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ESPEN Endorsed Recommendation

Nutrition education in medical schools (NEMS). An ESPEN position paper[☆]Cristina Cuerda^{a,*,1}, Maurizio Muscaritoli^{b,1,2}, Lorenzo Maria Donini^c, Patrick Baqué^d, Rocco Barazzoni^e, Eugenio Gaudio^f, Davor Jezek^g, Zeljko Krznaric^h, Matthias Pirlichⁱ, Marco Schetgen^j, Stephane Schneider^k, Juan A. Vargas^l, André Van Gossum^m^a Nutrition Unit, Hospital General Universitario Gregorio Marañón, Instituto de Investigación Sanitaria Gregorio Marañón, Madrid, Spain^b Department of Translational and Precision Medicine (Formerly Department of Clinical Medicine), Sapienza University of Rome, Rome, Italy^c Food Science and Human Nutrition Research Unit, Medical Pathophysiology, Food Science and Endocrinology Section, Experimental Medicine Department, Sapienza University of Rome, Rome, Italy^d School of Medicine, Université Nice-Sophia Antipolis, Université Côte d'Azur, Nice, France^e Internal Medicine, Department of Medical, Surgical, Health Sciences, Cattinara University Hospital, Trieste, Italy^f Sapienza University of Rome, Rome, Italy^g International Affairs, School of Medicine, University of Zagreb, Zagreb, Croatia^h University Hospital Centre Zagreb, Department of Gastroenterology, Hepatology and Nutrition and Zagreb School of Medicine, Zagreb, Croatiaⁱ Imperial Oak Outpatient Clinic, Endocrinology, Gastroenterology & Clinical Nutrition, Berlin, Germany^j School of Medicine, Université Libre de Bruxelles, Brussels, Belgium^k Gastroenterology and Nutrition, Centre Hospitalier Universitaire de Nice, Université Côte d'Azur, Nice, France^l School of Medicine, Universidad Autónoma de Madrid, Madrid, Spain^m Department of Gastroenterology and Nutritional Support, Hopital Erasme and Institut Bordet, Free University of Brussels, Brussels, Belgium

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SUMMARY

Background & aims: Nutrition education is necessary in the training of healthcare professionals, including medical students. However, recent surveys showed that there is a high variability within Medical Schools in different countries. The aim of this ESPEN position paper is to identify a minimum curriculum knowledge in nutrition that serves to improve the training of the future doctors and how to solve the main barriers of its implementation in university centres.

Methods: In 2017, the ESPEN Executive Committee launched the Nutrition Education in Medical Schools (NEMS) Project and formed a core working group including members of the ESPEN Nutrition Education Study Group (NESG) and representatives of several European Medical Schools. This group met in Brussels, on 19th July 2018 and decided to prepare a position paper on this topic.

Results: Five main learning objectives and twenty-one topics on human nutrition, within its three domains (basic, applied and clinical nutrition) were identified to be fulfilled at the end of training in all Medical Schools. The experts showed the following key factors for its implementation: establish a nutrition curriculum committee, use different models of integration of the contents in the curriculum (vertical and horizontal), have a multidisciplinary and experienced faculty, incorporate a variety of teaching models, and evaluate the programme periodically.

Conclusions: Nutrition Education is necessary and should be mandatory in all Medical Schools. This position paper aims at improving this gap knowledge and gives some clues for a successful implementation of the changes in the medical curriculum at university centres.

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[☆] Document elaborated by the ESPEN Nutrition Education Study Group (NESG), ESPEN Executive Committee and representatives of different European Medical Schools.

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1. Introduction

Nutrition is a broad, interdisciplinary cultural and scientific field, involving a number of chemical, molecular, genetic, biochemical, physiological, psychological, cognitive-behavioral,

List of abbreviations

ESPEN	European Society for Clinical Nutrition and Metabolism
NEGS	Nutrition Education Study Group
NEMS	Nutrition Education in Medical Schools
NCDs	Non-communicable diseases
COPD	Chronic Obstructive Pulmonary Disease
WHO	World Health Organization
UN	United Nations
DALY	disability-adjusted life years
DRM	disease-related malnutrition
HCPs	healthcare professionals
NPQ	La Nutrizione Passa di Qua (Nutrition Passes Here)
FeSIN	Federation of the Italian Nutrition Societies
PEN society	Parenteral and Enteral Nutrition society
ONCA campaign	Optimal Nutritional Care for All campaign
LLL programme	Life Long Learning programme
AMEE	Association for Medical Education in Europe
MNI	Medical Nutrition International Industry

statistical-epidemiological, clinical, technological, educational, economic, political and social aspects [1]. Human nutrition is an intrinsically complex topic, ranging from agriculture and zootechnics to food technology, from nutrition in different physiological states (growth, pregnancy, breast-feeding, aging), to the nutritional approach to acute and chronic diseases, from birth to the end of life [2].

Quite unfortunately, the nutritional field is largely dominated by confusion. Researchers, clinicians, patients and media have inconsistent ideas mainly due to two conflicting observations. Indeed, while on one side the professionals know how to implement healthy eating and how to prevent malnutrition (over and under-nutrition) and non-communicable diseases (NCDs) [3]; on the other side, the rapidly increasing rates of obesity and the evident failure to fight undernutrition suggest that something about the conventional thinking is wrong. This perception leads to non-univocal opinions, also because the meaning of “nutrition” goes far beyond the nutritional and clinical aspects, to economic interests that are not always limpid, and gives space to people who are not always qualified. Research cannot deliver unequivocal answers and ends up suffering from this situation, sometimes becoming dysfunctional while bending to market interests.

The complexity of the matter and the confusion that reigns there, however, should not represent an obstacle in acknowledging the relevance of nutrition in both preventive and clinical medicine. Since the beginning of this century the WHO has raised the alarm regarding the increase in the prevalence of obesity and related complications and the rising mortality rates due to NCDs such as cardiovascular diseases, cancer, diabetes or COPD. In particular, WHO focuses its attention in developing countries to the double burden of malnutrition that is characterised by the coexistence of undernutrition along with overweight and obesity, or diet-related NCDs, within individuals, households and populations, and across the lifecourse. In 2014, more than 1.9 billion adults worldwide, 18 years and older, were overweight while 462 million were underweight. More than 600 million were obese. These conditions cause 61% of the overall disease burden, expressed as the number of years lost due to ill-health, disability or early death (disability-adjusted life years - DALY), about 60% of cardiovascular deaths, and are co-responsible for 35% of tumor deaths [4–6]. The recently published global action plan for the prevention of NCDs to attain a 25%

relative reduction in premature mortality by 2025 confirms the role of lifestyle and nutritional aspects in the pathogenesis of NCDs [7,8]. On the other hand, the rates of undernutrition and in particular of disease-related malnutrition (DRM), averaging 35% in hospitals [9] have remained substantially unchanged since the 1970s, despite the unequivocal, consistent and repeated evidence in the international literature and the Council of Europe resolution and recommendations [10].

Efforts to combat hunger and malnutrition are also being carried out by the UN who has adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals. One of the targets of the second goal, named “End hunger, achieve food security and improved nutrition and promote sustainable agriculture” is directly related to malnutrition [11].

Malnutrition, the ‘disease within a disease’, with its iatrogenic component, causes high rates of complications, mortality and healthcare costs – about 12% or more of hospital expenditure [12,13] while research has clearly documented that nutrition can positively impact disease prognosis, treatment side effects and outcomes [14]. Surprisingly enough, in spite of its high prevalence, there is a great neglect regarding the prevention, diagnosis and treatment of malnutrition. Physicians seldom mention nutritional aspects during office visits and nutritional counseling is rarely performed with little empathy towards patients struggling with their weight or with malnutrition. This is most likely related to several factors, among which: the paucity of physicians and healthcare professionals who are full-time dedicated to clinical nutrition; the low priority given to nutritional activities by other disciplines in the competition for hospital budget; the difficulties in reimbursement of nutritional therapy by the healthcare systems or by insurance companies [15]. Moreover, socio-cultural aspects seem to hinder nutritional aspects related to health status, in particular in developed countries. Obesity is still frequently not recognized as a disease state, while the issue of undernutrition in elderly or obese subjects is largely overlooked. Not less important, the biological significance of food in the collective imagination has been lost in favor of its hedonistic aspects. Finally, people are led to consider nutrients regardless of the food matrix and to attribute them biological functions despite any other nutritional, clinical, functional or environmental consideration.

2. Current status of nutrition education in medical schools

The training of healthcare professionals (HCPs) working in the field of nutrition, and in particular of medical doctors, becomes crucial both for a correct take-up of the problem and for effectively combating the confounding environment that prevails in this domain of biomedical sciences. Medical students have a first contact with nutrition concepts during biochemistry lectures that are however usually disconnected from disease pathophysiology and clinical nutrition. In later clinical years, the nutritional aspects of diseases, the procedures for the evaluation of nutritional status and the specific characteristics of nutritional interventions are generally omitted. Medical students are trained to consider the scientific evidence for pharmaceutical decision making and clinical guidelines promoted by scientific institutions in specialties such as cardiology or surgery, while the evidence for nutritional interventions and the guidelines in clinical nutrition are often undervalued [16].

A recent global survey launched by ESPEN among representatives from all 57 countries of the Council and which was sent to different university centres within these countries, quite clearly showed that clinical nutrition education in undergraduate medical schools is heterogeneous and largely underpowered [17]. The lack of attention dedicated to nutrition in medical schools may depend,

at least partly, on the fact that nutrition science is generally little considered in clinical practice while in medical education it is subordinated to other subjects. Dietary interventions are considered to be outside the evidence base, scientifically weak and the domain of dietitians rather than physicians [16]. Conversely, the role of HCPs with adequate knowledge and skills in the field of nutrition is crucial and cost-effective. Several studies have demonstrated that physicians can have a positive influence on public health (in both primary and secondary disease prevention) by educating and counseling their patients in matters of healthy lifestyle, but, in particular due to time restraints and low nutritional education, HCPs are more frequently led towards quick fix approaches such as prescriptions rather than patient education [14]. Ultimately, medical students need an evidence-based nutrition education to understand the importance of nutrition in health and disease, to know the common sources of different micro- and macronutrients, to be aware of proper food preparation and food hygiene principles, to be familiar with healthy methods of weight control and exercise (while combating inaccurate ideas about eating habits, supplements and wrong or popular weight loss practices), to have competence on nutritional status evaluation and nutritional interventions, to be able to recognize and deal with malnutrition (over and under-nutrition) and eating disorders [18].

In spite of that, both medical school instructors and medical students believe that the amount of nutrition education in the curriculum is insufficient to adequately prepare them to correctly handle nutritional problems [17,19,20]. Very old (and unattended) recommendations are present in the literature: a minimum of 25 contact hours of nutrition education was suggested by the National Academy of Sciences, while the American Society for Nutrition proposed 44 h as the benchmark [21,22]. With some exceptions, in fact all the studies that analysed the level of nutritional education found that medical students do not receive this amount of education in The United States or Europe [21,23,24].

When implementing nutritional education in medical schools some aspects need to be taken into account [14,17,18,20,25,26]:

1. Most of the nutrition education in medical schools is not specifically identified as such in the curriculum. Nutrition instruction provided outside of designated courses, on one side, may be considered diluted in importance and given with lower emphasis, but, on the other hand, it can represent an easier and more efficient way of delivering this information without upsetting the organization of the courses of study and integrating the concepts that characterize nutrition into other subjects;
2. It still appears that most of the nutrition instruction, when provided, is delivered in medical schools during the preclinical years of medical training, while it would be probably more beneficial to distribute this information during all medical training period and in particular in the later clinical years, when the student can see the direct correlation between nutrition principles and medical treatment;
3. There is the necessity to overcome the gray line separating the purely physiological and cultural aspects from the specifically medical domains of human nutrition and to consider both these aspects in nutritional instruction in medical schools;
4. There is also the necessity to train the teaching staff of medical schools who will be involved in nutritional education;
5. Nutritional education may be provided in many ways (traditional lecture-based classes may be integrated with case-based learning, virtual learning environment, online nutrition courses, weekend nutrition workshops) and this may help in providing it more efficiently and more extensively;
6. In this field, as in other areas of knowledge, the Dublin Descriptors (knowledge and understanding, applying knowledge

and understanding, making judgements, communication, life long learning skills) need to be considered as the qualification framework.

3. The reasons for an ESPEN initiative

Different attempts have been done in recent years to define and promote an academic curriculum in nutritional education for medical schools, but these initiatives are still scarce and need to be supported by other interventions from academic and scientific institutions [14,26–29]. Recently, the Federation of the Italian Nutrition Societies (FeSIN) tried to identify and define the domains of human nutrition in the attempt to more clearly define the cultural identity of human nutrition in an academically- and professionally-oriented perspective and to report the conclusions in position papers. Three main domains of human nutrition, namely Basic Nutrition, Applied Nutrition and Clinical Nutrition, were identified and thirty-two items were identified, attributed to one or more of the three domains and ranked considering their diverse importance for academic training in the different domains of human nutrition [2]. Based on these considerations there is a need for a call to action of academic and scientific institutions for promoting the integration of nutritional education, aimed at the assessment and management of nutritional status together with behavioral counseling techniques into the medical school curriculum [14,18]. Along this line, a new educational program for medical students named “La Nutrizione Passa di Qua – NPQ” (Nutrition Passes Here), at Sapienza University in Rome has been started, which it is aimed to implement nutritional knowledge in the core curriculum [30].

In 2012, ESPEN created the Nutrition Education Study Group (NESG) with the aims “to promote recognition of the need for nutritional knowledge and nutritional support in health services, to identify the barriers preventing implementation of nutritional screening and nutritional interventions in clinical practice, and to identify potential strategies to address these issues” [31]. In 2017, ESPEN performed a survey within its Council countries on the status of nutrition education in the medical schools that showed high heterogeneity between countries and within countries [17]. Afterwards, the ESPEN Executive Committee decided to launch the Nutrition Education in Medical Schools (NEMS) Project and formed a core working group including members of the NESG and representatives of several European Medical Schools. This group met in Brussels, on 19th July 2018 and decided to prepare a position paper on this topic.

The aim of this position paper is to identify the criteria and guiding concepts to be applied in academic training in human nutrition. In particular, the main goal is to identify the subject matter that should characterise the core of human nutrition training for undergraduate medical students.

4. Nutrition education in medical schools. The ESPEN proposal for a teaching model

ESPEN believes that during the medical training at the university the students should receive mandatory information about human nutrition in its three different domains, including basic nutrition, applied or public health nutrition and clinical nutrition, sharing the approach previously expressed by the National Nutrition Task Force in UK and the Federation of the Italian Nutrition Societies (FeSIN) [2,27]. The way to organise these themes in the curriculum will depend on each university centre, taking into consideration the different models of teaching (parallel, integrated or case-solving based), the availability of teachers and the distribution of time and credits with the rest of subjects. As in any other

subject, the teaching should be based in a competence analysis in which the students will have to demonstrate their knowledge, skills and aptitudes [32]. Many centres include a vertical and horizontal integration of this nutrition knowledge in the medical curriculum [33,34]. The vertical integration consists on the inclusion of basic nutrition science in the first years of medical school (preclinical years) with the addition of applied and clinical nutrition contents over the following years (clinical years). The horizontal integration includes some nutrition contents spread over different subjects (generally in the last years, clinical years), which allows to save time in the generally crowded curriculum. However, some centres prefer to concentrate this knowledge in a Nutrition subject that sometimes is mandatory or elective. The distribution of these contents in traditional classes, seminars and clinical practice sessions is recommended. Also, the use of novel teaching tools, internet resources and e-learning should be encouraged [35,36].

4.1. Proposed learning objectives

According to ESPEN proposal, at the end of the Medical School, the future doctors should be able to:

- Recognise the importance of nutrition for the promotion of health, and the prevention and treatment of disease
- Know the basic scientific principles of human nutrition
- Understand nutrition-related problems in individuals and the community
- Provide general dietary advice to general population and patients
- Identify patients at risk of malnutrition or malnourished and know how to treat them and when to refer to a specialist in clinical nutrition

4.2. Content of education and training in human nutrition

During the medical training at the university the students should receive mandatory information about human nutrition in its three different domains [2,27]:

a Concepts of basic nutrition

Basic nutritional science should be taught in the first years of training, preclinical subjects, as it constitutes the bricks on which the student will construct his nutrition knowledge. Usually these themes are taught in the following subjects: biochemistry, physiology, etc. The basic knowledge should include:

- Macronutrients (proteins, carbohydrates, lipids), micronutrients (vitamins, oligoelements) and dietary fibre
 - Physiology of water, minerals and acid-base balance
 - Intermediate metabolism (adaptation to starvation, post-prandial status and stress)
 - Physiology of digestion and absorption
 - Principles of energy balance and methods of measurement
 - Body composition and methods of measurement
- ##### b Concepts of Applied Nutrition or public health nutrition

This refers to the nutrition recommendations to the general population and the promotion of health and prevention of the most prevalent diseases. These concepts could be taught in mid years of medical training, in subjects as epidemiology, preventive medicine, etc. In these subjects we recommend including the following themes:

- Nutritional recommendations and dietary guidelines
 - Nutrition applied to different stages in life (childhood, adolescence, pregnancy, lactation, menopause, aging)
 - Healthy lifestyle (including recommendations on diet, exercise, effects of alcohol, tobacco and drugs)
 - Prevention of cardiovascular disease and cancer
 - Prevention of malnutrition (undernutrition and obesity)
 - Food labelling
- #### c Principles of clinical nutrition

This refers to the nutrition concepts that apply to patients with different diseases. As a general rule, these themes should be taught in the last years of training (clinical years) and can be included in different subjects from a Nutrition subject, to Endocrinology, Geriatrics, Gastroenterology, Oncology, Surgery, Nephrology, etc. ESPEN recommends including these themes:

- Nutritional requirements
- Nutritional screening and assessment
- Diagnosis of malnutrition (types, severity)
- Dietary advice: general recommendations in different diseases
- Introduction to enteral nutrition
- Introduction to parenteral nutrition
- Ethics in medical nutritional treatment
- Drug-nutrient interactions
- Food allergy and intolerances

Besides these matters, some centres can offer an elective subject for some students interested in this field that include more themes such as the medical nutrition treatment in different diseases (cancer, surgery, critically ill patients, digestive disorders, neurology, eating disorders, etc).

5. Dissemination plan and conclusions

Improving the teaching of human nutrition in the medical curriculum seems to be mandatory, indeed nutrition must be included

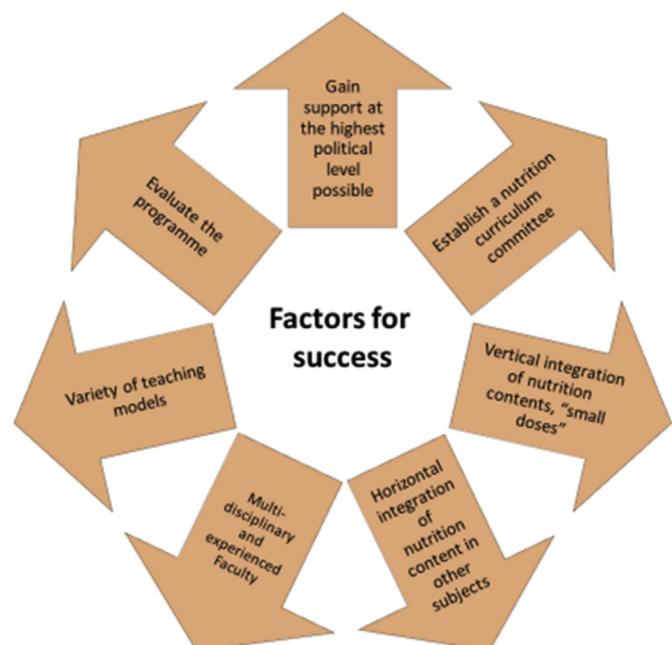


Fig. 1. Key factors for success in the implementation of Human Nutrition curriculum in Medical Schools.

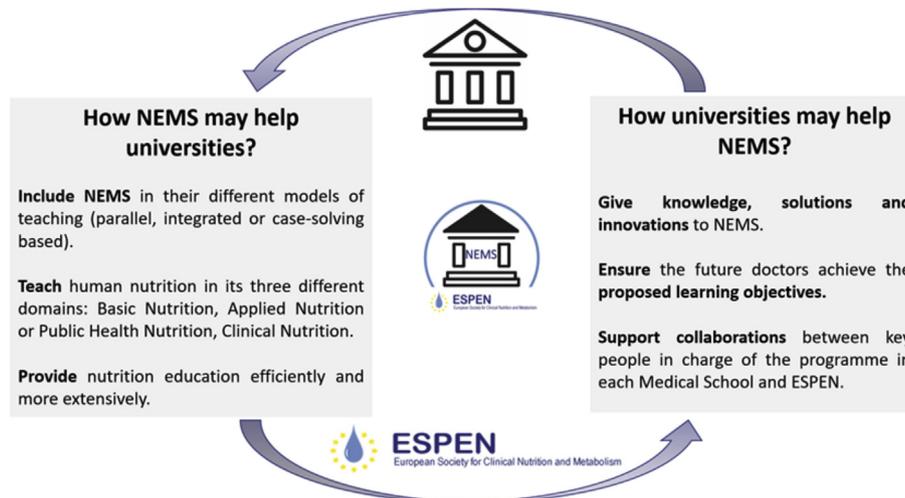


Fig. 2. Global integration of NEMS between Universities and ESPEN.

in the global care of each patient for improving the outcome. Despite this evidence, the place that is reserved in the European Faculties of Medicine is very heterogeneous [17,24]. In most of the Universities the content of the curriculum is determined by the programme commission of the Faculty. Although the global programme in the medical curriculum is quite comparable for facilitating the Erasmus exchanges of students, there are some differences mostly due to the interest or competence of the teachers.

At the level of ESPEN we are convinced that a bigger percentage of teaching time should be allocated to human nutrition for future doctors. We have to take into account that the content of each medical speciality is increasing while the number of teaching hours is limited. But the question is: how to reach and convince the programme committee of hundreds of Faculties of Medicine throughout Europe? From the literature research we can identify some key factors for success that have been implemented in some universities (Fig. 1).

As a scientific society, ESPEN may publish in some Journals recommendations on the minimum curriculum content that should be given to medical students. These journals include: its own journal, namely *Clinical Nutrition* and *Clinical Nutrition ESPEN*, as well as medical pedagogy journals. ESPEN may also sensitise all national affiliated Parenteral and Enteral Nutrition (PEN) societies throughout the ESPEN Council that currently includes 58 countries. As a stakeholder of the Optimal Nutritional Care for All (ONCA) campaign, ESPEN can influence the 18 European countries involved so far, by developing best practices for improving education of HCPs as a way to tackle the problem of DRM. ESPEN counts on many of its own resources, such as the ESPEN website, educational tools (LLL programme, Blue book, guidelines, courses, workshops, symposia, annual congress, etc.) and the huge network of ESPEN members. Many of these resources can be accessed through e-learning, which is becoming more and more relevant in the medical curriculum.

Another approach would be to participate in the annual meetings of the Deans of the European Universities and in the congress of the Association for Medical Education in Europe (AMEE) in order to reach a large number of Medical Schools. However, in practice, it is not easy to find the persons in charge of the programme in each Medical School.

Therefore, a pragmatic approach would be a direct contact of the committee of the scientific programme of major European Faculties of Medicine by reputed ESPEN members (Fig. 2). In this way, we may dream to reach step by step all the European Medical Schools.

Conflicts of interest

None.

Statement of authorship

All the authors contributed to the design of the paper, revised it critically and gave final approval to the submitted version.

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