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All acronyms and abbreviations used in the manuscript should be defined at first use, both in the abstract and in the main text. The abbreviation should be provided in parentheses following the definition.

When a drug, product, hardware, or software program is mentioned within the main text, product information, including the name of the product, the producer of the product, and city and the country of the company (including the state if in USA), should be provided in parentheses in the following format: "Discovery St PET/CT scanner (General Electric, Milwaukee, WI, USA)"

All references, tables, and figures should be referred to within the main text, and they should be numbered consecutively in the order they are referred to within the main text.

Limitations, drawbacks, and the shortcomings of original articles should be mentioned in the Discussion section before the conclusion paragraph.

References

Both in-text citations and the references must be prepared according to the Vancouver style.

While citing publications, preference should be given to the latest, most up-to-date publications. Authors should avoid using references that are older than ten years. The limit for the old reference usage is 15% in the journal. If an ahead-

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Type of manuscript	Word limit	Abstract word limit	Reference limit	Table limit	Figure limit
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Case Report	2500	250	20	No tables	10 or total of 20 images
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Editorial	1000	No abstract	5	No tables	No media

of-print publication is cited, the DOI number should be provided. Authors are responsible for the accuracy of references. Journal titles should be abbreviated in accordance with ISO 4 standards. When there are six or fewer authors, all authors should be listed. If there are seven or more authors, the first six authors should be listed followed by "et al." In the main text of the manuscript, references should be cited using Arabic numbers in parentheses. The reference styles for different types of publications are presented in the following examples.

Journal Article: Rankovic A, Rancic N, Jovanovic M, Ivanović M, Gajović O, Lazić Z, et al. Impact of imaging diagnostics on the budget – Are we spending too much? Vojnosanit Pregl 2013; 70: 709-11.

Book Section: Suh KN, Keystone JS. Malaria and babesiosis. Gorbach SL, Barlett JG, Blacklow NR, editors. Infectious Diseases. Philadelphia: Lippincott Williams; 2004.p.2290-308.

Books with a Single Author: Sweetman SC. Martindale the Complete Drug Reference. 34th ed. London: Pharmaceutical Press; 2005.

Editor(s) as Author: Huizing EH, de Groot JAM, editors. Functional reconstructive nasal surgery. Stuttgart-New York: Thieme; 2003.

Conference Proceedings: Bengisson S. Sothemin BG. Enforcement of data protection, privacy and security in medical informatics. In: Lun KC, Degoulet P, Piemme TE, Rienhoff O, editors. MEDINFO 92. Proceedings of the 7th World Congress on Medical Informatics; 1992 Sept 6-10; Geneva, Switzerland. Amsterdam: North-Holland; 1992. pp.1561-5.

Scientific or Technical Report: Cusick M, Chew EY, Hoogwerf B, Agrón E, Wu L, Lindley A, et al. Early Treatment Diabetic Retinopathy Study Research Group. Risk factors for renal replacement therapy in the Early Treatment Diabetic Retinopathy Study (ETDRS), Early Treatment Diabetic Retinopathy Study Kidney Int: 2004. Report No: 26.

Thesis: Yılmaz B. Ankara Üniversitesindeki Öğrencilerin Beslenme Durumları, Fiziksel Aktiviteleri ve Beden Kitle İndeksleri Kan Lipidleri Arasındaki Ilişkiler. H.Ü. Sağlık Bilimleri Enstitüsü, Doktora Tezi. 2007.

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Manuscripts Published in Electronic Format: Morse SS. Factors in the emergence of infectious diseases. Emerg Infect Dis (serial online) 1995 Jan-Mar (cited 1996 June 5): 1(1): (24 screens). Available from: URL: http:/ www.cdc.gov/ncidodlEID/cid.htm.

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CONTENTS

CLINICAL SCIENCE OF NUTRITION Review

Clin Sci Nutr 2020; 2(3): 85-96 • DOI: 10.5152/ClinSciNutr.2021.1016

Consensus Statement on Provision of Appropriate Nutritional Support in the Management of Childhood Malnutrition: A Turkey Perspective

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ABSTRACT

This review by experts aimed to identify areas of consensus regarding the provision of appropriate nutritional support in the management of pediatric malnutrition that can be translated into a practical and implementable guidance document. Experts identified the "six rights" of pediatric malnutrition care to discuss, including the (1) right patient (appropriate identification of malnourished child); (2) right method (appropriate selection of type, site, route, and mode of delivery of nutrition); (3) right product (appropriate selection of the nutritional product); (4) right posology (appropriate calculation of required intake); (5) right duration (appropriate duration, discharge criteria, and monitoring); and (6) right information (providing the right information to the caregiver and raising public awareness about preventive strategies) and prevention of malnutrition.

Keywords: Pediatric malnutrition, consensus statement, diagnosis, nutritional support, enteral nutrition

Introduction

Malnutrition in children typically develops between 6 and 18 months of age in accordance with accelerated growth and brain development specific to this period, whereas young children are also susceptible to malnutrition if complementary foods are introduced too early or too late or if the foods have low nutrient density and micronutrient bioavailability (1). Malnutrition during the early childhood period is associated not only with impaired growth but also with long-term adverse outcomes persisting into adulthood such as impaired motor skills, behavioral problems, attention deficits, learning disabilities, and increased incidence of impaired intelligence quotient (1-3).

Globally, data from 2011 revealed that an estimated 165 million (26%) children <5 years of age have stunted growth (height-for-age Z-score of ≤–2 based on the World Health Organization [WHO] Child Growth Standards), 101 million (16%) are underweight (weight-for-age Z-score < –2), and 52 million (8%) have wasting (weight-for-length/height or body mass index [BMI] Z-score < –2) (4). In Turkey, the evolution of the prevalence of stunting and wasting among children <5 years of age between 1990 and 1994 and between 2010 and 2016 revealed an absolute change of –14.6 and –2.1 percentage points, respectively (5). The Turkey Demographic and Health Survey from 2018 revealed that 6% of children <5 years of age are stunted or too short for age and 2% show wasting (6). Severe acute malnutrition (SAM), defined as a weight-for-height Z-score < –3, affects nearly 19 million (2.9%) children, whereas stunting, underweight, and wasting are considered to be the cause of 14.7%, 14.4%, and 12.6% of deaths among children <5 years of age, respectively (4).

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Preventing all grades of malnutrition is considered an effective strategy for improving child survival as well as for reducing the significant economic burden placed on the healthcare system because of malnutrition (7-12). Accordingly, in an effort to reduce the malnutrition-related child mortality, the WHO global targets for infant and young child nutrition entail achieving a 40% reduction in the number of stunted children <5 years of age by 2025 and reducing childhood wasting (acute malnutrition) to <5% and maintaining it at that level (1, 13).

However, although pediatric malnutrition is not an uncommon entity, it is frequently underdiagnosed or underestimated in the clinical practice, leading to an increased risk of morbidity and mortality, impaired recovery and convalescence, prolonged treatment duration, and increased treatment costs (1, 14, 15). Given that proper nutritional care can effectively ameliorate the malnutrition and related adverse outcomes in children, nutritional assessment is considered an essential part of every medical examination for early recognition of risk of malnutrition or current malnutrition and to initiate timely nutritional therapy (1, 15).

Unfortunately, only a small percentage of malnourished patients receive nutritional therapy largely because of the poor awareness of healthcare professionals about the importance of nutritional screening and the role of nutritional intervention in prevention, diagnosis, or early management of malnutrition and related adverse outcomes (1, 15).

Main Points

- This review by experts aimed to identify areas of consensus regarding the provision of appropriate nutritional support in the management of pediatric malnutrition that can be translated into a practical and implementable guidance document.
- Experts identified the "six rights" (right patient, right method, right product, right posology, right duration, and right information) of pediatric malnutrition care.
- The experts reached consensus on certain claims to improve pediatric malnutrition care, which includes screening for nutritional status and malnutrition at every visit, accurate identification of type and severity of malnutrition and related nutritional support requirement, timely and appropriate provision of nutritional support in accordance with overall and disease-specific indications, and criteria for the appropriate route, product, posology, duration, discharge criteria, and monitoring.
- This consensus report encourages provision of enteral nutrition with preference to oral tube feeding and if tube feeding is needed for gastric to postpyloric access whenever possible.
- Providing useful support for caregivers in terms of identification of the most advantageous way of integrating pediatric nutritional care into the daily psychosocial environment of the unique caregiver and family is of utmost importance for improving the caregiving role to thus achieve better social, emotional, physical, and cognitive development of the malnourished child.

Therefore, this review by experts aimed at identifying areas of consensus regarding the provision of appropriate nutritional support in the management of pediatric malnutrition, which can be translated into a practical and implementable guidance document. The main topics addressed in this paper are the "six rights" of pediatric malnutrition care, including the (1) right patient (appropriate identification of malnourished child); (2) right method (appropriate selection of type, site, route, and mode of delivery) of nutrition; (3) right product (appropriate selection of the nutritional product); (4) right posology (appropriate calculation of required intake); (5) right duration (appropriate duration, discharge criteria, and monitoring); and (6) right information (providing the right information and appropriate support to the caregiver and raising public awareness about preventive strategies) and prevention of malnutrition.

Right Patient: Appropriate Identification of the Malnourished Infant and Child and Nutritional Needs

Definition of malnutrition

Pediatric malnutrition is defined by the American Society for Parenteral and Enteral Nutrition as an imbalance between nutrient requirement and intake, leading to cumulative deficits in energy, protein, or micronutrients that may negatively affect growth, development, and other relevant outcomes (16).

Malnutrition is classified based on its etiology (primary, secondary), duration (acute, chronic), anthropometric measurements (stunting, wasting, and underweight), and severity (mild, moderate, and severe) (16).

Primary malnutrition is cause by the combined effect of several factors including poverty, poor maternal nutrition, low birthweight, poor breastfeeding, inappropriate complementary feeding, lack of adequate food, repeated infections, and environmental enteropathy (4). Secondary malnutrition is cause by the direct or indirect adverse effects of an underlying disease on growth, such as prolonged severe infections, some neurological diseases, malignancies, congenital heart diseases (CHD), chronic kidney diseases (CKD), chronic liver diseases (CLD), malabsorption, immune deficiencies, and cystic fibrosis (4).

Although primary malnutrition is most commonly seen in low- and middle-income countries, secondary malnutri-

tion is more commonly seen in developed countries, and cases with delayed diagnosis or no treatment are associated with an increased risk for infection, delayed wound healing, and an overall poor response to treatment for the underlying disease (4).

Based on anthropometric measurements, malnutrition can be classified as stunting, wasting, and underweight. Height or length-for-age is a criterion used for assessing stunting, which is caused by chronic malnutrition, whereas weight-for-height or length is used to assess wasting, which is caused by acute malnutrition. Weight-for-age is used to indicate underweight, indicating the combined effect of acute and chronic malnutrition (4).

In children aged 6–59 months, moderate and acute malnutrition is defined as moderate wasting (i.e., weight-for-length/height Z-scores between –3 and –2 of the WHO Child Growth Standards median) and/or a mid-upper arm circumference (MUAC) from 115 to 125 mm. Infants (1–6 months of age) and children (6–59 months of age) who have an MUAC of <115 mm (fails to detect SAM in many children) or a weight-for-height/length Z-score < –3 on the WHO growth standards, or have any degree of bilateral edema are considered to have SAM, which should be managed immediately (Table 1) (1, 17).

Anthropometric assessments based on the weight-for-height Z-score using the WHO growth standards are considered likely to identify a larger population with SAM than the National Center for Health Statistics (NCHS) growth reference values depending on the age group (1, 18). In addition, although low values of weight-for-height Z-score and MUAC both identify children with an increased risk for SAM (1), the criterion of a weight-for-height Z-score < –3 is considered more likely to identify SAM than the criterion of an MUAC of <115 mm, which reportedly failed to detect SAM in 75% of children with SAM as defined by a low weight-for-height Z-score (19).

In infants aged 1–6 months, the presence of bilateral pitting edema or confirmed weight loss of >10% and a weight-for-height Z-score < –3 and/or evidence of insufficient food intake are indications for hospitalization, whereas satisfactory clinical status, absence of acute infection plus weight gain of 10–15 g/kg per day, and ability to sustain appropriate feeding are indications for outpatient management (Table 1) (17).

Mild or moderate malnutrition make up the majority of malnourished cases, and the vast majority of malnutrition-related deaths (83%) are attributable to mild to moderate, rather than severe, malnutrition (12, 20). Hence, given the challenging diagnosis and mortality risk of moderate malnutrition (12), close monitoring of nutritional status and neonatal growth and supporting breastfeeding are considered crucial for controlling disease progression, mortality risk, and public disease burden (4, 20).

Indications for nutritional support

Nutritional support involves the provision of nutrition beyond that provided by normal food intake and has two basic goals, which are the restoration of the cellular function (short-term goal) and repletion of the lost tissue (long-term goal) (9, 15, 21).

Accordingly, nutritional support is provided to pediatric patients under the following two possible conditions (21-23):

1. Children who fail to receive less than 60% to 80% of the nutritional requirements for >10 days, those with a total feeding time of 4 to 6 h per day, and those with a likelihood of insufficient oral intake for >5 days (>1 year of age) or >3 days (<1 year of age).
2. Wasting and stunting status in children are identified as follows:
   - Lack of weight gain or improved height during monthly follow-up for children <2 years of age.
   - Failure to gain weight or presence of weight loss during follow-up visits in 3 months for children >2 years of age.
   - Drop in weight of >2 percentile on the growth charts.
   - Triceps skinfolds consistently below the fifth percentile of age.
   - Decreased height velocity by ≥0.3 standard deviation per year, or by >2 cm per year during puberty.

Nutritional support for primary malnutrition

Most children with primary and moderate malnutrition can be managed at home with nutrition-specific interventions such as counseling of parents about the proper diet with emphasis on continued breastfeeding and the appropriate complementary feeding, micronutrient supplementation, and ensuring household food security. Ideally, these children should receive 25 kcal/kg per day of energy in excess of that recommended for their healthy peers, and their diets should contain animal-source foods that are rich in essential fatty acids, essential amino acids, and micronutrients including vitamin A, iron, and zinc (Table 1) (4, 24).

Different approaches are available to address moderate malnutrition with prepared foods such as providing lipid-based nutrient supplements or blended foods either as a full daily dose or in a low dose to complement the regular diet (25).

Children with severe, acute, and primary malnutrition and complications require hospitalization, whereas those without complications can be treated at home with ready-to-use therapeutic food (RUTF) (4).

Table 1. Definitions of Pediatric Malnutrition in Infants Aged 1–6 months and Children Aged 6–59 months (1, 17, 18)			
Children aged 6–59 months			
Classification	**Signs**	**Treatment**	**Discharge**
No acute malnutrition	Weight-for-height Z-score ≥ –2 or MUAC ≥ 125 mm; no signs of anemia (palmar pallor)	If child is <2 years of age, assess the child's feeding and counsel the caregiver or mother about feeding according to feeding recommendations. If there is any feeding problem, schedule a controlled visit in 7 days.	—
Moderate acute malnutrition	Weight-for-height Z-score between –2 and –3; MUAC of 115–125 mm.	Assess the child's feeding and counsel the caretaker or mother about feeding recommendations. Assess for possible TB infection. Schedule a follow-up visit after 7 days. Tell the caretaker or mother when to come back immediately. Follow-up in 30 days.	Absence of edema for at least 2 weeks; MUAC ≥125 mm on two consecutive visits; Weight-for-height/length Z score ≥ –2 on two consecutive visits.
Severe acute malnutrition	Weight-for-height Z-score < –3; MUAC <115 mm (risk of failure to diagnose SAM in many children); bilateral pitting edema	Give oral antibiotics for 5 days. Give RUTF for a child aged >6 months. Assess the child's feeding and counsel the mother. Assess for possible TB infection. Schedule a follow-up visit after 7 days. Tell the mother when to come back immediately.	
Complicated severe acute malnutrition	Edema in both feet; Weight-for-height Z-score < –3; MUAC <115 mm; With a medical complication or not able to finish RUTF or a breastfeeding problem	Refer immediately to hospital. Give first dose of an appropriate antibiotic. Treat the child to prevent low blood sugar.	
Infants aged 1–6 months			
Nutritional status criteria	**Hospitalization;**	**Outpatient.**	**Discharge;**
	Presence of bilateral pitting edema or confirmed weight loss of >10%; Weight-for-height Z-score < –3 and/or evidence of insufficient food intake.	Satisfactory clinical status and absence of acute infection; Weight gain of 10–15 g/kg per day for 5 consecutive days in stage 3 plus ability to sustain appropriate feeding.	Weight-for-height/length Z score > –2 on two consecutive visits; weight is following the growth curve; Postdischarge follow-up until the age of 6 months for growth monitoring, mother support, and the provision of infant formula if needed.
MUAC: mid-upper arm circumference; TB: tuberculosis; RUTF: ready-to-use therapeutic food			

Management of SAM involves the stabilization, active catch-up, and nutritional rehabilitation phases. During the stabilization phase, a cautious approach is required when initiating feeding as soon as possible, decreasing the feeding frequency gradually, and using a nasogastric feeding tube in anorexic children or in those with oral intake of <80 kcal/kg per day (<5 years of age) or <80% of the recommended energy intake (4). Catch-up growth starts when the energy intake is >150 kcal/kg per day with use of RUTF or WHO-recommended formula in young children (Table 1) (4).

Nutritional support in secondary malnutrition

The prevalence of secondary malnutrition is 40% in patients with neurologic diseases, 34.5% in those with infectious disease, 33.3% in those with cystic fibrosis, 28.6% in those with cardiovascular disease, 27.3% in oncology patients, and 23.6% in those with gastrointestinal and liver diseases (16, 26).

For the management of secondary malnutrition, it is crucial to identify the underlying disease because management is impossible without treating the underlying cause (4). The nutritional support principles of the management of SAM are similar in primary and secondary malnutrition (4).

In children with CLD, malnutrition occurs because of vomiting, poor appetite, infection, gastroesophageal reflux, and the compressive effects of ascites or hepatosplenomegaly. The diet should contain a combination of lipids and carbohydrates with a controlled amount of protein to prevent hyperammonemia, whereas the use of medium-chain triglycerides (MCTs) (which does not depend upon bile acids for absorption) as the source of dietary fat is considered to counter the risk of malabsorption of fats and fat-soluble vitamins owing to decreased excretion of bile salts into the small intestine in CLD, especially with accompanying cholestasis. Water-soluble forms of the fat-soluble vitamins (A, D, E, and K) should be used when available (4).

In a child with severe neurological impairment, the indications for nutritional support are deviations in weight gain and growth from the defined pattern, low weight-for-height ratio, prolonged or stressful oral feeding or signs of aspiration or dehydration, micronutrient deficiency, and overweight or obesity (27, 28). Establishing a target weight as the weight at which the triceps and/or subscapular skinfolds are between the 10th and 50th percentile is considered clinically useful alongside measures to optimize the child's oral intake. Age-appropriate standard enteral products are sufficient for these patients with no need for the use of elementary products in the absence of a definite indication. In severely impaired children aged <1 year, such nutritional support should be started via high calorie, high protein, and fiber-rich nutritional products, whereas in children aged >1 year, enteral products with a calorie content of 1 kcal/mL or 1.5 kcal/mL with close monitoring of fluid intake can also be used (27).

In children with CKD, malnutrition and growth delays are common and associated with a greater risk for morbidity and mortality. Nutritional care plans individualized according to the child's age, development, residual kidney function, and mode of kidney replacement therapy are considered as vital components of the multidisciplinary management of children with CKD (29-31).

In children with CHDs, malnutrition and failure to thrive are common systemic consequences of the underlying cardiac abnormality with adverse effects attributable to postoperative outcomes and neurodevelopment. In the postoperative period, the enteral route should be preferred in hemodynamically stable patients, whereas parenteral feeding should be started immediately in hemodynamically unstable patients (32). In children with CHD, especially with cyanotic heart defects, energy intake should be 50% higher than that recommended for healthy children whereas protein intake should range from 2 to 4 g/kg, and these children should consume 55% to 60% of their caloric intake from carbohydrates and 30% to 35% from fat (32, 33).

Among pediatric oncology patients, malnutrition is common with an estimated prevalence ranging up to 60% during the course of cancer therapy (34), and it is associated with a decreased treatment response to chemotherapy and radiotherapy and an increased risk for morbidity and mortality. The indications for nutritional support are malnutrition at the time of diagnosis, loss of >5% bodyweight during treatment, weight-for-height ratio of <90%, a drop in weight across 2 percentiles or triceps skinfold thickness of <5th percentile (4, 34). The increase in energy and protein requirement when undergoing chemotherapy should be taken into consideration with frequent, low volume, protein-rich, and high-fiber feeding and energy intake of 120% that of the recommended intake for healthy children (4, 34, 35).

In children with cystic fibrosis, malnutrition is both a frequent feature and comorbidity and strongly associated with pulmonary function and survival. Energy intake in patients with cystic fibrosis is recommended to range from 120% to 200% of the energy needs for the healthy population of similar age, sex, and size (36). Enteral tube feeding is considered for infants ≤2 years of age who have persistent failure to thrive with their weight and length at <10th percentile and for children of 2 to 18 years of age who persistently are in a low BMI percentile (≤10 p) or who show weight loss of 2 percentile points since last visit and stunting of growth (36-38).

Right Method: Appropriate Selection of the Type, Site, Route, and Mode of Delivery of Nutritional Support

Type, site, and route of nutritional support

Following the assessment of the nutritional status and need for nutritional support via nutritional counseling, the most appropriate type of nutritional intervention is de-

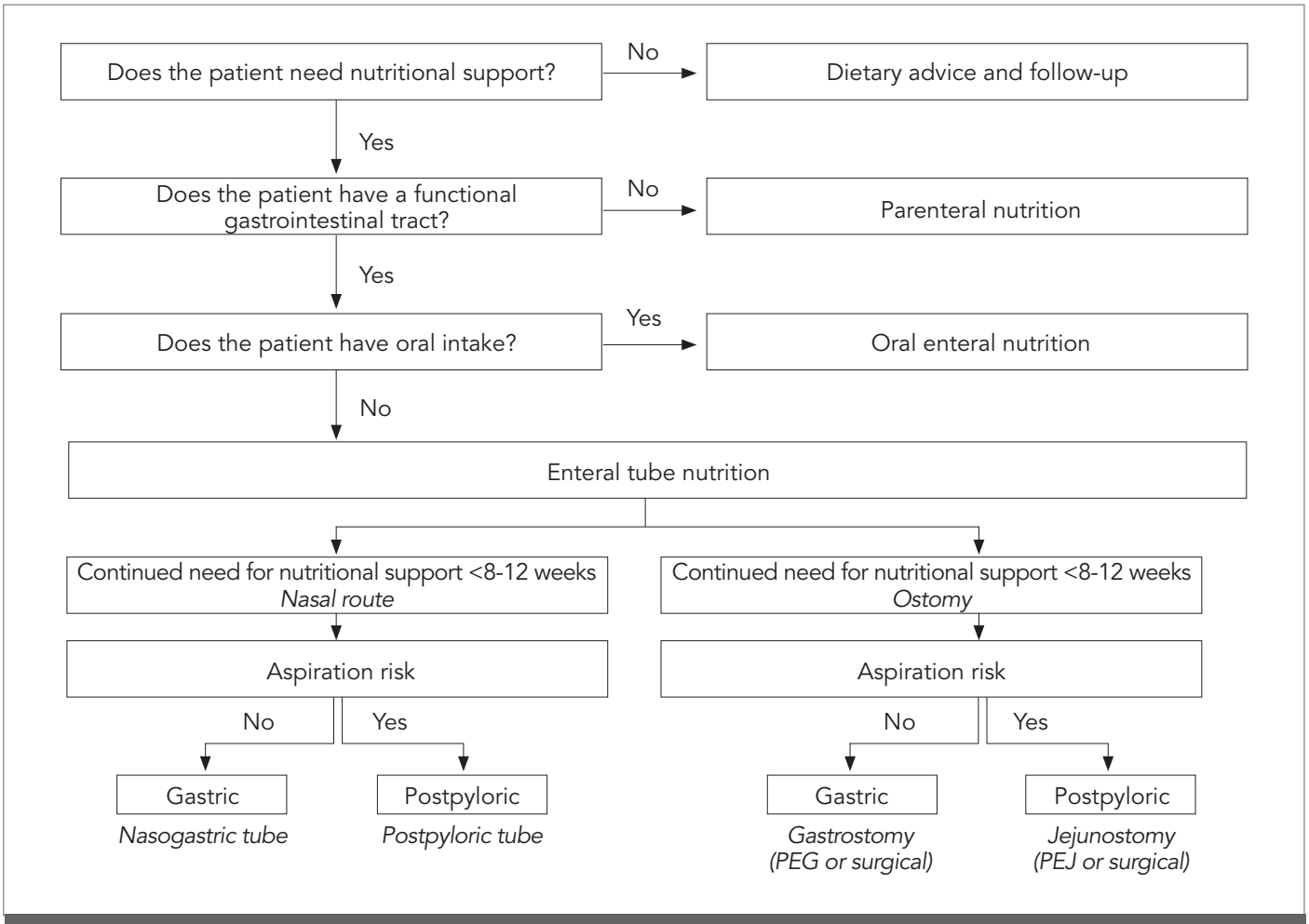

Figure 1. Flowchart of the decision-making process for enteral nutrition support

termined based on the patient's age, clinical condition, gastrointestinal function, the opportunity for oral intake, feasibility, dietary habits, and costs (21, 22, 39).

Accordingly, patients may receive dietary advice only or nutritional support with addition of enteral nutrition (EN) with oral nutritional supplements (ONS) or parenteral nutrition (PN) depending on the decision-making process (Figure 1) (21, 22, 39).

Oral nutrition via special diets and supplements is usually considered the first line therapy in managing malnutrition, whereas tube feeding is needed when oral intake is limited or swallowing is unsafe (22). EN is usually preferred in the context of a normally functioning gastrointestinal tract because it represents the physiological process more closely, is cheaper, and may help maintain gut-barrier function (9, 22). EN can be provided by access to the stomach or small intestine, preferably to the jejunum. Stomach is the preferred site unless there is a contraindication (22).

The decision about the site and route of EN administration is mainly based on the patient's disease status, the structural and functional status of the gastrointestinal tract, the purpose and duration of EN, and the risk for aspiration (21). Hence, EN delivery may be gastric or postpyloric and provided by replaceable tubes (nasogastric, nasoduodenal, nasojejunal) or via gastrostomy or enterostomy (Figure 1) (22).

When short-term enteral feeding (less than 8–12 weeks) is considered, nasogastric and postpyloric tubes are used in patients without and with aspiration risk, respectively. When a continued need for nutritional support is likely to be more than 8–12 weeks, enteral feeding using a gastrostomy (percutaneous endoscopic gastrostomy [PEG] or surgical gastrostomy) or jejunostomy (percutaneous endoscopic jejunostomy [PEJ] or PEG-jejunostomy or surgical jejunostomy) are considered for patients without or with aspiration risk, respectively (Figure 1) (9, 22).

Mode of delivery

Modes used to deliver enteral feeding can be intermittent, continuous, or combined. Intermittent bolus feeding is the preferred mode of delivery, because it more closely represents the physiological process, is cheaper, and is less restrictive than continuous feeding (21, 40). Intermittent bolus feeding provides a cyclic surge of gastrointestinal hormones with a trophic effect on the intestinal mucosa and enables the feeding patient to freely perform activities (21, 22, 41). However, in patients with severely impaired gastrointestinal function, continuous feeding is more beneficial because of a lower thermogenic effect enabling enhanced weight gain and improved substrate utilization (40). A constant infusion of nutrients at a rate below 3 kcal/min and optimization of nutrient concentration and osmotic load are required to avoid vomiting, which occurs in patients in which the infusion rate exceed the gastric emptying rate or in which the nutrient content slows gastric emptying (40). An appropriate and constant flow can be ensured by the use of a peristaltic pump. In children capable of oral intake, a combined method of feed delivery with tube feeding overnight for 10 to 12 h and oral intake during the day may be considered and suggested to be beneficial for the preservation of sensory and motor oral functions (40).

Pros and cons of different methods

Whenever possible, gastric feeding is preferred over postpyloric feeding because it resembles the physiological process more closely with easier achievement of a secure tube position alongside other advantages over postpyloric access such as bactericidal role, improved nutrient absorption, possibility of intermittent bolus feeding, no need for a feeding pump, and low cost (21, 22, 42). However, gastric feeding carries the risk of gastroesophageal reflux, pulmonary aspiration, and osmotic diarrhea and is disabled in jejunal feeding (21).

Postpyloric access is indicated only in clinical conditions challenging gastric feeding such as aspiration, gastroparesis, gastric outlet obstruction, or previous gastric surgery. Bolus feeds and hyperosmolar solutions should not be delivered postpylorically because of the risk of inducing diarrhea (21, 22). Continuous feeding delivered through infusion at a constant rate has certain advantages over intermittent feeding such as facilitated intestinal adaptation and optimal absorption via constant mucosal stimulation, a lower probability of emesis, and higher efficacy in enteral balance and weight gain (21, 43).

Right Product: Appropriate Selection of the Nutritional Product

Factors that should be considered when selecting an appropriate formula include nutrient and energy requirements adjusted for the age and clinical condition of the child, history of food intolerance or allergies, intestinal function, site and route of delivery (tube and oral vs. tube only), formula characteristics (i.e., osmolality, viscosity, nutrient content, complexity, fat, fiber, lactose, micronutrient content, and nitrogen source), taste preference, and cost (40).

EN products, predominantly offered as ready-to-feed liquid formulations, supply an adequate amount of nutrients in a form and volume that the child can tolerate.

EN products are classified as monomeric (elemental; amino acid-based), oligomeric (semi-elemental; hydrolyzed), and polymeric (complete protein) based on protein structure, whereas the isocaloric and hypercaloric classification is based on the energy content (22).

Polymeric products

For the majority of pediatric patients, the standard pediatric polymeric enteral formula derived from cow's milk protein with or without fiber is sufficient and well tolerated with the best cost to benefit ratio and is, therefore, the most frequent choice for both in-hospital and in-home settings (22, 40). Polymeric formulas contain macronutrients in the form of intact proteins, triglycerides, and carbohydrate polymers (22, 40). Their caloric density ranges between 1 and 2 kcal/mL and they may be used for oral and bolus feeding as well as for tube feedings (40).

Variations of polymeric formulas include high energy formulas, high protein formulas, and fiber-containing formulas (44).

High-energy formulas are energy dense that contain >1.2 kcal/mL and less water (70%–77%) than standard diets. Indications for the use of these diets include the need for fluid restriction, such as in cardiac and renal disease, and because of their higher lipid concentration, they may also be suitable for patients with pulmonary disorders and cystic fibrosis. High-protein formulas derive 20% or more of the total energy from proteins and are mainly used for patients in catabolic states with severe malnutrition and problems with wound healing (i.e., Crohn's disease, hemodialysis, or HIV infection) (44). High energy and protein feeds are hypertonic and, therefore, should be introduced with caution initially to avoid osmotic diarrhea (25, 45).

Fiber-containing formulas comprise plant-based carbohydrates that remain undigested and metabolically active in the colon such as non-starch polysaccharides, inulin and oligosaccharides, resistant starch, and lignin (44, 46). Fiber and its fermentation products (short-chain fatty acids) have potential beneficial effects for the intestinal

physiology and enable prevention of both diarrhea and constipation, with hydrolyzed guar gum and pectin being superior to soy polysaccharides. The use of a mixture of bulking and fermentable fiber has been suggested as the preferred approach (22).

Oligomeric products

Oligomeric low-molecular feeds are hypoallergenic oligopeptide feeds derived from protein hydrolysates, and most of these have higher MCT ratios and are more costly than polymeric feeds. These feeds are used only in selected patients, including those with cow's milk protein allergy, multiple food allergies, food intolerance, or impaired intestinal absorption and/or digestion (22, 40, 47). Because low-molecular feeds are hyperosmolar, the total daily volume and the concentration of the delivered solution should be increased gradually (40).

Monomeric or elemental products

Monomeric or elemental formulas are nutritionally complete solutions containing a nitrogen source in the form of amino acids, carbohydrates (as oligosaccharides), and fats as a mixture of long-chain triglycerides (LCTs) and MCTs (40). Owing to the unpalatability and high osmotic load limits, these feeds are used for tube feeding of patients with specific clinical indications, such as patients with severe multiple food allergies non-responsive to oligomeric formulas, eosinophilic esophagitis, anaphylaxis, and patients with severely impaired digestion and absorption (47). Because of the high osmolarity (500−900 mOsmol/L), these formulas may cause osmotic diarrhea, particularly if delivered directly into the jejunum in the form of a bolus or by too rapid infusion (40).

Specialized and disease-specific pediatric enteral formulas

Specialized and disease-specific pediatric enteral formulas may be beneficial in certain circumstances, such as for the use in patients with renal disease or hyperammonemia (feeds with reduced protein contents), severe cholestasis (feeds with part of the lipid content provided by MCTs and increased contents of lipid-soluble vitamins), short bowel syndrome (feeds with MCTs), galactosemia or glucose and galactose malabsorption (carbohydrate-modified formulas), and cow's-milk protein or multiple food allergies (formulas based extensively on hydrolyzed protein or amino acids) (22, 40, 48, 49).

Right Posology: Appropriate Calculation of the Nutritional Need

Mild to moderate malnutrition generally is treated on an outpatient basis by increasing the amount of energy intake by 50% to 100% that of the recommended energy requirement for age-matched healthy children (50-52).

Table 2. Recommended Energy Intake (REE) for Healthy Children (58, 59)

Age	REE, kcal/kg/day
0–3 month	102–110
4–6 month	82–84
6–12 month	78–82
13–35 month	81–83
Boy, 3–8 year	60–85
Girl, 3–8 year	60–85
Boy, 8–19 year	36–47
Girl, 8–19 year	34–40

The recommended energy intake for healthy children is summarized in Table 2 (51, 52). In infants, breastfeeding is continued along with enriched supplementary feeding and addition of an enteral product when necessary (50).

The daily energy requirement for catch-up growth in children with primary malnutrition is calculated based on the condition of the malnourished child with a 1.2- to 2.0-fold higher energy intake requirement than recommended for the healthy children (51, 52).

In children with secondary malnutrition, the energy requirement is determined based on the underlying disease with consideration for higher energy intake in cases with hypermetabolic conditions (i.e., chronic disease and severe infection) and lower energy need in those with minimal activity (i.e., children with neurological disease and bed-ridden children) (4).

Children with severe malnutrition should be hospitalized for treatment. Refeeding syndrome, a potentially fatal condition that occurs with initiation of high calorie feeding in severely malnourished children with prolonged nutritional deprivation, should be considered carefully (22, 53). To reduce its risk, the initial enteral feeding regimen should be limited in terms of volume and energy content to provide around 50% to 75% of the requirements at onset and meeting the energy needs within 7 to 10 days of initiation of nutrition support. A high carbohydrate diet should be avoided along with sodium restriction. Close monitoring of biochemical parameters, specifically the levels of phosphorus, potassium, magnesium, and glucose, should be performed daily for the first week along with phosphorus, potassium, magnesium, and thiamine supplementation (22, 53).

Right Duration: Appropriate Duration, Discharge Criteria, and Monitoring of Nutritional Support

The main objective of monitoring nutrition support is to review the objectives of nutritional support, to determine the efficacy of the implemented nutritional intervention via measures of actual nutrient delivery, to assess the need for altering the type of nutritional support to improve the effectiveness or minimize metabolic risk, to ensure safety and optimal growth, and to detect and treat clinical complications as quickly as possible (22, 27).

Although the type and frequency of monitoring will depend on the nature and severity of the underlying disease, intake, weight, height, general clinical state, wellbeing, biochemical and hematological indices, gastrointestinal function, tube integrity, and any tube-related complications are also factored in (22).

Children aged 6–59 months with acute malnutrition should only be discharged from treatment when their weight-for-height/length Z-score is ≥–2 or when their MUAC is ≥125 mm and they have had no edema for at least 2 weeks (1). In infants aged 1–6 months, the discharge criteria are a weight-for-height Z-score ≥ –2 on two consecutive visits and weight following the growth curve, whereas postdischarge follow-up is continued until the age of 6 months for growth monitoring, maternal support, and the provision of infant formula if needed (Table 1) (22). However, although most malnourished children have improved by the time of discharge, the child usually remains stunted and mental development is delayed, in addition to the high risk for postdischarge relapse of malnutrition (1, 54). Planned follow-ups of the child at regular intervals is essential along with an efficient strategy for tracing children who fail to attend follow-up appointments and, thus, are at increased risk for recurrence of malnutrition or of developing other serious illnesses (1, 54).

Accordingly, after discharge or recovery, periodic monitoring during week 1, week 2, and month 1 visits is required because the risk for relapse is greatest soon after discharge, followed by regular 3- to 6-month interval visits during the first 2 years (1, 54-56).

In children who achieved a weight-for-height ≥–1 Z-score or ≥90% of the median NCHS or WHO reference values, the progress is considered (54). At each visit, the mother should be asked about the child's recent health, feeding practices, and play activities, and the child should be examined, weighed, and measured with provision of any vaccines, vitamins, or medicines when needed (1, 54).

Right Information: Providing the Right Information and Appropriate Support to the Caregiver and Raising Public Awareness about Preventive Strategies

Given the direct impact of caregiving and consistent daily management of pediatric nutritional care on the child's growth and development, the wellbeing of the caregiver is vital to providing comprehensive care for the enterally fed child (57-59). Inability to cope with the role can lead to substandard caregiving and an undernourished child, which may negatively affect the social, emotional, physical, and cognitive development of the child (53).

Providing useful support to caregivers is of utmost importance to improve the wellbeing of the caregiver, with an increased ability to cope with the stressful and demanding situations inherent to the caregiving role being associated with an increase in the likelihood of better social, emotional, physical, and cognitive development of the malnourished child (59, 60).

Problems encountered during caregiving should be assessed carefully with appropriate modifications to enable the most advantageous way of integrating pediatric nutritional care into the daily routine of the caregiver and family. The three main factors underlying the psychological consequences that should be considered by healthcare professionals when evaluating the role of the caregiver are (59):

1. External factors (i.e., home care, family social support, economic resources, medical services coordination, doctor-patient relationship, knowledge of the disease, nutritional support, and ease to obtain equipment and materials)
2. Patient-dependent factors (i.e, illness severity, poor short-term prognosis, patient–caregiver relationship, psychological status, ability to communicate with the family, aggressiveness, difficulty in handling owing to weight or deformities)
3. Caregiver-dependent factors (i.e., basic lifestyle, anxiety, fear of leaving the child with another caregiver, preparation to perform technical tasks, work, and grief for not having a healthy child)

Malnutrition is a global public health concern with suboptimal detection rates and a significant burden to patients and healthcare systems even though simple corrections to the patient's nutritional statuses can ameliorate the poor nutritional status and related adverse outcomes (9). Potential measures suggested for prevention of malnutrition within a healthcare system are (4, 14, 54, 56):

- Education of women
- Improved family planning activities with wider use of contraceptive methods or prevention of unwanted pregnancies.
- Prepared and safe motherhood experience
- Appropriate antenatal care
- Emphasizing the value of exclusive breastfeeding for the first 6 months of life and encouraging the introduction of proper complementary feeding around the 6th month along with breastfeeding until the end of the second year of life.
- Emphasizing proper feeding or intake relationships with the recognition and support of family members with positive attitudes, especially that of the caregiver toward the infant or child.
- Early recognition of risk factors such as poverty, sensory and affection deprivation at home, or problematic feeding or intake relationships.
- Follow-up of the infant or child by the same healthcare team on a regular basis.
- Appropriate assessment of the growth via weight and height measurements and percentile definitions at each visit.

Conclusion

This review by experts from Turkey aimed to provide a practical guidance document regarding the provision of appropriate nutritional support in the management of pediatric malnutrition to assist clinicians in managing malnutrition. This consensus report emphasizes the "six rights" of nutritional care in pediatric malnutrition, including the right patient (appropriate identification of malnourished child), right method (appropriate selection of type, site, route, and mode of delivery), right product (appropriate selection of the nutritional product), right posology (appropriate calculation of required intake), right duration (appropriate duration, discharge criteria, and monitoring of nutritional support), and right information (providing the right information and appropriate support to the caregiver and raising public awareness about preventive strategies), which are critically important in proper implementation of nutritional support in the management of pediatric malnutrition.

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Malnutrition Prevalence Measurement and Nutritional Interventions in Internal Medical Departments of Turkish Hospitals: Results of the LPZ Study

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ABSTRACT

Objective: The Landelijke Prevalentiemeting Zorgkwaliteit (LPZ), or National Care Indicators Prevalence, study is an annual international multicenter cross-sectional prevalence measurement of care problems on the institution, department, and patient level across Europe. The aim of this study was to measure the prevalence of malnutrition (MN) and examine nutritional interventions in internal medical departments of Turkish hospitals.

Methods: A multicenter, cross-sectional study was performed using a standardized and tested questionnaire. Data were collected from adult patients (18 years and over) who were hospitalized in internal medical departments of the hospitals. The cross-sectional study was done in 12 different centers from six big cities in the country in every November of three consecutive years (2017–2019).

Results: A total of 1,764 patients (60.9% men, 39.1% women; mean age, 62.6±0.4 years; range, 18–99 years) from 12 centers were enrolled in the study. The main diagnoses were cardiovascular disease (35.8%), diabetes (29.3%), cancer (20.2%), respiratory diseases (20.0%), infectious diseases (18.7%), gastrointestinal diseases (18.5%), endocrine diseases (17.3%), neurological diseases (15%; dementia, 6%), and hematological diseases (9.3%). Mean weight and body mass index of the patients were 71.9±16.5 kg (range, 30–153 kg) and 27.0±5.1 kg/m^2 (range, 10.6–51.3 kg/m^2). MN risk prevalence was 44.2%, according to the malnutrition universal screening test (MUST), and 46.5% in elderly patients. Of the patients, 43.4% indicated unintentional weight loss in the last 6 months. Nutritional interventions to treat MN were referral to a dietitian (57.2%), oral nutrition supplements (40.7%), energy/protein–enriched diet (38%), energy/protein–enriched snacks (18.1%), parenteral nutrition (16.7%), support at mealtimes (15.8%), and tube enteral feeding (10.4%). No interventions were given to 5.4% of patients. Regular audits were made to ensure compliance with the protocol/guidelines in 88.5% of patients, and 68.5% of patients were discussed with multidisciplinary teams at the hospitals.

Conclusion: MN is highly prevalent the in internal medical departments of our hospitals. Although MN awareness is increasing, different interventions are in use according to national and international protocols/guidelines, and the number of active multidisciplinary teams is increasing. MN is still a big problem that needs further national plans.

Keywords: Malnutrition, prevalence, inpatients, internal medicine, treatment

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Introduction

Malnutrition (MN) increases both morbidity and mortality rates and healthcare costs in hospitals related to nosocomial infections and hospital length of stay (1).

In 2005, Korfalı et al. (2) conducted a multicenter study in 34 Turkish hospitals from 19 cities to assess nutritional risk at hospital admission. They included 29,139 patients in the study and found 15% MN risk during hospital admission. MN risk was 25% in those over 60 years of age. They used Nutrition Risk Screening-2002 (NRS-2002) to evaluate MN risk. Intensive care units had the highest MN risk prevalence with 52%, followed by medical oncology departments (43.4%), neurology (23.9%), radiation oncology (19.5%), gastroenterology (19.1%), gastrointestinal surgery (18.3%), thoracic surgery (18.2%), nephrology (18.1%), pulmonary diseases (17.8%), and general internal medicine wards (16.4%). Pirlich et al. (3) reported 56.2% MN in geriatric patients, followed by medical oncology (37.6%), gastroenterology (32.6%), and cardiology (22%).

The LPZ (Landelijke Prevalentiemeting Zorgproblemenstudy) is a tool that is based on a prevalence measurement of care problems in both acute and chronic care settings originally performed in the Netherlands. Since 1998, the occurrence of six basic care problems in healthcare institutions have been surveyed in the Netherlands on one specific day each year in April by means of the National Prevalence Measurement of Care Problems (LPZ) (4). Later, five more countries were included in the study; the LPZ has also been carried out in Turkey since 2016. The LPZ tool allows measurement of prevalences and risk of different care problems, such as MN, pressure ulcer, falls, urinary and fecal incontinence, pain and restraints using the same definition, screening instruments, and methodology in different healthcare institutions (hospitals, care homes, homecare) (4). LPZ provides insight into differences in the quality of basic care in different healthcare facilities because it involves an annual measurement.

Main Points

- Malnutrition (MN) prevalence varies from 20% to 60% in hospitalized patients.
- This study provided information about the prevalence of MN risk, together with care facilities, preventive measures, and interventions for MN prevention/treatment in the internal medical departments of Turkish hospitals.
- MN risk is highly prevalent (42.2%) in internal medical departments of our hospitals.
- MN risk is most prevalent in Emergency Medicine (84.6%), Medical intensive care unit (83.3%), and Palliative Care (54.2%) units.
- The main preventive nutritional interventions were MN risk screening, referral to a dietitian, and an energy/protein–enriched diet. The main nutritional interventions to patients with MN were referral to a dietitian, regular MN risk screening, and oral nutritional supplements.

The aim of this study was to measure MN risk prevalence in internal medical departments in Turkish hospitals with the existing preventive and treatment interventions using the LPZ tool.

Materials and Methods

This cross-sectional, multicenter prevalence measurement study was conducted in November of 2017, 2018, and 2019. Maastricht University is responsible for the central coordination of the study, and a national coordinator in each participating country organizes the measurement in their own country. In each center, one coordinator was responsible for the measurement. The coordinators were trained by the research group to manage the survey, apply the standardized questionnaire, use an internet data-entry program, and train the healthcare professionals who would perform the measurement within the organizations. Two healthcare professionals (nurses, dietitians, or doctors who worked in the patient's ward) assessed each patient in the hospitals.

The LPZ tool includes three questionnaires, the first for the institution, the second for the ward/section, and the third for patient information. The third form includes questions involving patient demographic characteristics, medical history, dependency, prevalence and risk of care problems, interventions for prevention, and management (4).

LPZ data included a malnutrition universal screening tool (MUST) (5) to assess MN risk in hospitals. MUST includes body mass index (BMI, kg/m^2), unintentional weight loss, and acute disease effect for scoring. Each parameter is scored as 0, 1, or 2 points. Overall risk for MN was established as low (total score = 0), medium (total score = 1), or high (total score ≥2) (Table 1). LPZ data also included preventive measures and interventions for MN.

The study was done in 12 different hospitals from six big cities in Turkey. The Istanbul Faculty of Medicine Ethical Committee at Istanbul University approved the study. All patients or their relatives gave informed consent.

Statistical analysis

Statistical analysis was done using SPSS 21.0 (IBM SPSS Statistics, Version 21). Data were expressed as mean±SD. Categorical variables were compared by chi-square anal-

Table 1. Malnutrition universal screening tool (MUST)					
STEP 1		**STEP 2**		**STEP 3**	
BMI (kg/m²)	**Score**	**Weight loss % (3–6 months)**	**Score**	**Acute disease/ low oral intake**	**Score**
>20	0	<5	0	No	0
18.5–20	1	5–10	1	Yes	2
<18.5	2	>10	2		
STEP 4					
Score 0: Low risk		Score 1: Medium risk		Score ≥2: High risk	
STEP 5					
Low risk: Screening weekly No intervention		Medium risk: Screening weekly No intervention		High risk: Screen weekly Treat malnutrition	

Table 2. Types of internal medical departments	
Department	**Number of patients (%)**
Internal medicine	1,271 (72.1)
Palliative care	182 (10.3)
Geriatrics	116 (6.6)
Physical rehabilitation	54 (3.1)
Neurology	30 (1.7)
Medical ICU	28 (1.6)
Emergency medicine	22 (1.2)
Others	61 (3.4)
Total	1,764 (100.0)
ICU: intensive care unit.	

Table 3. Medical diagnosis of patients during admission	
Medical diagnosis	**Number (%)**
Cardiovascular disease	631 (35.8)
Diabetes	516 (29.3)
Cancer	356 (20.2)
Respiratory diseases	350 (20.0)
Infectious diseases	330 (18.7)
Gastrointestinal diseases	326 (18.5)
Endocrine diseases	306 (17.3)
Genitourinary diseases	267 (15.1)
Neurological diseases	264 (15.0)
Musculoskeletal diseases	201 (11.4)
Hematological diseases	164 (9.3)
Others	122 (6.9)

ysis. Mann-Whitney U test, Student t-test, and Wilcoxon test were used to analyze differences between variables.

Results

A total of 1,764 patients (mean age, 62.6±0.4 years; range, 18–99 years; 60.9%: men, mean age 62.8±17.8 years; 39.1% women, mean age 63.4±17.0 years) from 12 centers were included in the study. Types of internal medical departments are given in Table 2. The main diagnoses were cardiovascular disease, diabetes, cancer, respiratory diseases, infectious diseases, and gastrointestinal diseases (Table 3). Mean weight and BMI of the patients were 71.9±16.5 kg (range, 30–153 kg; men: mean, 71.3±16.4 kg; women: mean, 72.3±17.7 kg) and 27.0±5.1 kg/m² (range, 10.6–51.3 kg/m²; men: mean, 25.8±5.8 kg/m², women: mean, 29.8±6.5 kg/m²).

MN risk prevalence was 44.2% according to MUST. Overall, 43.4% of the patients indicated unintentional weight loss in the last 6 months, and 45% of the patients experienced a decreased appetite over the last month. MN risk prevalence in different departments is given in Table 4. A total of 17.1% of the patients had swallowing problems.

Preventive nutritional interventions for all patients were regular MN risk screening every week, referral to a dietitian, energy/protein–enriched diet, monitorization of fluid intake, and oral nutritional supplements (ONSs). No intervention was given to 18.1% of the patients (Table 5). Main nutritional interventions for patients with MN risk were re-

Table 4. Malnutrition risk prevalence in different departments

Department	MN risk according to MUST (%)
Emergency medicine	84.6
Medical ICU	83.3
Palliative care	54.2
Geriatrics	43.8
Internal medicine	43.7
Neurology	45.0
Physical rehabilitation	15.6

ICU: intensive care unit; MUST: malnutrition universal screening test.

Table 5. Nutritional interventions for all patients

Nutritional intervention	%
Regular MN risk screening	51.6
Referral to a dietitian	48.4
Energy/protein–rich diet	23.6
Oral nutritional supplements	20.4
Monitorization of fluid intake	15.6
Adjustment of mealtime ambiance	10.2
Informing patients and/or relatives	10.1
Energy/protein–enriched snacks	9.4
Support at mealtime	9.5
Food desired by the patient	9.1
Parenteral nutrition	8.6
Tube feeding	7.5
Plate protocol (monitoring)	6.9

MN: malnutrition.

ferral to a dietitian, regular MN risk screening, ONSs, energy/protein–rich diet, monitorization of fluid intake, and parenteral nutrition. No intervention was given to 5.4% of the patients with MN risk (Table 6).

MN risk prevalence was 46.5% in old-aged patients (≥65 years old; n=923, 52.3%). The main diagnosis of the old-aged patients were cardiovascular diseases (45.3%), diabetes (31.7%), respiratory diseases (24.5%), infectious diseases (22.2%), cancer (19.9%), gastrointestinal diseases

Table 6. Nutritional interventions for those with MN risk

Nutritional intervention	%
Referral to a dietitian	57.2
Regular MN risk screening	51.6
Oral nutritional supplements	40.7
Energy/protein–rich diet	38.0
Energy/protein–enriched snacks	18.1
Monitorization of fluid intake	18.1
Parenteral nutrition	16.7
Food desired by the patient	16.3
Support at mealtime	15.8
Adjustment of mealtime ambiance	14.9
Adjustment of meal consistency	14.0
Informing patients and/or relatives	11.3
Tube feeding	10.4
Plate protocol (monitoring)	7.9
No interventions	5.4

MN: malnutrition.

(19.0%), endocrine diseases (18.0%), genitourinary tract diseases (15.9%), dementia (11.4%), and other neurological diseases (8.2%). The main nutritional interventions to treat MN risk in old-aged patients were referral to a dietitian (57.0%), ONSs (45.7%), energy/protein–enriched diet (43.0%), monitorization of fluid intake (24.0%), energy/protein snacks (23.1%), parenteral nutrition (21.7%), support at mealtimes (21.3%), adjustment of the consistency of the meal (19.9%), and tube feeding (14.9%). Overall, 22.6% of the old-aged patients had swallowing problems.

When care facilities were taken into consideration, regular audits were done in 88.5% of the wards to ensure compliance with national and international protocol/guidelines. A total of 68.5% of patients with MN risk were discussed with a multidisciplinary team. In 80.6% of the wards, risk assessment was reported in each patient's file, and in 88% of the wards, all caregivers had followed a refresher course for nutrition in the last 2 years.

Discussion

MN prevalence varies from 20% to 60% in hospitalized patients in different European countries and from 22% to 84% in the elderly (6, 7). Several factors are responsible for

the increased MN rates in hospitals. Infections, acute and chronic diseases and their complications, old age, and trauma are known risk factors for MN (8, 9). Eglseer et al. (10) showed that MN risk prevalence was between 14.5% and 33.7% in three European countries. In the elderly population, changes in body composition, chronic diseases, decreased food intake, immobility, sarcopenia, mood changes, and cognitive disorders are the main causes of MN (11). Leij-Halfwerk et al. (12) showed a 28% MN risk prevalence among elderly patients in European hospitals.

In a recent study, Marinho et al. (13) showed a very high prevalence of MN (73%) in internal medical departments of Portuguese hospitals. Marco et al. (14) reported a 1.4% MN rate in the internal medical wards of hospitals in a study with over 1.5 million participants. Most of those patients were old aged; had a greater degree of comorbidity; resided in nursing homes; and had dementia, cancer, HIV, and chronic kidney disease (14). Different MN prevalences may be related to different definitions, instruments, and populations (15).

In Turkey, Turkoglu et al. (16) reported a 26%–31% MN risk rate in hospitals according to four different screening methods, MUST, NRS-2002, Malnutrition Screening Tool (MST), and Short Nutrition Assessment Questionnaire (SNAQ). In another study, MN risk prevalence varied significantly between 18.4% and 86% according to different screening tools in old-aged hospitalized patients (17). Celik et al. (18) found 24.7% MN risk using NRS-2002 in 162 hospitalized patients. To the best of our knowledge, our data are the first from Turkey indicating MN risk prevalence in internal medical departments of hospitals, together with data about interventions and care quality. Our MN risk prevalence was 44.2% (46.5% in the elderly), which was in accordance with the previous data. MN risk was significantly higher in emergency and intensive care units (84.6% and 83.3%, respectively), followed by palliative care units (54.2%) and geriatric medicine units (43.8%). Internal medicine wards constituted 72.1% of all cases, and MN risk prevalence in those wards was 43.7%. A high MN risk rate was related to the comorbidities of the patients, such as cardiovascular diseases; diabetes; cancer; and respiratory and neurological diseases, including neurodegenerative disorders (Table 3).

MN screening and/or assessment are recommended during hospital admission to diagnose MN risk and/or MN. Either MN or MN risk indicates a treatment plan including referral to a dietitian (or nutrition expert) (19, 20). A study has shown that applying nutritional care strategies (such as using a malnutrition screening tool) increased dietician referrals (21). Other treatment strategies are enriched diets/snacks, personalized diets, oral and tube enteral feeding, and parenteral nutrition, according to the daily energy/protein needs of the patient (22). According to our data, the main preventive measures for MN were regular MN risk screening, referral to a dietitian, energy/protein–rich diet, support at mealtime, giving information to patients and relatives, and enteral or parenteral nutrition. The main interventions to treat MN were referral to a dietitian, regular MN risk screening, oral or tube enteral nutrition, energy/protein–rich diet and/or snacks, and parenteral nutrition. More than 50% of patients with MN risk were referred to a dietitian and/or had energy/protein diet or snacks, over 40% had ONSs, and 16.7% had parenteral nutrition; these rates were similar in old-aged patients, except parenteral nutrition, which was more prevalent in the elderly (21.7%).

Although regular audits were done in 88.5% of the wards to ensure compliance with national and international protocol/guidelines, regular MN risk screening was only done to half of the patients with MN risk, which was not in accordance with the international guidelines. Two thirds of the patients had a consultation with the multidisciplinary teams.

Conclusion

This study provided information about the prevalence of MN, care facilities, preventive measures, and interventions for MN in internal medical departments of Turkish hospitals. MN is highly prevalent in internal medical departments of our hospitals. Although MN awareness, interventions, and the number of active multidisciplinary teams are increasing, it is still a big problem and needs further national plans.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Istanbul University Istanbul Faculty of Medicine (Date and approval no: 29.01.2016 and 2016/71).

Informed Consent: Written informed consent was obtained from patients/relatives who participated in this study.

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Assessment of the nutritional awareness and basic knowledge levels of physicians working in the surgery clinic

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ABSTRACT

Objective: The clinical importance of nutritional awareness and assessment has become evident over the years. This study aimed to investigate the nutritional attitudes, personal perceptions and behaviors, and basic knowledge levels of physicians working in the General Surgery Clinic, University of Health Sciences.

Methods: A total of 37 physicians working in the General Surgery Clinic, University of Health Sciences were included in the study. A previously evaluated and proven Nutritional Questionnaire and Mini Knowledge Assessment Exam were applied to the participants. With the questionnaire, previous nutritional trainings, clinical nutritional awareness, personal nutritional competence, practice, and nutritional patient education were assessed. After the questionnaire, a multiple choice mini test was applied to evaluate basic nutritional clinical knowledge.

Results: The study sample included 37 physicians, including 19 (51.4%) specialist physicians and 18 (48.6%) residents working in the General Surgery Clinic, where nutritional evaluation was performed. It was observed that the participants highly approved of nutritional awareness and importance factors. Considering the participants' application of nutritional parameters in the clinic, weak application was observed in 6 physicians (16.2%), moderate application in 25 physicians (67.6%), and strong application in 6 physicians (16.2%). In the results of the mini test applied for the knowledge evaluation of physicians, very low level of knowledge, low level of knowledge, medium level of knowledge, good level of knowledge, and very good level of knowledge were detected in 1 (2.7%), 1 (2.7%), 3 (8.1%), 19 (51.4%), and 13 (35.1%) physicians, respectively. Good and very good knowledge levels were observed in a total of 32 (85.5%) general surgery physicians. It was observed that the only factor affecting the clinical practice of nutritional parameters by the participants was not feeling sufficient and self-confident in terms of nutrition ($p=0.04$). In the comparison of specialist physicians and residents, no statistically significant difference was observed in terms of nutritional education status, nutritional questionnaire opinions, and nutritional knowledge levels ($p>0.05$).

Conclusion: Participants basically know the concept of nutrition and are aware of its importance, but they are of the opinion that there is a sense of personal inadequacy and lack of self-confidence in clinical practice.

Keywords: General surgery, nutrition, nutrition awareness, nutrition questionnaire

Introduction

With nutritional education gaining value day by day and providing awareness about it in the field of health, it gains the importance it deserves. It can be accepted that there is a relationship between nutrition and mortality, and the most regulating factor in this association is the physician (1, 2). Although there has been a positive development over the years in medical faculties where physicians receive their professional education, inadequacies in nutritional education have been reported (3, 4). For this reason, clinical nutritional awareness, perception of personal competence, practice habits, and basic clinical knowledge of the physicians working in the General Surgery Clinic, where we work by prioritizing the educational factors, were investigated. Based on the results, we aimed to generate positive clinical contributions and development of educational factors.

Materials and Methods

The study was approved by the Ethics Committee of the University of Health Sciences Dışkapı Training and Research Hospital (Decision date: February 26, 2019; decision no. 60/11). A total of 19 specialist physicians and 18 residents

This study was presented as an oral presentation [SB 10] at the Clinical Enteral Parenteral Nutrition Congress, Antalya, Turkey, March 27–31, 2019.

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Table 1. Distribution of survey questions evaluating nutritional views of physicians working in general surgery clinic	
Content of questions	**Number of questions**
Determination of nutritional education status	2
Nutritional disease status in the family	1
Value and awareness of nutrition subject	3
Evaluation of the nutritional approach to the patient	6
Nutritional knowledge status opinion of physicians	1
Behavior assessment in patients with nutritional support	2
Opinion of the need for continuous education for nutritional behavior change	1
Opinion of the beginning of nutritional change with health problems in patients	1
Nutritional change opinion in patients with physician's personal effort	3
Assessment of unnecessary preventive health service and physician counseling	7
Evaluation of the physician's self-confidence and self-sufficiency	22
Physician's application status of nutrition parameters in clinic	18
Total	67

in the General Surgery Clinic of a Training and Research Hospital affiliated with the University of Health Sciences were included in the study. The participants were administered a previously evaluated and proven Nutritional Questionnaire and Mini Knowledge Assessment Exam (5). With the questionnaire, previous nutritional trainings and their importance, clinical nutritional awareness, personal nutritional competence, practice, and nutritional patient education were questioned. After the questionnaire, a multiple choice mini test was applied to evaluate basic nutritional clinical knowledge. The questionnaire was composed of 67 questions, compiled by revising the previously applied forms, and the mini test was composed of 17 questions. The distribution of questions in the evaluation of the questionnaire is given in Table 1. The physician's application of nutritional parameters in clinical practice was classified as weak application (0–6 yes answers in 18 questions), moderate application (7–12 yes answers in 18 questions), or strong application (13-18 yes in 18 questions). The results of the 17-item mini test that was administered for evaluating the knowledge of physicians were assessed as very low level of knowledge (0–4 correct), low level of knowledge (5–8 correct), medium level of knowledge (9–11 correct), good level of knowledge (12–14 correct), and very good level of knowledge (15–17 correct). In the other questionnaire questions, the opinions of the physicians were evaluated in the categories of strongly disagree (1), disagree (2), no idea and undecided (3), agree (4), and strongly agree (5). Average values of the questionnaire results of nutritional parameters were taken in the evaluation of multiple questions.

Main Points

- Nutrition education is a cornerstone of medical training in Surgical Clinics.
- General Surgeons are mainly aware of the nutrition term and its importance.
- Although clinicians have basic nutrition knowledge, there may be an insufficiency in clinical practice.

Statistical analysis

Statistical Package for the Social Sciences 16.0 (SPSS Inc., Chicago, IL, USA) software was used for statistical analysis of the data. When comparing categorical data between groups, the chi-square test was used and the results were presented as the number of cases and percentage (%). Whether numerical data displayed normal distribution or not was analyzed by using the Kolmogorov-Smirnov test. The distribution of numerical data conforming to the normal distribution was presented as mean ± standard deviation. The Kruskal-Wallis Test was used to compare the clinical practice of nutritional parameters with nonparametric data between the groups. Differences with a P-value <0.05 were considered significant.

Results

For 37 physicians, including 19 (51.4%) specialist physicians and 18 (48.6%) residents working in the General Sur-

Table 2. Nutritional education history of physicians working in general surgery clinic and application status of nutritional parameters in clinic and nutritional mini test results	
Nutrition Associated Items	**Total, n=37**
Nutritional education in Faculty of Medicine, n (%)	10 (27%)
Elective/voluntary nutritional education, n (%)	1 (2.7%)
Nutritional disease in family, n (%)	11 (29.7%)
Application rate of nutrition parameters in clinic, %	51.8±20.8
Strong clinical application frequency of nutrition parameters, n (%)	6 (16.2%)
Mini nutritional test result	78±16
Very knowledgeable (n=13) and knowledgeable (n=19) nutritional knowledge level, n (%)	32 (86.5%)

gery Clinic, where nutritional evaluation was performed, nutritional education status, presence of nutritional disease in their family, practice of nutritional parameters in the clinic, and nutritional mini test results are shown in Table 2. Physician's application status of nutritional parameters in clinic was observed as weak application in 6 physicians (16.2%), moderate application in 25 physicians (67.6%), and strong application in 6 physicians (16.2%). For the results of the 17-item mini test applied to the physicians for knowledge assessment, very low level of knowledge, low level of knowledge, medium level of knowledge, good level of knowledge, and very good level of knowledge were observed in 1 (2.7%), 1 (2.7%), 3 (8.1%), 19 (51.4%), and 13 (35.1%) physicians, respectively. Good and very good knowledge levels were observed in a total of 32 (85.5%) general surgery physicians.

Survey opinions about clinical nutritional awareness, nutritional positive approach, opinion of good knowledge level in physicians in terms of nutrition, opinion of patient behavior change with nutritional support, changes occurring with illness, contribution of periodic patient education, personal nutritional competence, nutritional self-confidence, patient approach, and nutritional patient education are given in Table 3 under 9 main headings.

The educational backgrounds, nutritional survey results, and knowledge evaluation test results of the physicians participating in the study, which affect the application status of nutritional parameters in the clinic, are given in Table 4. It was observed that the only factor affecting the poor application of nutritional parameters in the clinic by the physicians was feeling nutritionally inadequate and lack of nutritional self-confidence (p=0.04).

In the comparison of specialist physicians and residents, no statistically significant difference was observed in terms of nutritional education status, nutritional illness status in the family, clinical nutritional awareness, nutritional positive approach, opinion of good knowledge level in physicians in terms of nutrition, opinion of patient behavior change with nutritional support, changes occurring with illness, contribution of periodic patient education, personal nutritional competence, nutritional self-confidence, clinical application of nutritional parameters, and nutritional mini test results (p>0.05).

Discussion

Diabetes, coronary artery disease, hypertension, certain cancers, and, most importantly, obesity, which is the result of malnutrition, are nutrition-related diseases and are the leading causes of death (1). Patients consider physicians as the individuals who can help most in nutrition and give the most accurate nutritional advice to regain their health in case of illness (2). Despite the general awareness of physicians about nutrition, problems may occur because of time constraints, excessive workload, difficulties in patient compliance, and deficiencies in sustainable education in nutrition. With nutritional education gaining value day by day and providing awareness about it in the field of health, it gains the importance it deserves. Despite the positive development in medical faculties over the years, inadequacies in nutritional education have been reported (4, 5). It was observed that the physicians working in the General Surgery Clinic did not receive sufficient nutritional education in their return to medical faculty education and in their later professional life. Necessary importance should be given to nutritional education in the curriculum of the medical faculty and in-service trainings later.

The Nutritional Questionnaire and Mini Knowledge Assessment Exam, which are known to be reliable and previously used in other studies, were used in the study (5). With the questionnaire, nutritional practice status of the physician, nutritional education status, and awareness,

Table 3. The clinical nutritional awareness, personal nutritional competence, nutritional self-confidence, patient approach, and nutritional patient education of General Surgeons

Specialist physician and residents, n=37(%)					
Topic of questionnaire	**Strongly disagree**	**Disagree**	**No opinion/ undecided**	**Agree**	**Strongly agree**
Nutritional awareness	0 (0%)	1 (2.7%)	4 (10.8%)	17 (45.9%)	15 (40.5%)
Nutritional positive approach	0 (11%)	1 (2.7%)	12 (32.4%)	22 (52.5%)	2 (5.4%)
Nutritional good knowledge level opinion of physicians	1 (2.7%)	3 (8.1%)	14 (37.8%)	12 (32.4%)	7 (18.9%)
Change in patients' behaviors with nutritional support	0 (0%)	1 (2.7%)	11 (29.7%)	24 (64.9%)	1 (2.7%)
Requirement of continuous education for nutritional behavior change in patients	0 (11%)	3 (8.1%)	16 (43.2%)	15 (40.5%)	3 (8.1%)
Initiation of nutritional change owing to health problems in patients	0 (0%)	4 (10.8%)	7 (18.9%)	16 (43.2%)	10 (27%)
Nutritional change in patients with physician's personal effort	0 (0%)	3 (8.1%)	20 (54.1%)	14 (37.8%)	0 (0%)
Assessment of unnecessary preventive health service and physician counseling	0 (0%)	7 (18.9%)	26 (70.3%)	4 (10.8%)	0 (0%)
Physician's self-confidence and physician's finding himself/herself self-sufficient in nutrition	0 (0%)	9 (24.3%)	19 (51.4%)	9 (24.3%)	0 (0%)

with which the education habits of the patient and this situation may be associated, were questioned. In the same way, similar proven nutritional questionnaires are used to evaluate the general nutritional attitudes of physicians (6). With these questionnaires, it is possible to evaluate the nutritional approaches and practices of physicians. Based on the analysis of the survey results, positive developments can be achieved with theoretical and practical trainings for personal competence perception and development of practice habits. In addition, the tests applied to evaluate basic nutritional clinical knowledge provide information about the nutritional knowledge level of physicians and allow the revision of educational factors.

It has been reported that physicians' nutritional competencies and clinical practice success are associated with the nutritional education they have received (7). Although the level of nutritional knowledge was found at a good level in the clinic where the study was conducted, it is thought that the nutritional competence of the physicians is related to a multifactorial issue. The fact that the good nutritional knowledge of physicians is not reflected in clinical practice is an indicator of this. It has been shown that medical faculty students gain self-confidence in consultations related to nutrition with the help of preventive medicine and nutrition courses (8). Patient-physician relationship–oriented trainings, including this type of clinical knowledge and practical applications, will be useful in gaining self-confidence.

As the positive clinical effect of nutritional support on patients has been demonstrated in studies with high levels of evidence, it is seen that medical faculty education has been brought to the desired levels, especially in developed countries. In a study conducted in our country, the first and last years of the Faculty of Medicine students were compared, and it was observed that they showed a positive improvement in their nutritional habits and knowledge levels, which was partially attributed to the education provided in the Faculty of Medicine (9). In a survey conducted with the participation of 14 developed Western European countries, satisfactory results were obtained at a rate of nearly 70% in nutritional education in 217 accredited medical faculties (10). In another study, the education given is seen to be

Table 4. Analysis of the factors that may be associated with the status of general surgery physicians' application of nutritional parameters in the clinic	
Application Status of Nutritional Parameters in the Clinic, n=37	
Topic of the questionnaire	**p**
Nutritional education in Faculty of Medicine	0.521
Elective/voluntary nutritional education	1.0
Nutritional disease in the family	1.0
Nutritional awareness	0.255
Nutritional positive approach	0.645
Nutritional good knowledge level opinion of physicians	0.559
Change in patients' behaviors with nutritional support	0.135
Requirement of continuous education for nutritional behavior change in patients	0.707
Initiation of nutritional change owing to health problems in patients	0.542
Nutritional change in patients with physician's personal effort	0.350
Assessment of unnecessary preventive health service and physician counseling	0.291
Physician's self-confidence and physician's finding himself-herself self-sufficient in nutrition	0.04
Physician's nutritional knowledge level	0.448
P<0.05 is given as bold for statistical significance	

insufficient in the evaluation of nutritional education level in 127 accredited American medical faculties (11). When both studies were compared, it was seen that a better nutritional education was given in Western European countries (10). In our study, the lack of nutritional medicine education is observed in both residents and specialist physicians. Approximately 24 hours of education targeted at medical schools in Western European countries should be taken into account in closing this gap.

Conducting this research with the participation of physicians from only one surgical ward seems to be a limitation. A study involving more physicians by including more clinics will be more significant and effective to make healthier analyses.

In conclusion, it is observed among physicians that there are deficiencies in basic and sustainable nutritional education. Participants basically know the concept of nutrition and are aware of its importance, but their sense of personal inadequacy and lack of self-confidence negatively affect clinical practice.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of University of Health Sciences Dışkapı Training and Research Hospital (Decision date: February 26, 2019; decision no. 60/11).

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