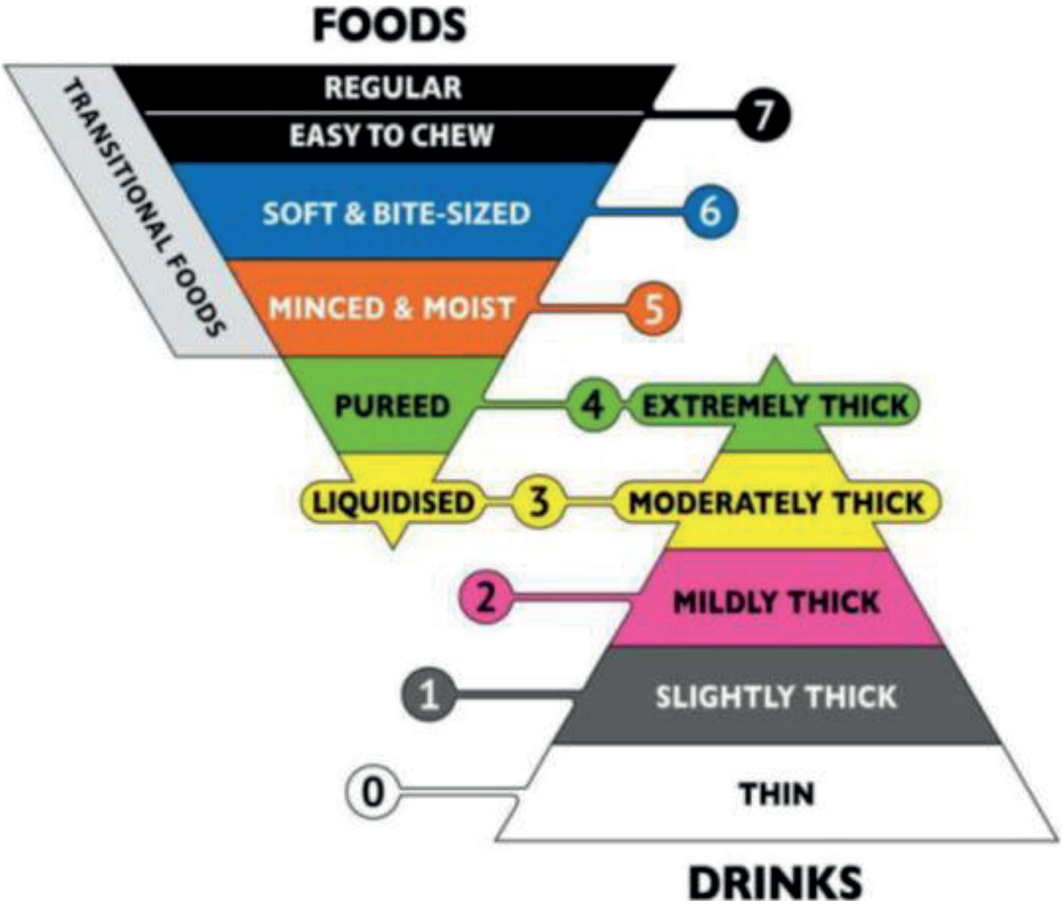

Figure 1. IDDSI framework (33).

requirements. ONS are sterile liquids, semi-solids or powders, which provide macro and micronutrients, they might have a disease specific composition and are prescribable by dietitians to dysphagic patients at high risk of malnutrition (43). Wu et al conducted a multicentre cross-sectional study on patients following texture- modified diets, half of them requiring ONS. The study confirmed that ONS improved macronutrient intake, helped in reaching energy requirements, without reducing the amount of food consumed (44). Although artificial nutrition won't be discussed in this article, we need to mention the central role of artificial nutrition in dysphagia. As many guidelines stated, enteral nutrition should be preferred to parenteral nutrition (intravenous delivery), unless the gastrointestinal (GI) tract is not well functioning. Enteral tube feeding is generally indicated when patients cannot meet their energy and metabolic needs by only oral intake or when oral nutrition is not safe anymore due to the risk of aspiration (45). Enteral nutrition can be delivered by a nasogastric tube or a gastrostomy according to the expected duration of nutrition: nasogastric tube is for short time nutrition (usually meaning up to six weeks), gastrostomy (inserted surgically, endoscopically or under radiological guidance) is for long-term feeding (46).

Hydration

In the elderly, the risk of dehydration is higher. The main reasons are the physiologic reduced percentage in total body fluid (47), the lowered thirst response (48), the potential reduction in kidney function (49), potential effects of disease and medications (50). Moreover, in case of dysphagia aspirating on liquids, fluid thickening is recommended as a way to slow the flow of the swallowed liquids, allowing more time for airway closure and reducing the risk of aspiration (51). However, the fluid thickening decreases of the acceptance of the beverages preventing from the full coverage of fluid needs. In a research by Whelan, pre-thickened ready-to-drink fluids were more accepted than powder-thickened fluids, suggesting that they can be used as a strategy to increase fluid intake among dysphagic patients (although the costs may he higher) (52).

Conclusions

Dysphagia is a pathological symptom shared by several disease (tumours, neurological disease, oesophageal disorders, etc) and is often linked to aging process. It can be described as difficult or impaired swallowing. Dysphagia is common but often underreported or underestimated. Treatment is both rehabilitative and compensatory and nutritional management is placed at the centre of it. Texture-modified diets and fluid thickening gain a real therapeutic value since a proper nutrition prevent weight loss and malnutrition and reduce the risk of aspiration. However, if not well-structured and well-supervised, it may be itself a trigger to malnutrition, dehydration and aspiration. A well-structured nutrition plan needs a multidimensional approach developed by a multidisciplinary team and cross-cutting expertise. Once diagnosis of dysphagia has been established by instrumental exams, speech and language therapist collaborate with nutritionist to define the safe food texture and suggest the postural adaptations. Nutritionists define the nutritional needs and work on the adequate nutritional plan which takes in consideration the reduced nutritional value of texture-modified diets, the risk of low acceptance and the risk of dehydration. Then monitoring and follow-up are essential to correct potential gap between macro and micro-nutrients requirements and actual intake, putting corrective strategies into practice: food fortification, in-between-meal nutritious snacks and oral nutritional supplements. The multidisciplinary team will also suggest the artificial nutrition, preferably enteral nutrition through nasogastric tube or gastrostomy, when oral nutrition is not safe anymore or fails in coverage of nutritional requirements. As many other conditions, the key of success is the patient-centred treatment, up to the task to feed the patient safely, while maintaining pleasurable tastes and recipes, social connections and food-related rituals.

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

Authors Contribution: Elsa Veronica Mignini, Milena Catani, Marco Ferrara, Marina Taus contributed to the implementation of the literature research, to the analysis of the data and to the writing of the manuscript.

References

1. Baijens LW, Clavé P, Cras P, et al. European Society for Swallowing Disorders - European Union Geriatric Medicine Society white paper: oropharyngeal dysphagia as a geriatric syndrome. Clin Interv Aging. 2016 Oct 7;11: 1403-1428. doi: 10.2147/CIA.S107750
2. Feng HY, Zhang PP, Wang XW. Presbyphagia: Dysphagia in the elderly. World J Clin Cases. 2023 Apr 16;11(11): 2363-2373. doi: 10.12998/wjcc.v11.i11.2363
3. Zhao WT, Yang M, Wu HM, Yang L, Zhang XM, Huang Y. Systematic Review and Meta-Analysis of the Association between Sarcopenia and Dysphagia. J Nutr Health Aging. 2018;22(8):1003-1009. doi: 10.1007/s12603-018-1055-z
4. Madhavan A, LaGorio LA, Crary MA, Dahl WJ, Carnaby GD. Prevalence of and Risk Factors for Dysphagia in the Community Dwelling Elderly: A Systematic Review. J Nutr Health Aging. 2016;20(8):806-815.
5. Takizawa C, Gemmell E, Kenworthy J, Speyer R. A Systematic Review of the Prevalence of Oropharyngeal Dysphagia in Stroke, Parkinson's Disease, Alzheimer's Disease, Head Injury, and Pneumonia. Dysphagia. 2016 Jun;31(3):434-41. doi: 10.1007/s00455-016-9695-9
6. Rivelsrud MC, Hartelius L, Bergström L, Løvstad M, Speyer R. Prevalence of Oropharyngeal Dysphagia in Adults in Different Healthcare Settings: A Systematic Review and Meta-analyses. Dysphagia. 2023 Feb;38(1): 76-121. doi: 10.1007/s00455-022-10465-x
7. Byun SE, Kwon KB, Kim SH, Lim SJ. The prevalence, risk factors and prognostic implications of dysphagia in elderly patients undergoing hip fracture surgery in Korea. BMC Geriatr. 2019 Dec 18;19(1):356. doi: 10.1186/s12877-019-1382-x
8. Miller N, Patterson J. Dysphagia: implications for older people. Reviews in Clinical Gerontology. 2014;24(1):41-57. doi:10.1017/S095925981300021X
9. Altman KW, Yu G, Schaefer SD. Consequence of Dysphagia in the Hospitalized Patient: Impact on Prognosis and Hospital Resources. Arch Otolaryngol Head Neck Surg. 2010;136(8):784–789. doi:10.1001/archoto.2010.129
10. Kuo P, Holloway RH, Nguyen NQ. Current and future techniques in the evaluation of dysphagia. J Gastroenterol Hepatol 2012;27(5):873–881.
11. Carucci LR, Turner MA. Dysphagia revisited: common and unusual causes. Radiographics. 2015 Jan-Feb;35(1):105-22. doi: 10.1148/rg.351130150
12. Wilcox CM, Alexander LN, Clark WS. Localization of an obstructing esophageal lesion: is the patient accurate? Dig Dis Sci 1995;40(10):2192–2196.
13. Dylczyk-Sommer A. Dysphagia. Part 1: General issues. Anaesthesiol Intensive Ther. 2020;52(3):226-232. doi: 10.5114/ait.2020.98074
14. Clavé, P., Shaker, R. Dysphagia: current reality and scope of the problem. Nat Rev Gastroenterol Hepatol 12, 259–270 (2015). https://doi.org/10.1038/nrgastro.2015.49
15. Panebianco M, Marchese-Ragona R, Masiero S, Restivo DA. Dysphagia in neurological diseases: a literature review. Neurol Sci. 2020 Nov;41(11):3067-3073. doi: 10.1007/s10072-020-04495-2
16. Ricci Maccarini A, Filippini A, Padovani D, Limarzi M, Loffredo M, Casolino D. Clinical non-instrumental evaluation of dysphagia. Acta Otorhinolaryngol Ital. 2007 Dec;27(6):299-305.
17. Suiter DM, Leder SB. Clinical utility of the 3-ounce water swallow test. Dysphagia. 2008 Sep;23(3):244-50. doi: 10.1007/s00455-007-9127-y
18. Cohen JT, Manor Y. Swallowing disturbance questionnaire for detecting dysphagia. Laryngoscope. 2011 Jul; 121(7):1383-7. doi: 10.1002/lary.21839
19. Belafsky PC, Mouadeb DA, Rees CJ, et al. Validity and reliability of the Eating Assessment Tool (EAT-10). Ann Otol Rhinol Laryngol. 2008 Dec;117(12):919-24. doi: 10.1177/000348940811701210
20. Nishimura K, Kagaya H, Shibata S, et al. Accuracy of dysphagia severity scale rating without using videoendoscopic evaluation of swallowing. Journal of Japanese Comprehensive Rehabilitation Science. 2015;6:124–8. doi: 10.11336/jjcrs.6.124
21. Langmore SE. History of fiberoptic endoscopic evaluation of swallowing for evaluation and management of pharyngeal dysphagia: changes over the years. Dysphagia. 2017;32(1):27–38.
22. Dziewas, R., auf dem Brinke, M., Birkmann, U. et al. Safety and clinical impact of FEES – results of the FEES-registry. Neurol. Res. Pract. 1, 16 (2019). doi: 10.1186/s42466-019-0021-5
23. Ramsey D, Smithard D, Kalra L. Silent aspiration: what do we know? Dysphagia. 2005 Summer;20(3):218-25. doi: 10.1007/s00455-005-0018-9
24. Fattori B, Grosso M, Bongioanni P, et al. Assessment of swallowing by oropharyngoesophageal scintigraphy in patients with amyotrophic lateral sclerosis. Dysphagia 2006; 21: 280-286. doi: 10.1007/s00455-006-9052-5
25. Moloney J, Regan J, Walshe M. Patient Reported Outcome Measures in Dysphagia Research Following Stroke: A Scoping Review and Qualitative Analysis. Dysphagia. 2023 Feb;38(1):181-190. doi: 10.1007/s00455-022-10448-y
26. Patel DA, Sharda R, Hovis KL, et al. Patient-reported outcome measures in dysphagia: a systematic review of instrument development and validation. Dis Esophagus. 2017;30:1–23.
27. Smith R, Bryant L, Hemsley B. The true cost of dysphagia on quality of life: The views of adults with swallowing disability. Int J Lang Commun Disord. 2023 Mar;58(2): 451-466. doi: 10.1111/1460-6984
28. Nielsen AH, Kaldan G, Nielsen BH, Kristensen GJ, Shiv L, Egerod I. Intensive care professionals' perspectives on dysphagia management: A focus group study. Aust Crit Care. 2023 Jul;36(4):528-535. doi: 10.1016/j.aucc.2022.04.004
29. Lazarus CL. History of the use and impact of compensatory strategies in management of swallowing disorders. Dysphagia. 2017;32(1):3–10. doi: 10.1007/s00455-016-9779-6
30. Newman R, Vilardell N, Clavé P, Speyer R. Effect of bolus viscosity on the safety and efficacy of swallowing and the kinematics of the swallow response in patients with oropharyngeal dysphagia: white paper by the European

Society for Swallowing Disorders (ESSD). Dysphagia. 2016; 31(2):232–249. doi: 10.1007/s00455-016-9696-8
31. Cheng I, Hamad A, Sasegbon A, Hamdy S. Advances in the Treatment of Dysphagia in Neurological Disorders: A Review of Current Evidence and Future Considerations. Neuropsychiatr Dis Treat. 2022 Oct 14;18:2251-2263. doi: 10.2147/NDT.S371624
32. Cichero JA, Lam P, Steele CM, et al. Development of International Terminology and Definitions for Texture-Modified Foods and Thickened Fluids Used in Dysphagia Management: The IDDSI Framework. Dysphagia. 2017 Apr;32(2):293-314. doi: 10.1007/s00455-016-9758-y
33. International Dysphagia Diet Standardisation Initiative: https://www.iddsi.org/ (2022). Accessed 11 January 2024.
34. Silva LML, Lima CR, Cunha DA, Orange LG. Dysphagia and its relation with nutritional status and calorie/protein intake in the elderly Rev CEFAC. 2019;21(3):e15618. Doi: 10.1590/19820216/201921315618
35. Saleedaeng P, Korwanich N, Muangpaisan W, Korwanich K. Effect of Dysphagia on the Older Adults' Nutritional Status and Meal Pattern. J Prim Care Community Health. 2023 Jan-Dec;14:21501319231158280. doi: 10.1177/21501319231158280
36. O'Keeffe M, Kelly M, O'Herlihy E, et al. Potentially modifiable determinants of malnutrition in older adults: A systematic review. Clin Nutr. 2019 Dec;38(6):2477-2498. doi: 10.1016/j.clnu.2018.12.007
37. Wu XS, Miles A, Braakhuis AJ. Texture-Modified Diets, Nutritional Status and Mealtime Satisfaction: A Systematic Review. Healthcare (Basel). 2021 May 24;9(6):624. doi: 10.3390/healthcare9060624
38. Ahlinder A, Hoglund E, Ohgren C, Milijkovic A, Stading M. Towards attractive texture-modified foods with increased fiber content for dysphagia via 3D printing and 3D scanning. Front Food Sci Technol. 2023;2:105864. doi: 10.3389/frfst.2022.105864
39. Ott A, Senger M, Lötzbeyer T, Gefeller O, Sieber CC, Volkert D. Effects of a Texture-Modified, Enriched, and Reshaped Diet on Dietary Intake and Body Weight of Nursing Home Residents with Chewing and/or Swallowing Problems: An Enable Study. J Nutr Gerontol Geriatr. 2019 Oct-Dec;38(4):361-376. doi: 10.1080/21551197.2019.1628158
40. Ueshima J, Shimizu A, Maeda K, et al. Nutritional Management in Adult Patients With Dysphagia: Position Paper From Japanese Working Group on Integrated Nutrition for Dysphagic People. J Am Med Dir Assoc. 2022 Oct;23(10):1676-1682. doi: 10.1016/j.jamda.2022.07.009
41. Bannerman E, McDermott K. Dietary and fluid intakes of older adults in care homes requiring a texture modified diet: the role of snacks. J Am Med Dir Assoc. 2011 Mar;12(3):234-9. doi: 10.1016/j.jamda.2010.06.001
42. Volkert D, Beck AM, Cederholm T, et al. ESPEN guideline on clinical nutrition and hydration in geriatrics. Clin Nutr. 2019;38:10e47.
43. Todorovic V. Evidence-based strategies for the use of oral nutritional supplements. Br J Community Nurs. 2005 Apr;10(4):158, 160, 162-4. doi: 10.12968/bjcn.2005.10.4.17954
44. Wu XS, Yousif L, Miles A, Braakhuis A. A Comparison of Dietary Intake and Nutritional Status between Aged Care Residents Consuming Texture-Modified Diets with and without Oral Nutritional Supplements. Nutrients. 2022 Feb 5;14(3):669. doi: 10.3390/nu14030669
45. Ley D, Austin K, Wilson KA, Saha S. Tutorial on adult enteral tube feeding: Indications, placement, removal, complications, and ethics. JPEN J Parenter Enteral Nutr. 2023 Jul;47(5):677-685. doi: 10.1002/jpen.2510
46. Bischoff SC, Austin P, Boeykens K, et al. ESPEN guideline on home enteral nutrition. Clin Nutr. 2020 Jan;39(1):5-22. doi: 10.1016/j.clnu.2019.04.022
47. Jéquier E, Constant F. Water as an essential nutrient: the physiological basis of hydration. Eur J Clin Nutr. 2010 Feb;64(2):115-23. doi: 10.1038/ejcn.2009.111
48. Li S, Xiao X, Zhang X. Hydration Status in Older Adults: Current Knowledge and Future Challenges. Nutrients. 2023 Jun 2;15(11):2609. doi: 10.3390/nu15112609
49. Denic A, Glassock RJ, Rule AD. Structural and Functional Changes With the Aging Kidney. Adv Chronic Kidney Dis. 2016 Jan;23(1):19-28. doi: 10.1053/j.ackd.2015.08.004
50. Puga AM, Lopez-Oliva S, Trives C, Partearroyo T, Varela-Moreiras G. Effects of Drugs and Excipients on Hydration Status. Nutrients. 2019 Mar 20;11(3):669. doi: 10.3390/nu11030669
51. Steele CM, Alsanei WA, Ayanikalath S, et al . The influence of food texture and liquid consistency modification on swallowing physiology and function: a systematic review. Dysphagia. 2015 Feb;30(1):2-26. doi: 10.1007/s00455-014-9578-x. Epub 2014 Oct 25. Erratum in: Dysphagia. 2015 Apr;30(2):272-3. doi: 10.1007/s00455-015-9603-8
52. Whelan K. Inadequate fluid intakes in dysphagic acute stroke. Clin. Nutr. 2001;20:423–428. doi: 10.1054/clnu.2001.0467
53. Adapted from "Harrison's Principles of Internal Medicine".

Correspondence:
Received: 25 March 2024
Accepted: 28 June 2024
Dr. Elsa Veronica Mignini
Dietology and Clinical Nutrition Unit, Azienda Ospedaliero Universitaria delle Marche
Via Conca, Ancona, 60126, Italy
E-mail: elsaveronica.mignini@ospedaliriuniti.marche.it
ORCID: 0009-0009-4472-9518