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Research Article

Student Perceptions of Nutrition Education at Marshall University Joan C. Edwards School of Medicine: A Resource Challenged Institution

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Nutrition education is an essential component of medical education if new physicians are to be equipped to address common chronic diseases, including obesity and the associated diabetes, cardiovascular disease, and cancer. Most medical students recognize this need and desire nutrition education; however, finding time in a medical school curriculum and funding are challenging. Available, free online resources and small group exercises can be utilized to provide basic, up-to-date nutrition information to medical students.

1. Introduction

Many of the health care challenges in the United States could be modified by nutrition changes [1]. Poor nutrition and lifestyle choices leading to obesity are a component of risk for many diseases including diabetes, some cancers, osteoporosis, and cardiovascular disease [1]. Improving nutrition and lifestyle choices could lower the morbidity and costs associated with disease.

West Virginia is an example of a state with multiple health care challenges that might be modified by nutrition change. West Virginia is one of only two states in the US with an adult obesity rate of greater than 35% [2]. Additionally, the state records high rates of diabetes and heart disease. In 2012, West Virginia had an age adjusted rate of diabetes of 11.1/100 compared to 9.0/100 in the US [3]. Also, diabetes-associated end stage renal disease was 185/100,000 compared to 164/100,000 in the US in 2011 [3]. West Virginia was 7th in the US for mortality from heart disease at 208.1/100,000

compared to 170.5/100,000 in the US overall [4]. Some of the risk for the statistically high instance of obesity, diabetes, and heart disease in West Virginia could be reduced by preventive care associated with improving the nutritional status of the population.

West Virginia has a high rate of poverty (17.9% of persons live in poverty compared to 15.4% in the US as a whole [5]) and almost 54% of the population lives in rural areas [6]. The additional stress of poverty and the rural character of the state make preventive care both difficult (people tend to not go to the doctor until feeling sick) and critical to the health of West Virginians. Improving the nutritional status could be an effective way to lower the rates of obesity, heart disease, and diabetes in the state and to decrease the resulting medical care costs [7].

Marshall University Joan C. Edwards School of Medicine (JCESOM) is one of 3 medical schools in West Virginia. The mission statement declares that JCESOM seeks to “create a center of excellence in primary care in rural underserved

areas” to serve the needs of West Virginians. JCESOM admits approximately 75 students to medical school each year; on average 60% of these students are residents of West Virginia. The 2010–2014 graduation questionnaires showed that almost 30% of the 2010–2014 graduating classes stated a desire to remain in the state to deliver healthcare to the people of West Virginia.

Family physicians are a logical source for nutritional information and most (72% or more) [8] physicians feel that it is their responsibility to provide nutritional information as they treat their patients with chronic diseases. However, there are barriers to providing nutritional education. These include the limited time of office visits, the lack of reimbursement for nutritional counseling [9], and perceived noninterest or noncompliance of the patient [10]. One survey reported that only about 10% of physicians provided dietary advice to 80% or more of their patients [10]. Another study reported that when knowledgeable physicians counseled their patients about dietary change, there were significant weight losses and reductions of body mass index [11] to reduce the patients’ risk for cardiovascular disease. However, many physicians feel inadequate to discuss obesity and related health problems with their patients [12]. Thus, if students are being trained to serve the health care needs of rural populations, then it is important that physicians receive the nutrition training to be able to deliver nutrition education to patients for prevention of prevalent chronic diseases.

In 1998, the NIH funded the first 10 Nutrition Academic Awards (NAA) with the goal of developing and enhancing nutrition curricula for medical students, residents, and practicing physicians [13]. Eleven additional institutions received NAA funding in 2000, with all funding concluded in 2005 [14]. The NAA was successful in the NAA funded schools as all of these schools integrated nutrition education into the curriculum; local and national websites were developed and about 50% of medical students had the perception that nutrition education was adequate [14]. However, in 2004, in the non-NAA institutions, less than 30% of students felt that their nutrition education was adequate [14].

To address the need for nutrition education, the NIH funded Nutrition in Medicine (NIM) Project was developed to provide access to up-to-date nutrition education for medical students [15]. The materials were initially developed as CD ROMs that were distributed free to medical schools. It was found that faculty commitment and training were needed for these modules to be successfully used as a resource [15]. In a further evolution, the modules were adapted to a free website, accessible to all registered medical students [16]. The case based educational modules are complete and do not require specialized faculty members for nutrition education of students, eliminating many of the cost associated barriers to nutrition education.

At JCESOM, we use a combination of nutrition specific lectures and learning exercises, nutrition information integrated into organ system education, and the NIM modules to provide nutrition information in a cost-effective manner. The aim of this research was to identify the nutrition education sessions and the nutrition related competencies that were addressed during medical school and to report the students’

perceptions of the adequacy of nutrition education during their medical school career.

2. Methods

The JCESOM curriculum map (which describes the content of all education sessions) was queried and relevant faculty members were interviewed, as needed, to identify nutrition related sessions during medical school years 1 through 4. Additionally, the syllabi of the required basic science and clinical educational activities were reviewed for pertinent nutrition content and the course directors were interviewed to confirm content identified in the syllabi.

The JCESOM Core Competencies were reviewed to identify nutrition related competencies and the expected progression of knowledge during medical school.

A nutrition education survey was designed to identify nutrition attitudes, perceived adequacy of education, and basic nutrition knowledge of current JCESOM medical students. This survey used many of the questions in the survey developed by Walsh et al. [17]; permission from the authors was obtained. The Nutrition Survey was available on SurveyMonkey from 1 December to 18 December, 2014. Requests to participate in the Nutrition Survey were sent by email to all year 1 to year 4 medical students, about 300 in total. Respondents were able to rate their agreement with both positive and negative statements related to their nutrition education on a 5-point Likert scale (strongly disagree, disagree, neutral, agree, and strongly agree).

This study was reviewed and approved as an exempt study by the Marshall University Institutional Review Board. No personal identifying data were collected.

3. Results

3.1. Nutrition Education Sessions during Medical School. Table 1 summarizes the nutrition education sessions, the total hours in each academic year specifically associated with nutrition education, the pedagogy used, and the assessment method of each session.

3.2. Nutrition Related Competencies. Table 2 lists the nutrition related competencies expected of medical students and the increasingly proficient outcomes expected of students at the end of each year of their education.

3.3. The Nutrition Education Survey. A total of 69 students (about 23% of the student population) responded to the survey. Of the respondents, 32.1% were year 1, 22.6% were year 2, 13.2% were year 3, and 32.1% were year 4 medical students. Of students who responded, 18 students (26%) did not respond to the questions related to nutrition knowledge; all 69 students answered the nutrition attitude questions. 53% of the respondents were male while 47% were female.

3.4. Student Perceptions about Nutritional Education (from Survey). The complete results of the attitude questions are

TABLE 1: Summary of nutrition learning activities during medical school years 1–4 at Marshall University Joan C. Edwards School of Medicine.

Year level	Number of hours	Topic	Pedagogy ¹	Assessment
1	1	Introduction to nutrition	Lecture	Written test
1	1	Vitamins and minerals	Lecture	Written test
1	1	Cancer nutrition	Lecture	Written test
1	1 in class, 2 outside class	Modification of disease by diet ²	Small group exercise	Presentation to class
1	2 outside class	NIM module: cardiovascular disease: lipoproteins	Independent learning	In-module test
1	1	Clinical correlate: lipids and cardiovascular disease	Lecture	
1	2 outside class	NIM module: diabetes: nutritional mechanisms	Independent learning	In-module test
1	1	Clinical correlate: diabetic ketoacidosis	Lecture	
1	2 outside class	NIM module: nutrition in pregnancy or nutrition and aging: mind and body	Independent learning	In-module test
1	2 outside class	NIM module: module of choice	Independent learning	In-module test
1	2 in class	Clinical correlation: nutrition and obesity	Lecture	
1	2 in class	Obesity as a risk factor for disease ³	Small group exercise and role play	Presentation to class
1	1	Endocrine histology	Lecture	Written test
1	1	Clinical correlate: lipids and cardiovascular disease	Lecture	
1	1	Diabetes and metabolic syndrome: new information on dietary management	Large group discussion	Participation in discussion
Total year 1	23			
2	4	Anemia	Small group	Written test
2	2	Nutritional disorders	Independent learning	In-module test
2	1	Congenital malformation of the nervous system	Case based instruction	Written test
2	1.5	Breast diseases	Lecture	Written test
2	1	Diabetes in adults	Lecture	Written test
Total year 2	9.5			
3 or 4	1	Hyperlipidemia (dietary management)	Lecture	Written test
3 or 4	1	Newborn lactation and nutrition	Lecture	Written test
3 or 4	1	Breastfeeding	Lecture	Written test
3 or 4	1	Anticipatory guidance	Lecture	Written test
3 or 4	1	Eating disorders	Lecture	Written test
3 or 4	1	Enteral and parenteral nutrition	Lecture	Written test
Total year 3 or 4	Up to 6 depending on rotations selected			

¹Pedagogy used, as defined by Medbiquitous [18].

Case based learning: the use of patient cases (actual or theoretical) to stimulate discussion, questioning, problem solving, and reasoning on issues pertaining to the basic sciences and clinical disciplines.

Independent learning: instructor- or mentor-guided learning activities to be performed by the learner outside of formal educational settings (classroom, lab, and clinic) with dedicated time on learner schedules to prepare for specific learning activities.

Large group: an exchange (oral or written) of opinions, observations, or ideas among a large group [more than 12 participants], usually to analyze, clarify, or reach conclusions about issues, questions, or problems.

Lecture: an instruction or verbal discourse by a speaker before a large group of learners.

Role play: the adopting of or performing the role or activities of another individual.

Small group: an exchange (oral or written) of opinions, observations, or ideas among a small group [12 or fewer participants], usually to analyze, clarify, or reach conclusions about issues, questions, or problems.

²Session description: each group must find out the molecular basis of the disease and of the interventions and then design a suitable, affordable diet and identify additional resources accessible to the rural West Virginia patient. Results are presented to the whole class.

³Session description: each group must identify molecular contributions of obesity to one of 10 diseases and then role-play a physician office counseling session for the whole class.

TABLE 2: Medical knowledge nutrition related competencies and progression during years 1–4 of medical school¹.

Competency	Outcome year 1	Outcome year 2	Outcome year 3	Outcome year 4
Explain various causes (genetic, developmental, metabolic, toxic, microbiologic, autoimmune, neoplastic, degenerative, behavioral, and traumatic) of major diseases and conditions and the ways in which they operate on the body (pathogenesis).	Recognize variations of normal development and function of organs and systems due to various causes.	Describe the various causes of disease and how these are manifest in organ system dysfunction.	Explain the pathophysiologic factors underlying the clinical manifestations of common disease	Discuss the pathogenesis of major conditions related to area(s) of specialty/disciplinary interest.
Identify the proximate and ultimate factors that contribute to the development of disease and illness and that contribute to health status within and across populations regionally, nationally, and globally.	Recognize the genetic basis of disease and complex interaction with social conditions and life experiences. Discuss the effects of socioeconomic status, diet, exercise, gender, and age on health and disease.	Describe the determinants of health and disease and provide specific examples of how these determinants influence health outcomes in common/major diseases. Discuss social conditions and behaviors that predispose patients to disease and decreased function (e.g., alcohol addiction and obesity). List major contributors to health and disease in populations including mechanisms of action.	Describe the determinants of disease and health for major clinical situations prevalent in WV (including regional variation), nationally and globally Recognize the influence of common health determinates and illness on patients. Integrate knowledge of social conditions and behaviors that predispose patients to disease and decreased function into the managements plan for individual patients.	Implement interventions to reduce the impact of disease determinants (or improve the likelihood of health improvements) within patient care.
Recognize the medical consequences of common societal problems.	Describe the impact on health of life experiences, poverty, education, race, gender, culture, crime, and the health care system.	Recognize the contribution of social conditions and problems to the health and disease outcomes of patients.	Create discharge/management plans that address the impact of social conditions and problems on patients.	Describe strategies to ameliorate the impact of social conditions and problems on the health and disease outcomes of patients.

¹From http://jcesom.marshall.edu/media/41654/CoreCompetencies_MK.pdf.

shown in Table 3. Some specific results will be highlighted below.

3.4.1. Attitudes about Presentation of Nutrition Advice to Patient. Questions 1 to 5 show that most (70 to 80%) of students thought that preventive health and nutrition education was an important part of the physicians job and worth the time and effort.

3.4.2. Perceived Competence to Advise Patients. More than half of students did not think they were competent to advise patients about nutrition (question 6). This belief is also reflected in question 9, in that 80% were neutral or thought that physicians were not adequately trained to advise patients in nutritional choices and in the overall score of 65% on the nutrition knowledge questions.

3.4.3. Perceived Influence of Nutrition Attitudes of Patient. Questions 7, 8, and 10–15 address the importance of both physician and patient attitudes toward making nutrition changes. Most students thought that physicians could have a positive influence on adapting healthy lifestyles in their patient.

3.4.4. Adequacy of Nutrition Education (Quantity and Quality). In questions 16 and 17, almost 50% of students indicated dissatisfaction with both the quality and quantity of their nutrition education. JCESOM uses an organ system organization of the curriculum which could make it difficult to recognize nutrition specific material. Students suggested that more nutrition information be integrated into organ system based instruction as well as separate, specific nutrition classes (questions 18 and 19). The amount of online material seems adequate (question 20) but students would have liked

TABLE 3: Results of the Nutrition Survey.

	Strongly disagree % count	Disagree % count	Neutral % count	Agree % count	Strongly agree % count	Total count	Weighted average
(1) Preventive health care is boring.	43.48% 30	40.58% 28	8.70% 6	2.90% 2	4.35% 3	69	1.84
(2) Nutrition counseling should be part of routine care by all physicians, regardless of specialty.	1.45% 1	8.70% 6	14.49% 10	33.33% 23	42.03% 29	69	4.06
(3) Nutrition counseling is not an effective use of my professional time.	40.58% 28	36.23% 25	15.94% 11	2.90% 2	4.35% 3	69	1.94
(4) I have an obligation to improve the health of my patients including discussing nutrition with them.	2.94% 2	0.00% 0	7.35% 5	42.65% 29	47.06% 32	68	4.31
(5) All physicians, regardless of specialty, should counsel high-risk patients about dietary change.	1.45% 1	7.25% 5	14.49% 10	28.99% 20	47.83% 33	69	4.14
(6) I am confident of my ability to counsel patients about nutrition.	4.35% 3	24.64% 17	30.43% 21	31.88% 22	8.70% 6	69	3.16
(7) Patient motivation is essential to achieving dietary change.	0.00% 0	0.00% 0	4.35% 3	28.99% 20	66.67% 46	69	4.62
(8) A change toward a healthier lifestyle is important at any stage of life.	0.00% 0	1.45% 1	1.45% 1	28.99% 20	68.12% 47	69	4.64
(9) Most physicians are not adequately trained to discuss nutrition with patients.	1.45% 1	13.9% 9	30.43% 21	34.78% 24	20.29% 14	69	3.59
(10) Specific advice about how to make dietary changes could help some patients improve their eating habits.	0.00% 0	1.45% 1	8.70% 6	40.58% 28	49.28% 34	69	4.38
(11) Patients need ongoing counseling following my initial instruction to maintain behavior changes consistent with a healthier diet.	0.00% 0	1.47% 1	13.24% 9	47.06% 32	38.24% 26	68	4.22
(12) Physicians can have an effect on a patient's dietary behavior if they take the time to discuss the problem.	2.90% 2	2.90% 2	13.04% 9	47.83% 33	33.33% 23	69	4.06
(13) For most patients, health education does little to promote adherence to a healthy lifestyle.	7.25% 5	43.48% 30	31.88% 22	11.59% 8	5.8% 4	69	2.65
(14) After receiving nutrition counseling, patients with poor eating habits will make major changes in their eating behavior.	10.14% 7	31.88% 22	52.17% 36	4.35% 3	1.45% 1	69	2.55
(15) My patient education efforts will be effective in increasing patients' compliance with nutritional recommendations.	1.47% 1	14.71% 10	39.71% 27	36.76% 25	7.35% 5	68	3.34
(16) I am satisfied with the quantity of my nutrition education.	11.59% 8	37.68% 26	24.64% 17	20.29% 14	5.8% 4	69	2.71
(17) I am satisfied with the quality of my nutrition education.	11.76% 8	36.76% 25	22.06% 15	22.06% 15	7.35% 5	68	2.76
(18) My medical school nutrition curriculum should have had more time specifically dedicated to the topic of nutrition (independent of organ system based studies).	5.80% 4	18.84% 13	15.94% 11	43.48% 30	15.94% 11	69	3.45
(19) My medical school nutrition curriculum should have had more nutrition content formally integrated into the organ system based courses.	1.45% 1	15.94% 11	18.84% 13	44.93% 31	18.84% 13	69	3.64
(20) My medical school nutrition curriculum should have included more online materials available for independent study.	18.84% 13	33.33% 23	28.99% 20	14.49% 10	4.35% 3	69	2.52
(21) My medical school nutrition curriculum should have included more material relevant to my personal health and well-being.	0.00% 0	20.29% 14	24.64% 17	40.58% 28	14.49% 10	69	3.49

TABLE 3: Continued.

	Strongly disagree % count	Disagree % count	Neutral % count	Agree % count	Strongly agree % count	Total count	Weighted average
(22) My medical school nutrition curriculum should have been more scientifically rigorous.	8.70% 6	33.33% 23	24.64% 17	26.09% 18	7.25% 5	69	2.90
(23) My medical school curriculum had too many hours of nutrition specific education.	20.29% 14	53.62% 37	23.19% 16	1.45% 1	1.45% 1	69	2.10
(24) My medical school curriculum did not have enough nutrition specific education.	1.45% 1	18.84% 13	23.19% 16	44.93% 31	11.59% 8	69	3.46
(25) My medical school curriculum had little or no nutrition education after the first year.	7.25% 5	7.25% 5	40.58% 28	24.64% 17	20.29% 14	69	3.43

more personally relevant material (question 21). Individual analyses of question 25 (nutrition education after the first year) show that 14 of 28 students who responded with a neutral answer were first year students and would not have had knowledge of curriculum in later years.

3.4.5. Nutrition Knowledge. Ten general questions were used to assess basic nutrition knowledge. There was an overall score of 65.6% among the 51 students who attempted the knowledge questions. It seems likely that the 18 students who skipped the knowledge questions did not think they knew the answers. Had they attempted the questions it is likely that the overall average would have further decreased.

3.4.6. Specific Suggestions for Improving Nutrition Education. There were only 5 different suggestions for improving nutrition education. These were (1) clinically relevant nutrition education for weight management and disease process modification which would be beneficial; (2) addressing cultural issues in nutrition. For example, a module comparing “diet fads” and popular trends about which our patients might ask (Atkins, disease specific diets, avoidance of certain food groups in autoimmune conditions, etc.) would be useful information; (3) During our first year we had the program director from Marshall nutrition talk to us. Additional lectures from a dietician with diet information relevant to organ systems would be appreciated; (4) not only nutrition, but advice on exercise regimens. Both are key to a healthy lifestyle. The nutrition education we received as MS1 was all biochemically based. If you want to be proficient for your patients, then you had to independently explore this topic and assess the current literature (which, by the way, is drastically different than what most physicians preach to patients); (5) more accurate and up-to-date information in the lecture material; material should address recent studies about nutrition.

4. Discussion

Many of the health challenges for the US could be modified by changing the diet and exercise practices of the population [7]. Since physicians can be instrumental in changing diet behaviors [11, 19], nutritional information is an important

component of medical student training [20, 21]. The resources of JCESOM, as of many medical schools, are, however, limited. Marshall University does have a Dietetics Department within the College of Health Professions. This program offers both Bachelor’s and Master’s degrees in Dietetics. Still, this school is not part of the medical school; thus access to these nutrition experts for our medical students is limited. As a courtesy, the Chair of the Dietetics Department does present an obesity lecture to our first year medical students. The remainder of the nutrition related material during the first block of the first year is presented by Biochemistry Faculty. As can be seen in Table 1, most of the focused nutrition information is taught during the first year of medical school.

Table 1 also highlights the variety of pedagogy used to present nutrition content. The varied pedagogy is intentional and is meant to enhance learning. Results of other researches indicate that a mix of pedagogical styles better meets the needs of various learning styles of students [22]. Typically, lectures are used to introduce material and provide background for clinical relevance. The use of the Nutrition in Medicine materials enables us to present high quality, up-to-date nutrition education without the presence of nutrition experts on School of Medicine faculty [23]. The Nutrition in Medicine web-based materials also contribute to the development of “life-long learning” skills. By assigning modules especially applicable to specific health topics (diabetes, cardiovascular disease, nutrition in pregnancy, or aging) and allowing selection of a module of interest, all students get both basic and individually tailored nutrition education. Students learn better if they are motivated, actively engaged, and personally invested. The use of independent learning pedagogy is based on three core elements: presenting the information in small bites, making learning self-paced by the learner, and providing immediate feedback to the learner using the built in self-assessment. The independent learning method of teaching, reinforced with immediate question/answer feedback, helps build a knowledge base and critical thinking skills [21].

Clinical correlate lectures by physicians allow students to ask questions, obtain response from clinicians, and provide reinforcement of the NIM material. The use of small group and role playing exercises enhances learning using peer teaching, a technique beneficial to both “teacher” and “learner” [24].

Almost 50% of students were dissatisfied with both the quantity and quality of their nutrition education during medical school. While somewhat alarming, this also means that 50% of the students were neutral or thought that the quantity and quality of their nutrition education were adequate, a fraction similar to that after completion of the NAA in schools that received that award and much better than the 30% of satisfied students in schools that did not receive the award [13].

Our students largely agreed with previous studies of practicing physicians in that they felt that a physician could influence a patient's nutrition choices [11] but that they felt inadequate to present nutrition and obesity information to patients [8, 12]. The students also desired more nutrition information during their undergraduate education. As faculty members and curriculum planners, the challenge remains of finding the time to include nutrition education in an already packed medical school curriculum and to help the students recognize the nutrition education that they receive.

5. Conclusions

Limitations of this study are that the conclusions of this study are limited by the restriction to one medical school with a smaller population than many medical schools, the rural environment, and by the limited response of the students. However this study does demonstrate that the nutrition education can occur without incurring large additional costs though time for the sessions must be found within the curriculum.

Medical students realized the need for nutrition education in their medical school curriculum and the need for physicians to provide this information to their patients. Using online resources and small group exercises, basic nutrition education can be addressed by faculty members who are not nutrition experts. Most medical students desire additional nutrition education; however a challenge remains for finding the time to include this information in the medical school curriculum.

Conflict of Interests

The authors declare that there is no conflict of interests for publication of this paper.

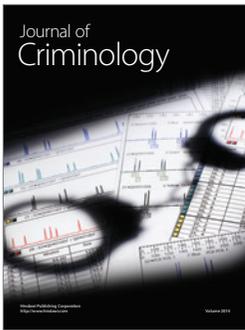
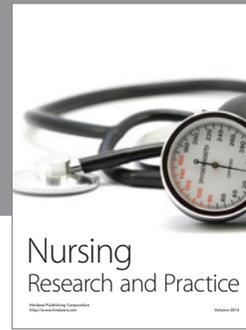
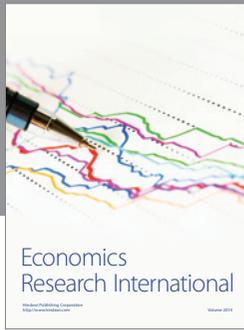
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References

- [1] D. P. Guh, W. Zhang, N. Bansback, Z. Amarsi, C. L. Birmingham, and A. H. Anis, "The incidence of co-morbidities related to obesity and overweight: a systematic review and meta-analysis," *BMC Public Health*, vol. 9, article 88, 2009.
- [2] Center for Disease Prevention and Control, *Obesity and Overweight*, Center for Disease Prevention and Control, 2014, <http://www.cdc.gov/obesity/data/prevalence-maps.html>.
- [3] Center for Disease Prevention and Control, Diabetes, 2014, <http://gis.cdc.gov/grasp/diabetes/DiabetesAtlas.html>.
- [4] Center for Disease Prevention and Control, *Heart Disease*, Center for Disease Prevention and Control, 2012, http://www.cdc.gov/nchs/pressroom/states/HEART_DISEASE_STATE_2012.pdf.
- [5] United States Census Bureau, *Quickfacts from US Census Bureau*, United States Census Bureau, 2014, <http://quickfacts.census.gov/qfd/states/54000.html>.
- [6] Urban and Rural Population by State, 2012, <http://www.census.gov/compendia/statab/2012/tables/12s0029.xls>.
- [7] J. Cawley, C. Meyerhoefer, A. Biener, M. Hammer, and N. Wintfeld, "Savings in medical expenditures associated with reductions in body mass index among us adults with obesity, by diabetes status," *PharmacoEconomics*, 2014.
- [8] C. B. Eaton, P. E. McBride, K. A. Gans, and G. L. Underbakke, "Teaching nutrition skills to primary care practitioners," *The Journal of Nutrition*, vol. 133, no. 2, pp. 563S–566S, 2003.
- [9] R. F. Kushner, "Barriers to providing nutrition counseling by physicians: a survey of primary care practitioners," *Preventive Medicine*, vol. 24, no. 6, pp. 546–552, 1995.
- [10] T. E. Kottke, J. K. Foels, C. Hill, T. Choi, and D. A. Fenderson, "Nutrition counseling in private practice: attitudes and activities of family physicians," *Preventive Medicine*, vol. 13, no. 2, pp. 219–225, 1984.
- [11] R. Ward, "Talking with your patients about dietary cholesterol, diet and nutrition: best practices for family physicians," *International Journal of Clinical Practice*, supplement 163, pp. 22–27, 2009.
- [12] M. Jay, C. Gillespie, T. Ark et al., "Do internists, pediatricians, and psychiatrists feel competent in obesity care?: using a needs assessment to drive curriculum design," *Journal of General Internal Medicine*, vol. 23, no. 7, pp. 1066–1070, 2008.
- [13] T. A. Pearson, E. J. Stone, S. M. Grundy, P. E. McBride, L. Van Horn, and B. W. Tobin, "Translation of nutritional sciences into medical education: the Nutrition Academic Award Program," *American Journal of Clinical Nutrition*, vol. 74, no. 2, pp. 164–170, 2001.
- [14] L. van Horn, "The nutrition academic award: brief history, overview, and legacy," *The American Journal of Clinical Nutrition*, vol. 83, no. 4, 2006.
- [15] K. Cooksey, M. Kohlmeier, C. Plaisted, K. Adams, and S. H. Zeisel, "Getting nutrition education into medical schools: a computer-based approach," *The American Journal of Clinical Nutrition*, vol. 72, pp. 868S–876S, 2000.
- [16] K. C. Lindell, K. M. Adams, M. Kohlmeier, and S. H. Zeisel, "The evolution of Nutrition in Medicine, a computer-assisted nutrition curriculum," *The American Journal of Clinical Nutrition*, vol. 83, pp. 956S–962S, 2006.
- [17] C. O. Walsh, S. I. Ziniel, H. K. Delichatsios, and D. S. Ludwig, "Nutrition attitudes and knowledge in medical students after completion of an integrated nutrition curriculum compared to a dedicated nutrition curriculum: a quasi-experimental study," *BMC Medical Education*, vol. 11, article 58, 2011.
- [18] MedBiquitous Curriculum Inventory Working Group Standardized Vocabulary Subcommittee, "Curriculum inventory standardized instructional and assessment methods and resource types," Tech. Rep., Association of American Medical Colleges, Washington, DC, USA, 2012.
- [19] R. A. DiMaria-Ghalili, J. M. Mirtallo, B. W. Tobin, L. Hark, L. van Horn, and C. A. Palmer, "Challenges and opportunities for

- nutrition education and training in the health care professions: Intraprofessional and interprofessional call to action,” *The American Journal of Clinical Nutrition*, vol. 99, no. 5, 2014.
- [20] L. Ball, J. Crowley, C. Laur, M. Rajput-Ray, S. Gillam, and S. Ray, “Nutrition in medical education: reflections from an initiative at the University of Cambridge,” *Journal of Multidisciplinary Healthcare*, vol. 7, pp. 209–215, 2014.
- [21] K. Cooksey, M. Kohlmeier, C. Plaisted, K. Adams, and S. H. Zeisel, “Getting nutrition education into medical schools: a computer-based approach,” *The American Journal of Clinical Nutrition*, vol. 72, no. 3, pp. 868S–876S, 2000.
- [22] J. R. van Doorn and J. D. van Doorn, “The quest for knowledge transfer efficacy: blended teaching, online and in-class, with consideration of learning typologies for non-traditional and traditional students,” *Frontiers in Psychology*, vol. 5, article 324, 2014.
- [23] K. M. Adams, M. Kohlmeier, M. Powell, and S. H. Zeisel, “Nutrition in medicine: nutrition education for medical students and residents,” *Nutrition in Clinical Practice*, vol. 25, no. 5, pp. 471–480, 2010.
- [24] K. L. Bene and G. Bergus, “When learners become teachers: a review of peer teaching in medical student education,” *Family Medicine*, vol. 46, pp. 783–787, 2014.



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