

ORIGINAL RESEARCH PAPER

## **Development and Implementation of a Nutrition Education Program for Medical Students: A New Challenge**

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**ABSTRACT Context:** *Teaching nutrition to medical students is constrained by limitations in curricular time and competition with other topics.*

**Objectives:** *To identify time slots and teaching methods for incorporating nutrition into the medical school curriculum, determine students' nutritional knowledge following the program, and their perception of the effectiveness of the program.*

**Methods:** *A nutritional workshop was added to the clinical experience weeks of second-year medical students. The first class included 66 students and the second class included 56 students. In order to fully acquaint the students with nutrition, four topics were included: nutritional policy, dietary assessment, nutritional recommendations, and obesity. Students were encouraged to actively participate in the program which included dietary intake interviews, debates regarding nutritional treatments, and actual practice in class. The main outcome measures were nutritional knowledge and evaluation of the program by the students.*

**Findings:** *Over 90% of the students answered the knowledge questions correctly. The effectiveness of the training was graded (on a scale of 1–7) between 3.7–5.4 in the first year and 3.4–5.7 in the second year.*

**Conclusions:** *The ten-hour nutritional workshops within the clinical weeks were well-received by second-year medical students. Using cases relevant to the students' age seems to enhance their interest in the program.*

**KEYWORDS** *Nutrition, diet, education, medical curriculum.*

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## Introduction

Education and training in nutrition are perceived to be neglected fields in medical education (Barratt, 2001). Studies around the world show a lack of knowledge in preventive as well as curative aspects of nutrition amongst medical students, residents and physicians (Chen *et al.*, 2001; Shai *et al.*, 2001). Over 50% of the participants in these surveys felt the need to add the topic of nutrition to the medical curriculum (Boog, 1999; Kolasa, 1999; Meaux Pereda *et al.*, 1999; Register *et al.*, 2000). However, implementation of various subjects in nutrition education in medical schools is hampered by its cross-specialty nature and lack of curricular time. Additionally, nutrition is perceived by many medical students as less important than the traditional basic and clinical sciences (Epling *et al.*, 2003). These studies recommend that all medical professionals should learn the various areas of nutrition systematically, through the integration of nutrition topics within the basic science curriculum with additional enrichment courses during the clinical rotations as well as in post-graduate education. Several recently published studies describe different implementation strategies on how to teach nutrition in medical school (Hark & Morrison, 2000; Kolasa *et al.*, 2001; Pearson *et al.*, 2001; Plaisted *et al.*, 2001; Van Horn *et al.*, 2001; Allen *et al.*, 2002; Kushner, 2003).

An innovative preventive medicine and nutrition course (PMN), conducted at Harvard Medical School for second-year medical students, resulted in an improvement of students' confidence in diet and exercise counseling and perceived dietary habits. Improving these skills is expected to change their practice patterns (Conroy *et al.*, 2004). At the University of Medicine and Dentistry of New Jersey, a trial was conducted adding the topic of nutrition into the medical curriculum. Study conclusions were that the survival and progression of nutrition as a component of medical and dental education depends to a large extent on the creativity and innovative strategies used by educators and administrators in medical and dental schools and in training programs (Touger-Decker, 2004).

Based on these conclusions and models, a nutrition workshop was developed for the medical school at Ben-Gurion University. The school has a strong community-orientation with emphasis on preventive medicine and health promotion (Segall *et al.*, 1978). The curriculum is composed of traditional basic science courses, accompanied by early clinical courses in the first two years with organ system-based courses that integrate basic science with pathophysiology in the third and part of the fourth years. The remainder of the fourth year and the whole of the fifth and sixth years are devoted to clinical rotations. The newly developed six-year nutrition program was planned to be integrated into the existing program with related lectures "injected" into the appropriate basic science and body-system courses with the addition of complementary nutritional workshop units added in the clinical rotations. The topics included in the workshops were chosen in accordance with the students' interest as

previously assessed in a study performed by the Faculty (Shai *et al.*, 2001), as well as in consideration of topics that are taught in other programs around the world (Freeman *et al.*, 2005). The method of teaching was based on case studies and the students' personal experience.

This paper describes the design process of a 10-hour nutrition workshop for second-year medical students, the results of the knowledge test at the end of the program and the evaluation of the program by the students.

## Methods

The nutritional program was developed in the following steps:

- (1) A steering committee was recruited from the Ben-Gurion University Faculty of Health Sciences. The committee included physicians, dietitians and nutrition epidemiologists who all had teaching experience.
- (2) Nutritional programs from around the world were obtained and reviewed, including programs that were developed by the American NNA (Nutrition Academic Award program; a \$5 million scholarship program that was designed to develop and implement a nutrition curriculum in 21 medical schools in the USA) (Pearson *et al.*, 2001). A local survey of students and physicians was conducted to evaluate their expectations regarding topics of interest and teaching strategies.
- (3) A list of study objectives and topics was developed.
- (4) The medical curriculum was mapped and optimal points for the injection of relevant nutritional topics were identified, such as chronic and metabolic diseases.
- (5) Finally a six-year nutrition education program was formulated. Lectures in biochemistry and physiology introduce the topic of nutrients and micronutrients. Lectures, case-discussions and problem-solving sessions integrated into various body-organ systems are utilized to understand the importance of nutrition in each of the systems (e.g. fiber in the gastrointestinal system, folic acid and B<sub>12</sub> metabolism in the hematology system and Iodine in the endocrine system). A workshop in the second year provides an integrative approach to nutrition. Case discussions in the clinical years are planned to illustrate the impact of nutrition on health and disease in each of the clinical rotations.

The six-year nutrition program is designed in the following manner:

- (1) In the first year, the topics of vitamins and minerals are taught as part of the biochemistry course.
- (2) In the second year, a 10-hour workshop is included within the clinical weeks of the program (described in detail here).

- (3) In the 3rd, 4th, and 5th years, the topic of nutrition is injected within the Cardiovascular clinical experience, and one day is focused on preventive nutrition topics. Within the Endocrinology clinical weeks, the topic of diabetes is addressed and within the Internal Medicine clinical weeks, nutrition and blood pressure are included. Other subjects include gastrointestinal disease and nutrition, kidney disease and nutrition and liver disease and nutrition.
- (4) In the 6th year, there is a “selective” one week program which is comprised of a clinical experience of dietetic treatment for patients by the dietetic services of the hospital with further discussions in the class. Geriatric nutrition is included within the clinical weeks in Geriatrics.

The description below is of the first two workshops held in 2002 and 2003 for second-year medical students.

#### *Specific Learning Objectives of the Workshops*

The learning objectives of the program were:

- (1) At the end of the program, the students will be familiar with the dietary recommendations for healthy people, as well as their scientific evidence.
- (2) At the end of the program, the students will be familiar with dietary assessment techniques.
- (3) At the end of the program, the students will be familiar with the health risks of obesity, treatment strategies and measurements of overweight and obesity.

Four topics were included in these sessions:

- (1) An introductory lecture, emphasizing the importance of nutrition in the prevention and treatment of disease.
- (2) Dietary assessment techniques: utility and methodology.
- (3) Established nutrition recommendations: the DRI (Dietary Reference Intake).
- (4) Obesity: epidemiology, pathology and treatment.

In order to fully acquaint the student with nutritional research methods, we encouraged active participation. Nutritional interviews and nutritional assessment methods were practiced by the students, which provided a visual experience for using these tools. We used a problem-based learning (PBL) technique to highlight the importance and complexity of obesity (Heinrichs, 2002; Smits *et al.*, 2003).

#### *Implementation of the Program*

Students were encouraged to prepare themselves for each session by reading assigned articles on the specific topic to be discussed. The obesity topic was

presented as a frontal lecture, followed by an interactive case of an obese adult and an obese child, with discussions of the increased health risk associated with obesity. Various treatment strategies for obesity, including life style changes, drugs, or surgery, were briefly presented. The class was then divided into three groups, each of which was required to further research one of these treatment modalities as homework for discussions and to defend the rationale behind its use to the rest of the class (Morrison & Hark, 1999).

### *Outcome Measures*

Evaluation of the nutrition workshop entailed two primary outcomes:

- (1) The first evaluation included an inventory of the nutrition topics and objectives, using a multiple-choice questionnaire of knowledge of the nutritional issues that were taught. The exam was designed to assess the effectiveness of the program in achieving knowledge of the learning objectives.
- (2) The second measure was a questionnaire used to assess the importance of the issues taught in the program and the quality of the teaching. These questions were based on Mark Spilsbury's *Measuring the Effectiveness of Training* (Spilsbury, 1995). In addition, students were asked to raise suggestions for topics of interest for future courses.

### *Statistical Analysis*

The program was conducted in two consecutive years (2002 and 2003). Using descriptive statistics, the percent of students answering each test question correctly for each course and for both groups together was analyzed. For the assessment, mean and standard deviation of each grade were calculated. Grades for each assessment item ranged from one to seven.

## **Results**

The nutrition workshop was implemented at the Ben-Gurion University Medical School in 2003 and 2004, targeting second-year students as a two-day nutrition course. The class included 66 students aged  $24 \pm 2.4$  years, with 61% males. The second course included 56 students aged  $22.8 \pm 2.2$  years, 66% males. The results of the knowledge test conducted at the end of the program are presented in Table 1. The test was a multiple-choice format and was performed at the end of the second day using the handouts for each lecture. Analyses are based on the outcomes of interest (learning objectives). As shown in Table 1, in both courses, over 90% of the students answered most questions correctly. The students were not clear about identifying patients at nutritional risk; only 67% in the first course and 61% in the second course answered this question correctly.

The students' assessments of the program are presented in Table 2. For each question, students responded on an evaluation scale from a low of 1 to a

**Table 1.** Percentage of students answering final test questions correctly\*

Test item	Correct answers	Correct answers	Total
	1st course <i>n</i> = 66	2nd course <i>n</i> = 56	
What are the possible outcomes of imbalanced diets?	98%	100%	99%
What medical areas involve nutrition?	100%	97%	98%
Risk factors for obesity	97%	98%	98%
What level of BMI is considered obese?	96%	97%	96%
Characterization of folic acid deficiency	94%	95%	95%
What percentage of the population is covered by the DRI?	88%	98%	93%
What is the purpose of dietary assessment?	86%	89%	88%
Who is at nutritional risk?	83%	92%	88%
What is the physician's role in identifying patients at risk?	67%	61%	64%

\*All questions in the test were in multiple-choice format.

**Table 2.** Mean evaluation of the nutrition program\*

Variable	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
	1st course <i>n</i> = 66	2nd course <i>n</i> = 56	Total
How relevant was the topic of childhood obesity?	5.4 $\pm$ 1.3	5.7 $\pm$ 1.2	5.5 $\pm$ 1.2
How relevant was the lecture about the epidemiology and pathophysiology of obesity?	5.3 $\pm$ 1.6	5.7 $\pm$ 1.1	5.5 $\pm$ 1.5
How relevant was the case of overweight women?	5.4 $\pm$ 1.4	5.5 $\pm$ 1.3	5.4 $\pm$ 1.3
How relevant was the topic of nutritional assessment?	5.2 $\pm$ 1.5	5.3 $\pm$ 1.2	5.2 $\pm$ 1.4
How relevant were the articles regarding treatment for obesity?	4.8 $\pm$ 1.7	5.2 $\pm$ 1.5	5.0 $\pm$ 1.6
Understanding the complexity of nutritional research	4.9 $\pm$ 1.4	4.8 $\pm$ 1.6	4.9 $\pm$ 1.5
Understanding the issue of obesity	4.0 $\pm$ 1.5	4.0 $\pm$ 1.5	4.0 $\pm$ 1.5
Understanding the importance and use of the DRI	3.7 $\pm$ 1.5	4.0 $\pm$ 1.6	3.8 $\pm$ 1.5
General assessment of the course in relation to your future career as a physician	4.1 $\pm$ 1.5	3.4 $\pm$ 1.2	3.7 $\pm$ 1.4

\*Grade range is from 1 (bad) to 7 (excellent).

high of 7; students were asked “to what degree the teaching goals were achieved” and the relevance of each topic to their medical education. As shown in Table 2, the assessment grades ranged from 3.7 to 5.4 in the first course and 3.4 to 5.7 in the second course. Theoretical and general topics such as the DRI and the complexity of nutritional research were graded relatively low by the students, while what are considered practical issues, like “obesity”, were ranked higher (over 5) on the assessment questionnaire in both courses.

## Discussion

There are many dilemmas related to the optimal strategies of integrating nutritional education into the medical curriculum. This paper presents the first stage of including nutrition education in the medical curriculum at the Ben-Gurion University in Israel.

Despite concerted scientific, educational and congressional calls to increase nutrition coverage in medicine most graduating medical students report an inadequate quality and quantity of nutritional training (Shai *et al.*, 2001; Kushner, 2003). The topics of obesity and dietary assessment methods were chosen in the present project as the leading topics in nutritional knowledge because of the obesity epidemic of concern worldwide and the lack of knowledge in that particular area by physicians (Block *et al.*, 2003). Present study results indicate that most students found these subjects interesting and relevant to their future jobs.

A variety of teaching methods are described in the literature, including a computer-based nutrition workshop (Maiburg *et al.*, 2003). However, since most nutritional problems and treatments are related to health behavior and interpersonal communication skills (Kohlmeier *et al.*, 2003; Maiburg *et al.*, 2003) the present focus was on teaching nutrition through the students' personal experience and person-to-person contact. A study conducted at the University of Iowa provided medical students with the opportunity to do a self-assessment of their personal risk factors for developing cardiovascular disease (Snetselaar *et al.*, 2003). This study showed equal interest and better understanding of the patients' experience by the medical students.

Nutritional knowledge of second-year medical students is based partly on the knowledge that is found in the general population rather than specific scientific knowledge acquired later in the course of their training. In assembling the curriculum, efforts were made to connect the students to the topics through their own nutritional habits and fields of interest. Results may indicate that a relatively brief educational intervention can result in a sufficient level of nutritional knowledge among medical students, as well as a high level of interest in nutrition. The intervention consisted of a 10-hour nutrition workshop within the clinical weeks. This seems to be a good educational mix, resulting from the establishment of an enhanced sense of relevance of the

nutrition materials to the student themselves and to their education. Incorporation of the students' input into teaching nutrition both as "real time input" as well as a constructive criticism of the program, seems to enhance their interest and cooperation in participating in the course and by showing high level of interest. In developing this type of educational program, the thought was to provide the students with a sense of ownership and develop their intellectual curiosity regarding nutritional topics. The nutritional teaching protocol seems to have achieved this goal.

Several studies show deficient nutritional knowledge and a need to identify the educational needs of medical students (Ammerman *et al.*, 1989).

A major limitation of this study is that it was not originally planned as a research protocol. It lacks a control group and can only be compared to previously reported surveys of nutritionally-relevant knowledge among medical trainees. A second limitation of the study is that the teaching curriculum was developed interactively during the study, thus lacking a formal protocol for such a course. A third limitation is that the questionnaires used in this study were developed for this particular nutrition intervention and were not validated.

Another potential limitation is the choice of topics according to students' interest. The decision to choose topics by students' interest was based on the intention to make the introduction as attractive as possible for the students, utilizing a "student-centered" approach. Once the route of creating an "official" curriculum is taken there will be a need to include essential topics in nutrition in the curriculum. However, most of the topics chosen by the students had considerable overlap with the "mainstream" and essential topics in medical nutrition (Shai *et al.*, 2001).

## Conclusions

Project recommendations include integrating nutrition education for medical students during the second year of medical school and including topics of interest to the students. Additionally, it appears to be beneficial to work with the students on personal issues to enhance their nutritional experience.

The years during which the basic sciences are taught are a beneficial time to integrate nutritional skills in the medical curriculum. Using personal age-related and population-based interests can create interest in the nutrition fields.

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