

# Nutrition Education in U.S. Medical Schools: An Assessment of Nutrition Content in USMLE STEP Preparation Materials

Shaily Patel<sup>1</sup>, Katelynn H. Taylor<sup>1</sup>, Kathryn L. Berlin<sup>2</sup>, Roy W. Geib<sup>1</sup>, Robin Danek<sup>1</sup> & Gabi N. Waite<sup>1,\*</sup>

<sup>1</sup>Indiana University School of Medicine Terre Haute, 135 Holmstedt Hall, Terre Haute, IN 47809, USA

<sup>2</sup>College of Nursing, Health and Human Services, Indiana State University, Terre Haute, IN 47809, USA

\*Corresponding author: Department of Cellular and Integrative Physiology, Indiana University School of Medicine, Terre Haute, IN 47809, USA. Tel: 1-812-237-7743. E-mail: gnindl@iupui.edu

Received: January 23, 2015      Accepted: March 19, 2015      Online Published: April 7, 2015

doi:10.5430/jct.v4n1p108      URL: <http://dx.doi.org/10.5430/jct.v4n1p108>

## Abstract

In the U.S., the numbers of obese individuals and of obesity-related health conditions are rising. While physicians understand the need to improve patient health by promoting a healthy lifestyle, the advancement of nutrition education in medical school and residency is not keeping pace. This is evident in the inadequate time dedicated to nutrition education by medical schools and in the dissatisfaction of medical students and residents with their medical nutrition training.

The aim of the current study was to investigate how food, diet, nutrition, and obesity are represented in the U.S. medical school licensing examinations (USMLE) as a potential incentive to better match medical nutrition curricula to the modern societal needs.

We semi-quantitatively analyzed nutrition-related information of the USMLE Step 1, 2, and 3 Content Description documents and two test preparation books, using QRS NVivo 10. The software's coding comparison query was used as reliability statistics. We found an adequate amount of nutrition references. However, the content of the references was inadequate in that there was minimal information in regards to chronic diseases and no content related to disease prevention. Moreover, there was a lack of specifics in regards to food and nutritional science.

We propose a content adjustment to the medical licensing exams to ensure that future physicians are more skilled and comfortable in fulfilling their roles as health care providers and advisors for an increasingly obese patient clientele.

**Keywords:** *chronic disease; diet, food; medical education; medical school curriculum*

## 1. Introduction

More than one-third of the adults in the United States (U.S.) are obese, taking an enormous toll on the health of the population, as can be seen in the steadily rising prevalence of obesity-related diseases. For instance, the prevalence of type 2 diabetes rose 13% from 2010 to 2012 (Centers for Disease Control and Prevention [CDC], 2014), and is predicted to continue to rise in the future. Some statistical models show that by 2050 one in three U.S. adults will suffer from type 2 diabetes (Boyle, Theodore, Gregg, Barker, & Williamson, 2007). The U.S. obesity epidemic has also led to an increase in coronary heart disease, stroke, and some cancers, whose rise over time has been correlated with the increase in obesity (Kopelman, 2007).

Even if the alarming trend in the increase of obesity-related illnesses can be slowed, the next three generations of U.S. physicians will face a population of patients with a clinical profile often influenced by obesity. The aim of this study is to shed light on the question of how well U.S. physicians are being prepared to attend to this patient clientele. Specifically, the study explores whether nutrition knowledge and counseling is adequately addressed during medical school licensing exams.

Upon graduation, senior medical students are administered a questionnaire by the Association of American Medical Colleges (AAMC). From 2001 to 2005, medical students were asked about their perceptions regarding the time spent

on medical nutrition education, with the outcome that every other student (57 +/- 7.0%) rated it as inadequate. After 2005, such data were no longer available because a different questionnaire is used that asks student feedback on the education of disease prevention and health maintenance in general, but does not specifically mention nutrition anymore. We recently confirmed, at our university, that the negative perception on nutrition education in general, and on obesity education in particular, has not significantly changed over the past years. In focus groups with medical students and residents, we found that students felt especially ill prepared to counsel patients on proper nutrition, a sentiment that was strongly echoed by primary care residents [unpublished data]. Our findings agree with published data in that physicians, especially early in their career, are not very confident about their knowledge or skills necessary to advise and motivate their patients towards a healthy diet and lifestyle (Adams, Kohlmeier, Powell, & Zeisel, 2010a; Delege, Alger-Mayer, Van Way, & Gramlich, 2010; Lenders et al., 2014).

It can be speculated that this lack of satisfaction and confidence is partly based on improper nutrition education in medical schools. Historically, the American Medical Association Council on Food and Nutrition first documented this deficiency in the 1950s. It inspired a series of reform measures so that in 1985, the National Academy of Science published a report that recommended medical school curricula include at least 25 hours of nutrition education (Committee on Nutrition, 1985). This was followed four years later by the recommendation from the American Society for Clinical Nutrition that 37-44 hours of nutrition education be integrated into existing curricula (Weinsier et al., 1989). To foster the process of creating and disseminating nutrition integrated curricula, the National Institutes of Health awarded funds to 21 medical schools from 1998 to 2005 (Daghigh, Vettori, & Harris, 2011). In 2010, a survey was published showing that, despite the national guidelines and incentives, U.S. medical schools on average devoted fewer than 20 hours to nutrition education (Adams, Kohlmeier, & Zeisel, 2010b). Since this education occurs as part of basic science courses, with little to minimal connection to patients (Adams et al., 2010b), it appears logical that type and time spent on nutrition may be one underlying problem for why young doctors are hesitant to counsel their patients in nutrition.

The potential reasons for why medical schools do not meet goals of providing patient-oriented nutrition education have been widely discussed. A few of those reasons include: exponentially expanding medical knowledge in conjunction with limited class time; nutrition experts unavailable to teach; and inadequate clinical opportunities with formal training to practice lifestyle counseling skills (Adams et al., 2010b; Daghigh et al., 2011). For our study, we considered whether the type of nutrition coverage included in the nationally standardized tests could be another reason. It has recently been brought to attention that the post medical school accreditation documents for cardiology and internal medicine do not contain the word “nutrition” (Devries et al., 2014), which made us wonder how nutrition, diet, and obesity are represented in the U.S. medical school licensing examinations (USMLE). In order to achieve this, we analyzed the nutrition-related information of the USMLE Step 1, 2 and 3 Content Description documents and two Step 1 preparation books and present the outcomes in this paper.

## 2. Method

### 2.1 Resources

In order to answer the question on the type of nutrition-related information of the current medical school licensing exams, two sets of preparation material for the USMLE Step exams were selected. The first set included the following four 2012/ 2013 USMLE Step Content Description documents, available on the USMLE webpage: *Step 1 Content Description and General Information*, *Step 2 Clinical Knowledge*, *Step 2 Clinical Skills*, and *Step 3 Content Description and General Information*. These documents contain a Content Outline section, which outlines and summarizes what medical students are expected to know, and a Sample Question section, which contains case-study question stems with multiple choice answers. The second set of Step preparation materials used two USMLE test preparation books: *Crush Step 1: The Ultimate USMLE Step 1 Review*, and *USMLE Step 1 Secrets* (Brown & Shah, 2012; O’Connell, Pedigo, & Blair, 2013). These books summarize what the book authors anticipate that medical students are expected to know for the Step 1 exam, whose scores are the most relevant among test scores for the student to match into a residency program. From the multitude of similar exam preparation books, these two books were selected because they are freely available to the students at our university and easily available to all English speaking students. Both books are in the top one hundred Amazon bestseller list in the category of medical education books.

### 2.2 Semi-quantitative Analysis of Resources

To analyze the six selected resources for nutrition-related content, the qualitative research software QRS NVivo 10

was used. NVivo is a qualitative software package that helps researchers organize and analyze unstructured data. Two investigators independently coded the material and organized the coded references into categories, also called nodes. The coding comparison query of NVivo was used to generate a quantitative statistic as to the degree of agreement between the two researchers. An inter-rater reliability agreement greater than 93% was achieved for all nodes. Discrepancies over coding between the prime coders were resolved through discussion involving two additional raters.

The USMLE Step Content Description documents were coded in their entirety. The USMLE preparation books were a priori screened with a list of 141 keywords that were assigned to one of the following groups: Food (e.g. chicken, egg, fruit, salad, gluten), Nutrient (e.g., calcium, fat, vitamin), Disease (e.g. artery, cancer, disease, obesity), and Intake (e.g. consume, diet, eat, nutrition). The search was conducted in pairs of keywords from different groups. For instance, “food” keywords were matched with “disease”, “nutrient”, and “intake” keywords, and “intake” keywords were paired with “disease” keywords. This allowed cutting down on irrelevant noise (e.g. references to diseases in animal models). When keyword pairs were found within 10 words of each other, the references were coded for the type of information.

### 3. Results

#### 3.1 USMLE Step Documents - Content Outline Section

Each USMLE Step document includes a section that outlines the content that medical students are expected to know for each of the three Step exams. When analyzing this section, we found 55 references that referred to nutrition; 43 of them, or 78%, in the context of disorders and illnesses. We subdivided the 43 references into the following four categories: The largest category, ‘Metabolic and Endocrine Disorders,’ contains 20 references, with four of them mentioning diabetes. The second largest category, ‘Malnutrition or Deficiency,’ contains 14 references pertaining to anemias, vitamin and mineral deficiencies, dehydration, malabsorption, and breastfeeding complications. The third and fourth categories were ‘Psychological Disorders,’ containing five references, and ‘Gastrointestinal Disorders,’ containing four references, respectively. The remaining 12 of the 55 references, or 22%, were unrelated to diseases. Four references referred to ‘Ingested Poisons,’ three references were categorized as ‘Behavioral,’ and two references fit into the category ‘Hyperalimentation, Obesity.’ As part of the latter, one reference discusses anti-obesity drugs, and the second reference mentions obesity as an example of a nutritional disorder.

#### 3.2 USMLE Step Documents - Case Study Question Stems

In addition to the content outline section, each USMLE Step document contains multiple-choice practice questions. The question stem is the part that presents the issue about which the question is asking in the form of a patient case study. As part of the four documents, there are 366 such patient case studies. Of those, 124 contain references to nutrition-related topics, which resulted in 148 coded references. The references were organized into the following 10 categories: ‘Hypoalimentation,’ n=36; ‘History of Drinking Alcohol,’ n=27; ‘Normal Food Intake,’ n=23; ‘Psychological Abnormalities,’ n=9; ‘Obesity/ Weight Gain,’ n=9; ‘Vitamins and Supplements,’ n=8; ‘Toxicities and Allergies,’ n=6; ‘Dietary Counseling,’ n=6; ‘Dehydration/ Thirst,’ n=4; and ‘Poor Diet,’ n=1.

As indicated in the category ‘Obesity/ Weight Gain,’ nine patients, or 2.5%, were overweight or obese. In eight of the nine overweight/ obese patients, the weight information was mentioned as part of the patient presentation for diabetes (4 patients), hormonal imbalances (3 patients), and hypertension (one patient). The objective of the question was to apply clinical knowledge pertaining to the diagnosis or treatment of the diseases. In one case, or 0.3%, obesity is addressed as the issue causing the health problem. The case refers to a morbidly obese 15 year-old boy complaining of fatigue and the need to urinate frequently during the night. For comparison, 27 patients, or 7%, had information related to their alcohol consumption.

The six references in the ‘Dietary Counseling’ did not contain any specific information on diets, such as the reference “He had diabetes mellitus controlled by diet,” or the reference “In addition to dietary counseling...” Coming closest to specific diet-related information is the one question that asks about the biochemical process that is most likely to increase when a patient restricts her caloric intake to 500 kcal per day.

#### 3.3 USMLE Step Documents - Multiple Choice Answers

Each of the 366 case studies, analyzed above, is followed by potential answer choices, from which one is correct. Of the 2,010 total multiple-choice answers across all four USMLE documents, 148 (7%) contained nutrition-related content which was organized into 10 categories. The largest two categories were ‘Vitamin and Mineral Deficiencies,’

and 'Gastrointestinal Disorders' (n=44 and 40, respectively). The following four categories contained 15, 12, 10 and nine references, respectively: 'Metabolic Processes,' 'Alcohol,' 'Macronutrient and Water Intake,' and 'Breastfeeding.' The following three categories contained five references each: 'Food,' 'Food Poisoning,' and 'Herbal Supplements.' The last category of "Psychological Abnormalities" contained two references. All references to food were general in nature. For instance, there is an answer choice in which the physician requests a "meat-free diet for the next 3 days" after which a repeat test of an occult blood stool test is scheduled. Another example is an answer choice that mentions, "the preparation of food was by outside contractors".

### *3.4 USMLE Preparation Books*

Our predefined keyword search of the two test preparation books, as described in Methods, resulted in a total of 127 hits related to nutrition, from which 34 were eliminated as noise. The remaining 93 hits were coded into a total of 197 references that were grouped into six categories: 1) diet as it pertains to a disease (59 references); 2) diet as treatment, risk factor, or cause of the disease (58 references); 3) macro- or micro-nutrient (34 references); 4) food contaminated by toxin or parasites (23 references); 5) biochemical mechanism related to nutrition (19 references); and 6) cross-reaction of food with a medication (4 references).

We further coded the information according to diseases, or disease categories. We found 63 references, 18 of them referring to vitamin and mineral-related diseases and 10 of them referring to celiac disease. Cardiovascular disease had five, type 2 diabetes two references, respectively. All references to food or diet were kept general. For instance, in regards to cardiovascular disease, one reference recommends "moderate alcohol consumption," while the reference in regards to type 2 diabetes mentions that "symptoms will often respond to reduced carbohydrate intake as well as smaller, more frequent meals."

### *3.5 Longitudinal Analysis across Step Exams*

When analyzing the data longitudinally across the advancing Step 1, 2, and 3 licensing examinations, the results showed that nutrition was most often mentioned in relation to vitamin or micronutrient deficiencies, independent of the Step level of the examination preparation material. There was a trend in the type of references, in that Step 1 resources primarily referenced nutrition in regards to the diagnosis of a disease, while Step 2 and 3 materials also related nutrition to the treatment of a disease. This trend was evident in almost all categories that contained 10 or more references, and it is consistent with the mission of the examinations to attest medical proficiency in alignment with the increasing maturity of the medical student to not only diagnose but also treat a patient.

## **4. Discussion**

In this study, we analyzed the references to nutrition, obesity, food, and diets in selected resources that prepare students for the U.S. Medical Licensing Examinations. The goal was to examine how in-depth nutrition and food is treated as medicine in examinations that attest medical proficiency.

The short answer is "not very well." While nutrition is quantitatively a significant part of the examination material (e.g., we found it in 34% of the case study question stems), it is addressed in a manner that does not reflect the needs of today's increasingly obese patient. For instance, in all material, independent of the learner's level, vitamin and mineral deficiencies received the highest number of hits; however, they were rarely related to food. Instead, the deficiencies presented were severe and treated with vitamin supplements. Common conditions included Beriberi, Pellagra, Scurvy, and Rickets (vitamin B1, B3, C, and D, respectively) which are rarely seen in the U.S. due to widespread fortification programs. Minor vitamin deficiencies, in contrast, were neglected. While minor deficiencies do not present with easily diagnosed symptomology, they are much more common and some, such as vitamin D deficiency, have been linked to chronic health conditions (Holick, 2007). A proper diet can prevent these issues.

While we found significant mention of vitamin-related disorders, we found a conspicuously low number of references in regards to chronic disorders that are influenced or caused by poor dietary choices, such as cardiovascular diseases and others. Moreover, we did not find references in regards to disease prevention and preventative medicine as it relates to lifestyle and nutrition. Healthcare in the U.S. is shifting from a system based on sickness and disease to a system that integrates prevention and wellness. While this shift includes other stakeholders besides physicians, the Patient Protection and Affordable Care Act (2010) puts physicians at the forefront to providing services of disease prevention and lifestyle counseling (Kris-Etherton, Pratt, Saltzman, & Von Horn, 2014; American Public Health Association [APHA], 2010). While understandably changes in standardized medical assessments require time, medical students will have no choice but to keep pace with the fast changing medical profession.

Another common finding across all documents is the lack of nutrition specifics, such as dietary details or aspects of nutrition sciences. For instance, the dietary recommendation for individuals who are overweight, with type 2 diabetes, was “to eat smaller meals with fewer carbohydrates.” This statement does not reflect our full knowledge of a healthy and balanced diet (U.S. Department of Health, 2010). Patient education with up-to-date knowledge is a fundamental pillar of the medical profession. It is the role of the physician to be the bridge between scientific knowledge and the patients’ questions. How does one eat healthy? Is it simply about eating fewer calories or does one need to count carbohydrates? Which fat is good or bad? What should one know about nutrients such as high fructose corn syrup? Primary care physicians need the knowledge and background to answer these questions. Specialty physicians need, at the minimum, to communicate with the dietician or other members of the healthcare team to ensure proper counseling is delivered. The popular media answer these questions in multiple ways, which leaves the patient confused and seeking help from the expert. However, the knowledge and skill of dietary counseling was virtually nonexistent in the preparation material for the U.S. physician licensing exams.

In order to better prepare medical students for their roles as nutrition experts and role models in the eyes of the community, we recommend that students be encouraged to see themselves as their own “first patient” by practicing the healthy habits they will later be endorsing. Not only are physicians that practice healthy habits more likely to counsel patients on lifestyle modifications, but doctors who can share their own healthy dietary and exercise routines are seen as more motivating and believable (Frank, Breyan & Elon, 2000; Wells, Lewis, Leake, & Ware, 1984).

Our study was designed to analyze the type of nutrition coverage in graduation exams. While we overall give it a ‘thumbs down,’ we want to emphasize that we found some encouraging attempts to better match the assessment of medical school knowledge and skills with today’s health care that should include food as one of a doctor’s tools to improve patient health. Our study was not designed to quantify the amount of nutrition information in relation to other items, so we cannot comment on the trend of nutrition coverage over time. This was done in an earlier study in 1997, in which the researchers found an encouraging 2% increase in nutrition-related items (from 9-11%) in the 1993 Step 1 exam as compared with the 1986 exam (Hark et al., 1997). A limitation of our study is that we indirectly examined the test content by analyzing selected test preparation material. This was because we were not given access to the actual USMLE Step examinations. However, the analysis of such test preparation material allowed us to see the type of nutrition knowledge that students need to master when preparing for their licensing exams.

## References

- Adams, K. M., Kohlmeier, M., & Zeisel, S. H. (2010). Nutrition education in U.S. medical schools: latest update of a national survey. *Acad Med: J Assoc Am Med Colleges*, 85, 1537-1542. <http://dx.doi.org/10.1097/ACM.0b013e3181eab71b>
- Adams, K. M., Kohlmeier, M., Powell, M., & Zeisel, S.H. (2010). Nutrition in medicine: nutrition education for medical students and residents. *Nutr Clin Pract*, 25, 471-480. <http://dx.doi.org/10.1177/0884533610379606>
- American Public Health Association (APHA) (2010, October). *Prevention provisions in the Affordable Care Act* (Issue Brief). Washington, DC: Shearer, G. Retrieved from <https://www.apha.org/topics-and-issues/health-reform>
- Boyle, J. P., Theodore, J.T., Gregg, E.W., Barker, L.E., & Williamson, D.F. (2007). Projections of the year 2050 burden of diabetes in the US adult population: dynamic modeling of incidence, mortality and prediabetes prevalence. *Pop Health Metr*, 8, 29. <http://dx.doi.org/10.1186/1478-7954-8-29>
- Brown, T. A., & Shah, S. (2012). *USMLE Step 1 secrets* (3rd ed.). Saunders.
- Centers for Disease Control and Prevention. (2014). *National diabetes statistics report: estimates of diabetes and its burden in the United States, 2014*. Atlanta, GA: U.S. Department of Health and Human Services. Retrieved November 5, 2014 from <http://www.cdc.gov/diabetes/library/reports/surveillance.html>
- Committee on Nutrition in Medical Education, Food and Nutrition Board, & National Research Council. (1985). *Nutrition education in U.S. medical schools*. Washington, D.C.: The National Academy Press. Retrieved from <http://www.nap.edu/catalog/597/nutrition-education-in-us-medical-schools>
- Daghigh, F., Vettori, D. J., & Harris, J. (2011). Nutrition in medical education: history, current status, and resources. *Topics in Clin Nutr*, 26, 147-157. <http://dx.doi.org/10.1097/TIN.0b013e318219318d>

- Delegge, M. H., Alger-Mayer, S., Van Way, C. W., & Gramlich, L. (2010). Specialty residency training in medical nutrition education: history and proposal for improvement. *JPEN*, *34*, 47s-56s. <http://dx.doi.org/10.1177/0148607110378017>
- Devries, S., Dalen, J. E., Eisenberg, D. M., Maizes, V., Ornish, D., Prasad, A., Sierpina, V., Weil, A. T., & Willett, W. (2014). A deficiency of nutrition education in medical training. *Am J Med*, *127*(9), 804-806. <http://dx.doi.org/10.1016/j.amjmed.2014.04.003>
- Frank, E., Breyan, J., & Elon, L. (2000). Physician disclosure of healthy personal behaviors improves credibility and ability to motivate. *Arch Fam Med*, *9*(3), 287-90. <http://dx.doi.org/10.1001/archfami.9.3.287>
- Hark, L. A., Iwamoto, C., Melnick, D. E., Young, E. A., Morgan, S. L., Kushner, R., & Hensrud, D. D. (1997). Nutrition coverage on medical licensing examinations in the United States. *Am J Clin Nutr*, *65*(2), 568-571.
- Holick, M. F. (2007, July). Vitamin D deficiency. *New England J of Med*, *357*(3), 266-81. <http://dx.doi.org/10.1056/NEJMra070553>
- Kopelman, P. (2007). Health risks associated with overweight and obesity. *Obesity Rev*, *8*, 13-17 (suppl. 1). <http://dx.doi.org/10.1111/j.1467-789X.2007.00311.x>
- Kris-Etherton, P. M., Pratt, C. A., Saltzman, E., & Van Horn, L. (2014). Introduction to nutrition education in training medical and other health care professionals. *Am J Clin Nutr*, *99*, 1151S-1152S. <http://dx.doi.org/10.3945/ajcn.113.073494>
- Lenders, C. M., Deen, D. D., Bistrrian, B., Edwards., M. S., Seidner, D. L., McMahon, M. M., Kohlmeier, M., & Krebs, N. F. (2014). Residency and specialties training in nutrition: a call for action. *Am J Clin Nutr*, *99*, 1174S-1183. <http://dx.doi.org/10.3945/ajcn.113.073528>
- O'Connell, T. X., Pedigo, R. A., & Blair, T. E. (2013). *Crush Step I: the ultimate USMLE Step 1 review* (1st ed.). Saunders.
- Patient Protection and Affordable Care Act (2010). 42 U.S.C. § 18001 et seq.
- U.S. Department of Health and Human Services. (2010). *Aim for a healthy weight: maintaining a healthy weight on the go, a pocket guide* (NIH Publication No. 10-7415). Retrieved from <http://catalog.nhlbi.nih.gov/catalog/product/Aim-for-a-Healthy-Weight-Maintaining-a-Healthy-Weight-on-the-Go-A-Pocket-Guide-/14-7415>
- Weinsier, R. L., Boker, J. R., Brooks, C. M., Kushner, R. F., Visek, W. J., Mark, D. A., Lopez, S. A., Anderson, M. S., & Block, K. (1989). Priorities for nutrition content in a medical school curriculum: a national consensus of medical educators. *Am J Clin Nutr*, *50*, 707-12.
- Wells, K. B., Lewis, C. E., Leake, B., & Ware, J. E. (1984). Do physicians preach what they practice? A study of physicians' health habits and counseling practices. *JAMA: the journal of the American Medical Association*, *252*(20), 2846-2848. <http://dx.doi.org/10.1001/jama.1984.03350200032016>