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Is continuing medical education sufficient? Assessing the clinical nutrition knowledge of medical doctors

Maria G. Grammatikopoulou M.Sc., Ph.D. [a], Areti Katsouda [a], Kyriaki Lekka [a], Kyriakos Tsantekidis [a], Emmanouil Bouras M.Sc. [a], Eirini Kasapidou B.Sc. [a], Kalliopi-Anna Poulia M.D. [b], Michael Chourdakis Ph.D., M.D., M.P.H. [a,*]

[a] *Laboratory of Hygiene, Social and Preventive Medicine and Medical Statistics, Department of Medicine, Faculty of Health Sciences, Aristotle University of Thessaloniki, Thessaloniki, Greece*

[b] *Department of Nutrition and Dietetics, Laiko General Hospital, Athens, Greece*

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ABSTRACT

Objectives: Provision of nutritional support (NS) can improve disease outcome and shorten hospital length of stay. NS, often prescribed by medical doctors, requires adequate clinical nutrition (CN) expertise. The aim of this study was to investigate self-perceived and actual CN knowledge among medical doctors in Greece.

Methods: Internal medicine physicians and surgical specialties (residents and specialized) were asked to self-evaluate their CN expertise, via a seven-item questionnaire and to complete a 20-question multiple-choice test on CN topics, with the aim of evaluating their actual CN knowledge. Participants were discouraged from accessing literature/information during the completion of either questionnaire.

Results: Of 182 invited medical doctors, 115 (50.4% surgical specialties) participated in the study (63.2% response rate). The majority of participants (65.2%) demonstrated inadequate CN knowledge, with 30.4% of those scoring low having a high self-perception of their CN expertise. Comparison of perceived and actual CN knowledge revealed that only 56.5% of the participants estimated their knowledge correctly. Those who had participated in CN continuous medical education courses demonstrated increased related expertise ($P = 0.002$).

Conclusions: Medical doctors in Greece demonstrate low knowledge of fundamental CN principles, jeopardizing the provision of high-quality and efficient NS. Most importantly, the majority of participants overestimated their CN knowledge and prescribe artificial nutrition or participate in related decision making. Physicians' CN knowledge should be enhanced accordingly, either by attending CN modules during their studies, by participating in basic and advanced courses or CN-specific continuous medical education, or both.

Introduction

Over the past decades, interest has increased regarding the effects of nutrition on health and disease. A plethora of clinical trials, systematic reviews, and meta-analyses have stressed the importance of nutrition in the primary and secondary prevention of non-communicable diseases, contributing to the development of nutritional guidelines and recommendations in various countries [1–5] Additionally, the provision of adequate nutritional support (NS) in hospitalized patients, especially those in critical condition, has been shown to decrease morbidity and mortality, shorten the hospital length of stay, and reduce health care costs [6–10].

However, studies agree that the prevalence of malnutrition is high among hospitalized patients worldwide, ranging from 20% to 40% [11–14] This, among other factors, can be considered a direct epiphenomenon of inadequate NS provision. Approximately two-thirds of all patients experience unintentional weight loss during hospitalization, with the recorded prevalence of malnourished surgical patients being even higher [15], Wide discrepancies have been observed between evidence-based nutritional guidelines and

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* Corresponding author: Tel.: +30 231 099 9035; Fax:+30 2312 205270.
E-mail address: Mhourd@auth.gr (M. Chourdakis).

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Table 1
Questionnaire 1: Self-perception of clinical nutrition knowledge* and involvement in the provision of nutritional support (N = 115)

Questions	Strongly disagree *n* (%)	Disagree *n* (%)	Agree *n* (%)	Strongly agree *n* (%)
1I feel I have adequate knowledge of nutritional support of surgical patients.	10 (8.7)	46 (40)	46 (40)	13 (11.3)
2I have adequate knowledge and skill to identify patients at risk of malnutrition.	10 (8.7)	15 (13)	61 (53)	29 (25.2)
3I am able to calculate my patient's daily energy and nutritional requirements.	22 (19.1)	38 (33)	37 (32.2)	18 (15.7)
4Providing adequate nutritional support to patients reduces complications and shortens length of hospital stay.	5 (4.3)	16 (13.9)	94 (81.7)	–
5I regularly make decisions regarding nutritional support/interventions as part of the management of my patients.†	14 (12.2)	22 (19.1)	48 (41.7)	31 (27)
6I have been provided with adequate information (e.g., guidelines) to facilitate nutritional support of my surgical patient.†	26 (22.6)	45 (39.1)	37 (32.2)	7 (6.1)
7I consider that the provision of nutritional assessment and nutritional training would be valuable to my career.	4 (3.5)	12 (10.4)	40 (34.8)	59 (51.3)

* Self-perceived clinical nutrition knowledge calculated from questions 1 to 3 (0 points for *strongly disagree*, 1 point for *disagree*, 2 points for *agree*, 3 points for *strongly agree*, resulting in 0–9); scoring 0 to 4: *inadequate*; scoring 5 to 9: *efficient*.

† Questions 5 and 6: Identifying physicians involved in the provision of nutritional support and self-perceived competency to do so.

actual clinical practice [16–19]. For the provision of efficient NS, medical doctors (MDs), who are in most countries responsible for prescribing NS, should have adequate knowledge in the field of clinical nutrition (CN). However, despite the fact that CN has been proven to be cost-effective in improving health outcomes among all age groups of hospitalized patients [20], CN education of MDs, both at the undergraduate and postgraduate levels, appears to be insufficient and often outdated [21,22].

Given that patients regularly receive nutritional advice from MDs, the latter should have an adequate level of CN expertise. Literature is scarce on the nutrition education offered by the European medical schools curricula [23]. To date, the incorporation of CN in the medical curricula or training of specialized doctors, as well as in the continuing medical education (CME) modules destined for practicing clinicians, remains a low priority [7,14,22]. Moreover, MDs, as is the case of most health care professionals, appear to have inadequate CN knowledge, primarily stemming from the insufficient relevant education received during their studies. Additionally, great variability is demonstrated in the CN education offered by medical schools across and within countries [24].

Lastly, MDs seem to be lacking sufficient information on the benefits of NS, which might be partially explained by their low interest in receiving nutritional training, adhering to the established guidelines (e.g., from the European Society for Clinical Nutrition & Metabolism [ESPEN]) or both, as well as by the subsequent poor nutritional management documented across European hospitals [17,19,25–31].

In Greece, nutrition education during undergraduate medical studies demonstrates great variability, depending on the university. To date, Aristotle University appears to offer the majority of nutrition-related courses compared with other institutes; however, nutrition remains a low priority during curricula reform. On the other hand, although by law the majority of Greek public hospitals are employing at least one dietitian, given the workload, one is equal to none. The primary aim of the present cross-sectional study was to investigate perceived and actual knowledge in CN among MDs in Greece. Secondary aims included the comparison of CN knowledge between internal and surgical specialties, different hospital settings, MDs with and without postgraduate education, or those having attended nutrition seminars.

Methods

Setting

The study was conducted in seven hospitals, situated in mainland Greece (four university hospitals, two military hospitals, and a general hospital). Ethical approval was granted by the Aristotle University's Bioethics Committee, in compliance with all the relevant national regulations, institutional policies, and in accordance with the tenets of the Helsinki Declaration, including, but not limited to the anonymity of participants being guaranteed and the informed consent of participants being obtained.

Sample

In all, 182 residents and qualified MDs of specialties acquainted with the provision of NS (including endocrinologists, gastroenterologists, and pediatricians), were informed of the study's aims and invited to participate.

Tools

All participants were asked to complete two questionnaires. The first consisted of seven questions, with answers on a 4-point Likert scale (*strongly disagree, disagree, agree*, and *strongly agree*; (Table 1). The initial three questions were used as an estimate of self-perception regarding CN knowledge, providing a score that ranged from 0 to 9. Scores ranging from 0 to 4 were considered indicative of "inadequate" self-perceived CN knowledge and scores ranging from 5 to 9, identified "efficient" self-perceived CN knowledge. Questions 5 and 6 assessed participants' involvement in making decisions related to the provision of NS and the level of self-perceived competence to perform this task.

The second questionnaire was adapted with permission from Awad et al. [15] and assessed actual CN knowledge, including common scenarios in daily clinical practice. It consisted of 20 questions, each with five possible answers, of which, only one was correct. Each correct answer provided 1 point, with the maximum being 20 points. Participants with ≤12 points (i.e., having ≤60% correct answers) scored were considered as having inadequate CN knowledge ("low scorers") and those >12 points, were considered as having CN expertise ("high scorers").

To increase accuracy of the results, none of the participants were notified about the test before their participation acceptance, nor were they allowed to discuss or access any form of literature or information during the completion of the questionnaires, either through textbooks or the Internet.

Statistical analyses

Continuous variables were presented as means ± SD when normally distributed, or as medians, with their 25th to 75th interquartile range, when the criteria for normal distribution were not met. Categorical variables were presented as *n*, with their corresponding frequencies. Independent samples *t* tests, Mann–Whitney U, or χ^2 tests were applied to assess between-group differences. All reported *P* values were based on two-sided tests. The level of significance was set at <0.05. All analyses were performed with the SPSS, version 24 (SPSS, Chicago, IL, USA).

Results

Participants

Of the 182 invited MDs, 115 (50.4% of surgical specialties) completed the survey (response rate: 63.2%, male/female ratio 2.29, surgical specialties 50.4%, postgraduate degree 44.3%, attended CN CME 42%, mean medical practice experience 13.8 ± 10.7 y).

Self-perception of CN proficiency

Responses to questionnaire 1 ("Self-perceptions of CN proficiency") are presented in Table 1. The vast majority of respondents (81.7%) acknowledged the importance of efficient NS, whereas

Table 2
Differences in the self-perceived clinical nutrition knowledge* by participant characteristics

	Total sample (N = 115)	Self-perceived "inadequate" (score 0–4) (*n* = 55)	Self-perceived "efficient" (score 5–9) (*n* = 60)	*P*-value†
Sex, male (%)	80 (69.6)	36 (65.5)	44 (73.3)	0.359
Age, >40 y (%)	55 (47.8)	22 (40)	33 (55)	0.108
Age, y (median)	40 (30–51)	36 (28–45)	41.5 (32.8–53)	0.034
Specialty, surgical (%)	58 (50.4)	28 (50.9)	30 (50)	0.922
Attendance at clinical nutrition CME (%)	48 (41.7)	22 (40)	26 (43.4)	0.717
Hospital, university (%)	45 (39.1)	22 (40)	23 (38.3)	0.855

CME, continuing medical education
* Self-perceived "inadequate": scoring 0 to 4: *inadequate*; scoring 5 to 9: *efficient*; added score from questions 1 to 3 in questionnaire 1, Table 1.
† χ^2 test.

Table 3
Differences in actual clinical nutrition knowledge by participant characteristics (median, IQR).

	Actual CN knowledge	*P*-value*
Sex		
Male (*n* = 80)	8 (6–10)	0.591
Female (*n* = 35)	9 (5–10)	
Age group		
≤40 y old	8 (5–10)	0.248
>40 y old	9 (7–11)	
Specialty		
Pathological	9 (7–11)	0.228
Surgical	7.5 (5–10)	
Having attended nutrition-related CME		
No	9 (5.75–10)	0.002
Yes	8 (6–11)	
Hospital type		
Non-university	8 (5–10)	0.689
University	9 (7–11)	

CME, continuing medical education; CN, clinical nutrition; IQR, interquartile range
* Mann–Whitney U test.

47.9% reported ability to calculate daily energy and nutritional requirements of patients. The majority of participants (69%) claimed to be prescribing NS to their patients on a regular basis, despite the fact that 78.2% considered themselves unable to identify patients at risk for malnutrition.

Median self-perception CN knowledge score of the sample (5; 4–6) was evenly distributed between "inadequate" (47.8%) and "efficient" (52.2%). Although 38.3% of the participants reported feeling efficient in terms of NS provision, 86% acknowledged that special training in NS would be a valuable asset for their medical career. Furthermore, none of the examined parameters including age, sex, medical specialty, hospital setting, or having a postgraduate degree resulted in differences in participants' self-perception of CN knowledge (Table 2).

Actual CN knowledge

Questions and correct answers (*n*, %) of the questionnaire assessing the actual CN knowledge of participants are presented in Supplementary Table 1. The majority of participants incorrectly answered 14 of 20 questions. Overall, median scoring of the sample was poor (8; 6–10), with 65.2% of the participants demonstrating inadequate CN knowledge (≤12 out of a maximum of 20). Internal medicine specialists scored better (9; 7–11) than those in surgical specialties (7.5; 7–10); however, without statistical significance (*P* = 0.228; Table 3). Being employed in a university hospital rather than a general hospital (9; 7–11 versus 8; 5–10), being male versus being female (8; 6–10 versus 9; 5–10), or being ≥40 y of age (9; 7–11) compared with younger participants (8; 5–10), did not affect CN expertise ($P \geq 0.05$ for all). The only parameter increasing actual CN knowledge was having attended CN-specific CME courses (*P* = 0.002; 9; 7–11 versus 8; 5–10).

Table 4
Differences in the clinical nutrition knowledge of medical doctors: perceived vs actual (N = 115)

Perceived*	Actual† Inadequate *n* (%)	Efficient *n* (%)	Total N (%)
Inadequate	40 (34.8)	15 (13.1)	55 (47.9)
Efficient	35 (30.4)	25 (21.7)	60 (52.1)
Total	75 (65.2)	40 (34.8)	115 (100)

CN, clinical nutrition
* Perceived CN scores: calculated score from questions 1 to 3, questionnaire 1, Table 1 (scoring 0–4: *inadequate*; scoring 5–9: *efficient*).
† Actual CN scores: calculated from questionnaire 2, Table 3 (scoring 0–12: *inadequate*; scoring 13–20: *efficient*).

Wrong answers in the CN knowledge test were not limited to difficult or demanding questions such as those requiring calculations or experience in the field of CN, but were even extended to more basic CN issues (Supplementary Table 1). In particular, regarding fundamental aspects of nutritional science, only 38.3% of the participants could identify the amount of energy (kcal) present in 1 g of each macronutrient (question 5), only 8.7% of the participants were able to accurately recall the recommended protein intake for healthy individuals (question 12) and only 31.3% of the participants were able to define healthy body mass index cutoffs (question 14). When more advanced CN questions were concerned, only 22.8% of the respondents were able to calculate the daily energy requirements of patients with postoperative pyrexia and 27% were aware of the complications associated with the refeeding syndrome.

Perceived versus actual CN knowledge

Comparison of self-perceived (questionnaire 1) versus actual CN knowledge (questionnaire 2) is presented in Table 4. Only 56.5% of the 115 participants estimated their knowledge correctly. Of the participants, only 30.4% considered themselves to be CN experts, despite having inadequate CN knowledge.

Subgroup analyses

No differences were observed in the CN knowledge between physicians participating in the prescription of NS (68.7%) compared with the rest of the sample. Total duration of medical practice did not affect the percentage of participants under- or overestimating their actual CN knowledge. Finally, those claiming to have obtained adequate information about CN did not score better in the test.

Discussion

The majority of participating physicians in Greece demonstrated inadequate to average knowledge regarding the principles of CN, despite their belief that their expertise in CN and NS issues was adequate. These findings can impede the provision of NS in a safe and efficient manner. It is noteworthy that the general regional training program for internal and surgical specialties in Greece still lacks formal NS training/education. Most importantly, the respondents appeared unaware of their insufficient knowledge, and often overestimated their expertise. Due to the importance of NS in disease prevention and quality of provided care [31], the assessment of physicians' CN knowledge has been a popular research topic during the past few decades (Supplementary Table 2). Several tools have been implemented and the majority of studies have indicated inadequate CN knowledge and a subsequent need for further education via the undergraduate medical curriculum [32–34] or through CME [35]. Studies in Bangladesh [36], Kuwait [37], and Saudi Arabia [38], demonstrated increased knowledge on topics often presented in the media, including the optimal body mass index cutoffs or the energy content of macronutrients. Unlike the participants of the present study, physicians from Taiwan [39], Brazil [40], and Iran [41] scored better on basic nutrition topics than on more advanced areas.

However, despite the documented inadequate CN knowledge, a great number of physicians provide NS to their patients [42,43] The majority of the respondents demonstrated inability to identify nutritional risk screening tools and were unable to solve common clinical practice issues, overlooking malnutrition and its consequences, leading to an inadequate provision of NS among patients at risk [44–46]. Additionally, as previously exhibited by physicians in Germany [47], the United Kingdom [15], and several Scandinavian countries [18], physicians in Greece were unable to calculate patient nutritional requirements, a fact that can lead to either under- or overestimation of their needs [48]. Several barriers have been reported, including lack of training and knowledge, inadequate teaching materials, lack of time for nutritional screening, patient non-compliance, and low physician confidence [18,40,42,49–51].

Given the need for high-quality health care provision, knowledge of CN should be enhanced in order to avoid mistakes or critical omissions. Throughout the world, the need to establish competencies in nutrition-related patient care among medical practitioners appears urgent [7]. In the United Kingdom [52] and in the United States [53], lack of nutrition competence among physicians has been acknowledged and a call for action has been declared. Interventional studies have showed ameliorated nutrition knowledge, skills, and satisfaction among physicians who attended nutrition-related CME [54–56], with the majority declaring interest in receiving relevant modules [35], as found in the present study. According to the present study, physicians who reported participating in nutritional workshops/seminars exhibited increased CN knowledge compared with the rest, indicating that nutrition-related CME can be effective.

According to the World Health Organization [4], medical professionals must undertake an active role in promoting healthy dietary behaviors. In parallel, the Council of Europe-Committee of Ministers [57] and several scientific organizations [58] have concluded that the inadequate NS observed in hospitals stems from the insufficient nutrition education of medical practitioners. To adhere to this issue of international concern, nutrition curriculum guidelines for medical studies have been published [59,60]. In Europe, 14.7% of medical schools offered some form of nutrition education at the undergraduate level [21], whereas according to a more recent ESPEN survey [24], CN modules were obligatory in 55.4% of the participating schools, mostly as part of the instruction on different disciplines (i.e., pediatrics, gastroenterology, endocrinology, geriatrics, etc.). A unanimous finding, however, involves the inadequate duration of students' exposure to nutrition-related modules, being on average 23.7 h in total during their medical studies [24,53,61]. Nevertheless, in the United Kingdom [55], as well as in Greece, nutrition modules have been displaced by several other disciplines in the undergraduate medical education curriculum.

As per Dalen and Alpert's suggestion [62], the integration of nutrition courses in the pre-med curriculum is undeniably more relevant to future medical practice, than organic chemistry, or a variety of medical history or foreign-language courses that could be optional instead of compulsory. The implementation of more educational programs of different levels, the establishment of NS teams, and the differentiation of distinct responsibilities between doctors, nurses, and dietitians could enhance the provision of efficient NS and reduce patient risk for malnutrition [35]. Registered dietitians are uniquely equipped to provide essential counseling on health promotion and disease prevention [20,63,64]. However, because not all health care settings in Greece employ dietitians, all health professionals should enhance their CN knowledge.

The results of the present study are of great importance for policymakers, health managers, medical curriculum planners, and scientific societies interested in promoting education on clinical nutrition among health professionals, and especially physicians. It should be stressed, however, that the response rate observed during sample recruitment restricted the number of participants, as observed in the majority of relevant research, also demonstrated in Supplementary Table 2. This finding could stem from a fear of answering incorrectly and being criticized. However, it should be noted that physicians are not the only ones to blame for the lack of integrated or adequate nutrition education. The gaps in CN knowledge demonstrated in the present study indicate the need for additional education for ameliorated health care provision. As improved CN education, related educational programs, and activities could enhance the quality of NS provided to the patients [7,65], emphasis should be given to this direction for all health care personnel under the guidance of registered dietitians.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.nut.2018.05.013.

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