Nutrition Knowledge and Attitude Towards Nutrition Counseling Among Osteopathic Medical Students

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Emily J. Hargrove
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This thesis titled

Nutrition Knowledge and Attitude Towards Nutrition Counseling Among Osteopathic Medical Students

by

EMILY J. HARGROVE

has been approved for

the School of Applied Health Sciences and Wellness

and the College of Health Sciences and Professions by

Darlene E. Berryman

Professor of Applied Health Sciences and Wellness

Randy Leite

Dean, College of Health Sciences and Professions
Abstract

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Nutrition Knowledge and Attitude Towards Nutrition Counseling Among Osteopathic Medical Students

Director of Thesis: Darlene E. Berryman

Despite the increasing emphasis on changing dietary practices to improve health, nutrition education is lacking in many healthcare training programs. Many health conditions and diseases can be minimized or managed with appropriate and adequate nutrition education. However, medical schools do not provide sufficient nutrition education to prepare future physicians to give specific dietary recommendations. This research study was designed to better understand the nutrition knowledge and attitudes towards nutrition counseling of osteopathic medical students, whose focus is on holistic medicine. The participants completed an online Qualtrics survey with a demographic questionnaire, a previous nutrition knowledge and nutrition experiences questionnaire, a nutrition knowledge multiple-choice quiz, and questions from two previously validated studies on nutrition in patient care and self-perceived proficiency in nutrition. A sample of 257 first and second year medical students (mean age = 24.8 ± 3.4 years, 53.0% female, and 79.0% white/Caucasian) completed the survey. The mean score on the nutrition knowledge quiz was 69.9% with a significant difference between first and second year students (66% vs. 74%, p < 0.001). 59% (n = 143) of students felt comfortable counseling patients on nutrition recommendations, but only 12% (n = 213) were aware of the current DRI nutrition guidelines. Qualitatively, most students noted the
importance of nutrition in medical school, particularly in providing patient education, overall health and wellness, and preventing and treating disease. Despite the perceived importance of nutrition education and comfort level with counseling patients, most students lacked nutrition knowledge and information about dietary guidelines. These findings provide empirical support for the integration of more nutrition education into medical school curricula.
Preface

Chapter 4 contained within the thesis document serves as a prepublication manuscript. This manuscript has been formatted to meet the guidelines set forth by Thesis and Dissertation Services at Ohio University.
I would like to dedicate my work to my family and friends who encouraged me and supported me throughout this whole process.

Without each of you, this would not have been possible.
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I would like to express my most sincere appreciation for all who have helped me throughout the thesis writing process.

I would like to thank Ms. Jennifer Yoder, who was a great committee member and mentor for the duration of my master’s program. She guided me and advised me in many aspects of the graduate program and provided assistance whenever needed.

I would also like to thank Dr. Elizabeth Beverly who was instrumental through the entire thesis process, from beginning to end. She helped develop the idea for this study and was incredibly helpful in the progression of the study. Dr. Beverly showed me that research could be fun. I am truly grateful for her mentorship and owe my new-found interest in research to her.

Finally, I would like to thank Dr. Darlene Berryman for stepping in to become my thesis advisor. Dr. Berryman did an exceptional job at providing guidance and helping turn this research study into something I am very proud of. She saw potential in me that I did not know existed and pushed me to become better. For that, I am eternally grateful.

This process has not only been a period of intense learning, but also a period of significant personal growth, and I am very thankful for those who have contributed to that growth. In addition to my committee members listed above, I would also like to thank all faculty, staff, and fellow students who provided help and support throughout my entire graduate studies at Ohio University.
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Chapter 1: Introduction

Nutrition is a major component of life, whether living in a healthy, disease-free state or working to manage chronic illnesses. There is a definitive connection between diet and health, yet nutrition is often overlooked in everyday healthcare. Poor nutrition often leads to overweight and obesity, which are risk factors for additional chronic diseases. Currently, more than 33% of adults in the United States are classified as obese, and obesity-related diseases and conditions contribute between $147 and $210 billion in healthcare costs per year (Cawley & Meyerhoefer, 2012; Ogden, Carroll, Kit, & Flegal, 2014).

Obesity-related diseases and conditions can be reduced and managed with proper nutrition education. For example, type 2 diabetes mellitus can be well managed with education on what is a carbohydrate and how to eat carbohydrates consistently throughout the day and hypertension can be managed by educating a patient on the Dietary Approaches to Stop Hypertension (DASH) diet (Nelms, Sucher, & Lacey, 2014). Healthcare providers, at all levels, provide an opportunity for this needed education. The member of the healthcare team most proficient in providing medical nutrition therapy or nutrition education and counseling is the Registered Dietitian (RD) or Registered Dietitian Nutritionist (RDN) (Academy of Nutrition and Dietetics, n.d.-b). However, most patients do not see the RDN unless referred by a physician, because of insurance coverage (Academy of Nutrition and Dietetics, n.d.-a). Research suggests countless barriers for patient referrals to a RDN including time, finances, and confidence in a patient’s willingness to change (Pomeroy & Cant, 2010). Because of this trend of low
referrals, if a patient receives nutrition education or nutrition counseling, the primary care physician (PCP) often provides it (Darer, Hwang, Pham, Bass, & Anderson, 2004). However, physicians are more knowledgeable in the treatment of disease; moreover, the literature shows that many medical students and practicing physicians feel ill prepared to discuss specific dietary recommendations with patients (Anis et al., 2004; Connor, Cialdella-Kam, & Harris, 2015; Darer et al., 2004; Krause & Fox, 1977; Kushner, 1995; Lasswell, DeForge, Sobal, Muncie, & Michocki, 1995; Vetter, Herring, Sood, Shah, & Kalet, 2008).

The lack of nutrition knowledge and nutrition counseling skills is a direct result of inadequate nutrition education during medical school. With respect to nutrition education in medical schools, allopathic medical programs are well studied, and it has been found that they do not contain the recommended number of hours of nutrition education (Adams, Lindell, Kohlmeier, & Zeisel, 2006). Osteopathic medical programs are different in their philosophies from allopathic programs and focus more on the person as a whole, with an emphasis on wellness (American Association of Colleges of Osteopathic Medicine, n.d.). However, to the best of our knowledge, nutrition education in osteopathic medicine programs has not been studied extensively. Approximately 56% of osteopathic medical students become PCPs, compared to only 35% of allopathic medical students, meaning the importance of having nutrition education is vital (American Osteopathic Association, 2015).
Statement of the Problem

Nutrition education is lacking in medical schools, and PCPs are often the healthcare team member providing patients with nutrition education. Without the base knowledge and skill set to do so, PCPs could be providing inadequate information or no information at all. With the growing trend of obesity and chronic disease in the United States, as well as the knowledge of nutrition implications in non-chronic conditions, patients need to be given appropriate nutrition education and counseling. The purpose of this study is to better understand the nutrition knowledge and skills of osteopathic medical students at Ohio University Heritage College of Osteopathic Medicine, in order to design curriculums that provide adequate nutrition knowledge and nutrition counseling skills to help future practicing physicians. Approximately 48% of graduates from the Ohio University Heritage College of Osteopathic Medicine go into primary care practice, making nutrition education an important aspect of their medical school training (OUHCOM, 2015).

Research Objectives

1. Determine the osteopathic medical students perceived importance of nutrition education and the role of a registered dietitian nutritionist.

2. Determine nutrition knowledge among osteopathic medical students.

3. Determine attitudes/beliefs of osteopathic medical students towards nutrition counseling in clinical practice.
Significance of Study

Findings from this study could be used to fill a gap in knowledge among osteopathic medical students at Ohio University Heritage College of Osteopathic Medicine and at other osteopathic medical programs. Additionally, findings from this research study could lead to an adjustment in curriculum for all medical programs, which could help prepare future professionals better and make them more equipped and confident to deal with nutritional concerns in professional practice. Finally, this study could make future physicians aware of all members of their healthcare team, specifically the qualifications and usefulness of the RDN.

Limitations/Delimitations

1. Data were only collected from one osteopathic medical school in the United States. This affects the data because the knowledge base and attitudes surveyed are all from the same osteopathic medical school, with students who are taking the same courses. This gives us a great picture of this medical school, but does not give us an accurate picture of other osteopathic medical schools.

2. Data were only collected from current first and second year medical students at Ohio University Heritage College of Osteopathic Medicine. This affects the data because we did not survey third or fourth year medical students who are currently out in the field and may have different attitudes on nutrition counseling and nutrition knowledge.

3. All survey responses were self-reported by the medical student. This affects the data because self-reported responses are not always reliable.
Definition of Terms

Nutrition Academic Award. A five-year grant awarded to successful applicant medical schools throughout the United States, to encourage the development of medical curricula that enhances nutrition knowledge and principles (National Heart, Lung, and Blood Institute, 2014).

National Academy of Sciences. Private, non-profit society of distinguished scholars, charged with giving of independent advice to the nation on matters related to science and technology (National Academy of Sciences, n.d.).

Primary care physician. A generalist physician who is the first line of contact with patients and takes a continuing responsibility for providing a patient care (American Academy of Family Physicians, n.d.).

Registered dietitian nutritionist or registered dietitian. Food and nutrition experts who have met the minimum requirements to earn the RD or RDN credential; note that these terms are interchangeable (Academy of Nutrition and Dietetics, n.d.-b).
Chapter 2: Review of Literature

A fundamental component to living a healthy, active life is proper nutrition. The Academy of Nutrition and Dietetics defines the foundation for a health-promoting lifestyle as a balanced diet with a variety of nutrient-dense foods and beverages consumed in moderation with ample physical activity (Freeland-Graves & Nitzke, 2013). Despite widely available dietary recommendations, most Americans are not eating a diet with sufficient or quality proportion of nutrients. Many are over consuming total kilocalories, sugars, and fats, while under consuming important vitamins and minerals. For example, a diet rich in fruits and vegetables is the best way to assure a diet adequate in the missing nutrients, but more than two-thirds of adults reported eating fruits or vegetables less than twice a day (Freeland-Graves & Nitzke, 2013). This is a major cause for concern because poor dietary habits can lead to chronic disease or poor management of existing diseases. This chapter will describe the importance of nutrition in health, the health professionals that provide nutrition advice and counseling, and the education and training provided to those healthcare professionals.

Importance of Diet

A person’s diet contributes greatly to their overall health. Extensive research has been done to determine what a person should eat when in a healthy state and when in a stressed or diseased state. For example, a woman who is pregnant needs, on average per day, an additional 300 kilocalories, minimum of 175 grams of carbohydrates, an extra 25 grams of protein, 13 grams of linoleic acid, 1.4 grams of alpha-linolenic acid, and increased folate, vitamin D, calcium, and iron (Brown et al., 2011). A patient with kidney
Disease needs to monitor his or her protein intake, phosphorus intake, and fluid intake (Nelms et al., 2014). A patient with diabetes needs to monitor his or her carbohydrate intake (Nelms et al., 2014). These examples demonstrate how diets can be distinctive for different people and conditions. The nutrients found in food are essential for the human body to function. The foods consumed are broken down to fuel body processes and build and repair cells and tissues. Without fueling the body with a diet adequate in needed nutrients, the body cannot function properly, increasing the risk of developing health problems.

**Diet and Health Implications**

An increasing number of preventable chronic diseases including cardiovascular disease, type 2 diabetes mellitus, and obesity are causing more disability and early death worldwide (World Health Organization [WHO], 2015). In fact, 68 percent of deaths worldwide were attributed to noncommunicable, chronic diseases in 2012 (WHO, 2014). Specifically, in the United States, seven out of the top ten causes of death are chronic diseases (heart disease, cancer, stroke, diabetes, chronic lower respiratory diseases, influenza/pneumonia, kidney disease), and more than two-thirds of adults are considered overweight or obese (Flegal, Carroll, Kit, & Ogden, 2012). Overweight and obesity are major concerns because they are risk factors for developing the other chronic diseases.

Modifying diet and lifestyle risk factors could prevent many cases of preventable chronic disease such as coronary artery disease, stroke, type 2 diabetes, and many cancers (Willett & Leibel, 2002). The following table illustrates aspects of dietary intake for which there is convincing evidence that diet influences the health condition. The positive
health implications associated with these dietary changes have been shown to greatly decrease the risk of preventable chronic disease (Willett et al., 2006).

Table 1

Select Dietary Changes and Health Implications

<table>
<thead>
<tr>
<th>Dietary change</th>
<th>Health implication</th>
<th>Reference</th>
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</thead>
<tbody>
<tr>
<td>Replace saturated fat and trans fats with unsaturated fats</td>
<td>Reduce risk of CAD by reducing total cholesterol and LDL</td>
<td>(Hu &amp; Willett, 2002; WHO, 2003)</td>
</tr>
<tr>
<td>Consume generous amounts of fruits and vegetables</td>
<td>Reduce risk of CAD, stroke, and colon and breast cancers</td>
<td>(Conlin, 1999; Hu &amp; Willett, 2002)</td>
</tr>
<tr>
<td>Consume grains in whole-grain, high-fiber form</td>
<td>Reduce risk of CAD and type 2 diabetes, and helps maintain weight control</td>
<td>(Hu, van Dam, &amp; Liu, 2001; Hu &amp; Willett, 2002)</td>
</tr>
<tr>
<td>Limit consumption of sugar</td>
<td>Increases risk for overweight and increases risk of metabolic syndrome, diabetes, and CAD</td>
<td>(Hu et al., 2001; Hu &amp; Willett, 2002; Schulze et al., 2004)</td>
</tr>
<tr>
<td>Limit excessive calorie intake</td>
<td>Increases risk of becoming overweight and obese</td>
<td>(Willett et al., 2006)</td>
</tr>
</tbody>
</table>

Note. CAD, Coronary artery disease.

The dietary changes listed above all contribute to a decreased risk for overweight and obesity, which are two of the greatest risk factors for developing chronic diseases (Willett et al., 2006).
Obesity

The terms overweight and obesity refer to an excessive amount of adipose tissue to the degree of causing negative health consequences (Haslam & James, 2005). The most common measurement for overweight and obesity is body mass index (BMI), which is calculated based on a person’s height and weight ratio. Despite being the most widely used measure to assess overweight and obesity, the BMI calculation does not accurately estimate the prevalence of overweight and obesity (Gomez-Ambrosi et al., 2012). In adults, overweight is defined as a BMI between 25.0 and 29.9 and a BMI greater than 30 indicates obesity (Harvard T.H. Chan School of Public Health, n.d.). While these cutoff points are valuable in epidemiological studies, they do not take into account the body composition or the amount of excess fat actually causing obesity-related health effects (Gomez-Ambrosi et al., 2012). Therefore, the BMI calculation is flawed in that it does not determine body fat percentages, which can potentially classify someone as having a healthy weight even though they have an unhealthy fat mass or classify someone as overweight or obese while having a healthy fat mass (Gomez-Ambrosi et al., 2012).

Obesity is a complex issue with many causes including genetics, environmental factors, psychological elements, social dynamics, and economic issues. However, the greatest contributing factor to obesity is probably energy imbalance (Aronne, Nelinson, & Lillo, 2009). The energy imbalance results from excess dietary consumption of energy calories not counterbalanced by enough energy expended through metabolic processes and physical activity (Aronne et al., 2009). In part, this superfluous energy consumption
comes from an increased intake of energy-dense foods that are high in fat and sugar (WHO, 2016).

In addition to being a complex issue with many causes, obesity also has a myriad of consequences. Obesity is a major risk factor for noncommunicable, chronic diseases. The common health consequences resulting from obesity include cardiovascular disease; diabetes and other metabolic disorders; musculoskeletal disorders; increased risk of cancers including esophagus, pancreatic, colon, breast, kidney, thyroid, and gallbladder; and even premature death (Pi-Sunyer, 2009). Other major consequences of obesity include alterations in quality of life, decreased mobility, increased levels of unemployment, and increased psychological stresses and disorders (Pi-Sunyer, 2009). The impact obesity has on an individual’s life is very broad and very concerning.

Obesity is currently the largest contributor to preventable chronic disease healthcare costs in the United States (Cawley & Meyerhoefer, 2012). The direct healthcare costs from obesity range from $147 billion to almost $210 billion per year (Cawley & Meyerhoefer, 2012). However, there are many indirect costs of obesity including missing work, contributing to an additional $4.3 billion and decreased productivity while at work adding an additional $506 per obese worker (Cawley, Rizzo, & Haas, 2007). Obese individuals contribute 42% more direct healthcare costs than adults who are of healthy weight (Cawley et al., 2007). Obese individuals also on average have more emergency room visits and are on more medications, further increasing healthcare costs (Arterburn, Maciejewski, & Tsevat, 2005). Reducing the prevalence of obesity will help lower healthcare costs. In fact, a 2008 study found that a ten-dollar per
person investment in prevention could save more than $16 billion annually within 5 years (Richardson & Segal, 2008).

Obesity is a serious preventable health issue that needs to be reduced. The focus needs to be on prevention, rather than treatment. The best way to prevent obesity is education through supportive environments and communities that help encourage healthy lifestyle choices (WHO, 2016). The most basic step for preventing or improving obesity is simply healthier food choices (Khan et al., 2009). However, there are many barriers to making healthier food choices, including a lack of education (O'Dea, 2003).

**Nutrition in Other Health Conditions**

Obesity and obesity-related chronic diseases are not the only types of conditions that require nutrition support and/or interventions. Many other conditions, as well as certain periods in life, require specific dietary guidelines. Autoimmune diseases such as celiac disease, rheumatoid arthritis, multiple sclerosis, and thyroid disorders all require specific dietary changes to help manage the condition or minimize symptoms (Nelms et al., 2014). In these types of disease states, it is important to know and understand what foods cause inflammation and what foods reduce inflammation (Nelms et al., 2014). Additionally, patients with food allergies need nutrition support to ensure they are eating safe foods and receiving adequate nutrients (Nelms et al., 2014). Other conditions in which nutrition support or intervention is necessary is with eating disorders, vitamin or mineral deficiencies, HIV/AIDS, kidney disorders/disease, all cancers, wounds and burns, presurgery and postsurgery, gastrointestinal conditions, pregnancy and lactation, and any other condition in which the body is in a “stressed state” (Nelms et al., 2014).
Furthermore, dietary needs change based on activity level, development, and age, so dietary recommendations are different for all stages of life (Nelms et al., 2014). Nutrition is needed in every aspect of treating patients, whether they have a chronic disease or not.

**Healthy People Objectives**

The overarching vision of Healthy People 2020 is for a society in which all people live long and healthy lives (Healthy People, 2015). Healthy People objectives are science-based, 10-year goals to improve the health of all Americans (Healthy People, 2015). The Healthy People objectives encourage collaborations across communities, empower individuals to make informed decisions for their health, and measure the impact of different prevention activities (Healthy People, 2015). The Healthy People 2020 objectives are not strict guidelines to be followed, but are a goal for healthcare professionals to work towards. A specific goal of Healthy People 2020 is to “promote health and reduce chronic disease risk through the consumption of healthful diets and achievement and maintenance of healthy body weights” (Healthy People, 2015). A healthful diet includes consuming a variety of nutrient-dense foods, limiting unhealthy fats, cholesterol, added sugars, and sodium, and limit caloric intake to meet needs (U.S. Department of Agriculture [USDA], 2015). The Healthy People 2020 goal emphasizes the importance of nutrition and weight status because a healthful diet reduces the risk for many health conditions including overweight and obesity, malnutrition, cardiovascular disease, diabetes, some cancers, and many other chronic health conditions (USDA, 2015). The Healthy People 2020 goal identifies many determinants of weight status, one of which being knowledge and attitudes (USDA, 2008). This leads into a specific objective
of increasing the proportion of physician office visits that include counseling or education related to nutrition or weight (Healthy People, 2015). This objective identifies how important it is for nutrition to be a major part of healthcare and physicians to offer nutrition education and counseling to all patients. Currently, patients who already have health concerns are receiving very little, if any, nutrition education or counseling at appointments with their physician. The Healthy People 2020 objectives, baseline data, and targets related to the weight and nutrition counseling are listed in Table 2 (Healthy People, 2015).
Table 2

*Health People 2020 Objectives Related to Increasing the Proportion of Physician Office Visits That Include Counseling or Education Related to Nutrition or Weight*

<table>
<thead>
<tr>
<th>Specific Objective</th>
<th>Baseline</th>
<th>Target</th>
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<tr>
<td>Increase the proportion of physician office visits made by patients with a diagnosis of cardiovascular disease, diabetes, or hyperlipidemia that include counseling or education related to diet or nutrition</td>
<td>20.8% of physician office visits by adult patients with a diagnosis of cardiovascular disease, diabetes, or hyperlipidemia included counseling or education related to diet or nutrition in 2007</td>
<td>22.9%</td>
</tr>
<tr>
<td>Increase the proportion of physician office visits made by adult patients who are obese that include counseling or educated related to weight reduction, nutrition, or physical activity</td>
<td>28.9% of physician office visits by adult patients who are obese included counseling or education related to weight reduction, nutrition or physical activity in 2007</td>
<td>31.8%</td>
</tr>
<tr>
<td>Increase the proportion of physician visits made by all child or adult patients that include counseling about nutrition or diet</td>
<td>12.2% of physician office visits by all child or adult patients included counseling about nutrition or diet in 2007</td>
<td>15.2%</td>
</tr>
</tbody>
</table>


**Healthcare Team**

Offering the best healthcare to a patient is a group effort. There are often many different healthcare professionals involved and each one has a different role. The members on a healthcare team that often deal with nutrition education and counseling with patients are the specialty physicians, PCP, Physicians Assistants, Nurse Practitioners, RDN/RD, dietetic technicians (DTR), and nurses (Britt, 2012). Depending on a patient’s current health situation, they may have interactions with all of the
healthcare providers or just one. The RDN is the most commonly identified person that is qualified to provide nutrition support. The DTR works under the supervision of the RDN and can offer support in nutrition screening and less complex nutrition interventions (Institute of Medicine, 2000). Additionally, other healthcare professionals can provide basic nutrition education, but most do not have the concentrated background in the field of nutrition science to provide in depth nutrition services (Institute of Medicine, 2000). Nurses often handle brief, uncomplicated nutrition education and counseling with patients who are not referred to see a RDN (Henning, 2009). Physicians are the ones responsible for referring a patient to a RDN to receive medical nutrition therapy or in some cases are providing the nutrition education and counseling themselves (Institute of Medicine, 2000). Collectively, this team of healthcare providers should ideally arm the patient with the nutrition knowledge and tools to address their specific health needs.

**Registered Dietitian Nutritionist**

An RDN is a food and nutrition expert who is able to translate the difficult science of nutrition to help individuals make positive lifestyle choices (Academy of Nutrition and Dietetics, n.d.-b). The RD credential and the RDN credential are both used and have identical meanings and legal trademarks. “Nutritionist” was added to the RD credential in 2013 to better communicate the concept of wellness and prevention that is part of the nutrition and dietetics practice (Academy of Nutrition and Dietetics, n.d.-b). The RD and RDN credential are used interchangeably, but the Academy of Nutrition and Dietetics is moving more towards the RDN credential being the norm (Academy of Nutrition and Dietetics, n.d.-b).
RDNs are registered professionals who provide medical nutrition therapy, which can improve patient health and reduce health care costs. Approximately 55% of RDNs work in the clinical setting, working with healthcare teams to provide patients in health care institutions with medical nutrition therapy (Hooker, Williams, Papneja, Sen, & Hogan, 2012). Additionally, RDNs work in private practice, food industry, community and public health settings, universities, sports nutrition, corporate wellness, or research (Academy of Nutrition and Dietetics, n.d.-b). The education requirements and training required to become a RDN is extensive and exemplifies why the RDN is the food and nutrition expert in the medical field (Sanders, 2014). The educational and professional requirements are listed in Table 3 (Academy of Nutrition and Dietetics, n.d.-b). In addition to the requirements listed below, in the year 2024, all RDNs will be required to have a masters level degree to enter the profession (Academy of Nutrition and Dietetics, n.d.-b).
Table 3

*Educational and Professional Requirements to Become an RD or RDN*

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Specifics</th>
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<tr>
<td>Complete a minimum of a bachelor’s degree at a U.S. regionally accredited university</td>
<td>Coursework required by the Accreditation Council for Education in Nutrition and Dietetics includes food and nutrition sciences, biochemistry, chemistry, anatomy and physiology, microbiology, foodservice systems, pharmacology, business, behavioral social sciences, and communication</td>
</tr>
<tr>
<td>Complete 1200 hr of supervised practice through an Accreditation Council for Education in Nutrition and Dietetics accredited dietetic internship</td>
<td>Rotations include clinical nutrition, foodservice, community, and other specified concentration areas</td>
</tr>
<tr>
<td>Pass a national examination administered by the Commission on Dietetic Registration</td>
<td>Credentialing exam includes areas on food and nutrition science; nutrition care process; counseling, communication, education and research; foodservice; and management</td>
</tr>
<tr>
<td>Continuing education</td>
<td>75 hr every 5 years of approved continuing education credits</td>
</tr>
</tbody>
</table>


RDNs can work in a wide variety of healthcare, business and industry, community health, education, research, and private practice settings (Sanders, 2014). Specifically in the healthcare setting, RDNs work in hospitals and clinics, ordering medical nutrition therapy as part of an interdisciplinary healthcare team and also offer patients nutrition education (Academy of Nutrition and Dietetics, n.d.-b). However, many patients do not
get the opportunity to consult with a RDN because most insurances will not cover nutrition counseling unless referred by a physician (Academy of Nutrition and Dietetics, n.d.-a). In a study conducted with patients with type 2 diabetes, 75% of participants believed working with a RDN would help them in changing dietary behaviors, however, only 34% of participants received a referral from their physicians (Alameddine et al., 2013). Research on patient referrals by PCPs to see RDNs is limited; however, there are indications that there may be low referral rates due to financial barriers and the PCP’s own beliefs in a patient’s ability to change (Alameddine et al., 2013; Pomeroy & Cant, 2010). Because of a PCPs low referral rate to RDNs, patients generally seek nutrition education and counseling elsewhere, despite various studies showing that treatment and outcomes for patients with chronic diseases is much more effective when accompanied by medical nutrition therapy from a RDN (Gaetke, Stuart, & Truszczynska, 2006; Huang, Hsu, Wang, & Shin, 2010; Kirk, Woo, Jones, & Siegel, 2015; Willaing, Ladelund, Jorgensen, Simonsen, & Nielsen, 2004). In fact, a study measuring the effectiveness of a single nutrition counseling session found that patients with type 2 diabetes and cardiovascular disease had much better clinical outcome measures of fasting blood glucose, hemoglobin A1c, total cholesterol, LDL cholesterol, triglyceride levels, and felt more motivated to improve their health after receiving a single medical nutrition therapy session when compared to a control group that did not receive the nutrition counseling (Gaetke et al., 2006). RDNs have the knowledge and skills to have an effect on all patients.
Primary Care Physicians

A PCP is most often the first line of contact with patients and takes a continuing responsibility for providing a patient care (American Academy of Family Physicians, n.d.). PCPs include family medicine doctors, internal medicine doctors, gynecologists/obstetricians, geriatricians, and pediatricians (American Academy of Family Physicians, n.d.). PCPs work in areas of health promotion and disease prevention; patient education and counseling; and managing acute and chronic diseases (American Academy of Family Physicians, n.d.)

Patients expect PCPs are to be a credible source of nutrition information, but there is much debate about the skills and time available to offer sound nutrition counseling to patients (Hiddink, Hautvast, van Woerkum, Fieren, & van 't Hof, 1997). A nationally representative survey sampled from the American Medical Association’s Masterfile was conducted to determine PCPs assessment, counseling, referral, and follow-up in regards to diet and physical activity. The survey response rate was 64.5% and less than 50% of the PCPs reported always discussing diet with patients (Smith et al., 2011). The survey also found that less than 10% of PCPs always refer patients for additional evaluation, regardless of chronic disease status (Smith et al., 2011). A majority of PCPs do not consistently discuss nutrition or offer dietary counseling to patients in need because of the perceived barriers of too little time and patient noncompliance (Galuska, Will, Serdula, & Ford, 1999; Pomeroy & Cant, 2010). In addition to lack of time and lack of patient compliance, PCPs also report lack of nutrition training and lack of confidence as barriers to offering nutrition education and counseling to patients (Helman, 1997).
Practicing physicians. The literature indicates a continuing trend of lack of nutrition knowledge among physicians. The trend appears to follow that the longer the physician has been out of medical school, the less nutrition knowledge he or she appears to have (Kushner, 1995). In 1977, practicing PCPs were surveyed with a nutrition-related questionnaire and the average test score was 65%, with scores being higher on basic nutrition questions and lower on nutrition in relation to diseases (Krause & Fox, 1977). In a 1989 survey, physicians scored an average of 69% on a different nutrition test, with some scoring as low as 46.8% (Mlodinow & Barrett-Connor, 1989). A survey given to family medicine residents across 56 different programs with questions on drug-nutrient interactions found that physicians were only correct 61% of the time, indicating a lack of knowledge in this critical area of nutrition (Lasswell et al., 1995). In addition to the barriers listed above, 67% of practicing physicians report lack of training in counseling skills, and 62% report nutrition knowledge deficits as major barriers to offering patients nutrition education and counseling (Kushner, 1995). A 2002 survey also found that only 22% of practicing physicians in Washington State feel they have adequate nutrition training (Mihalynuk, Scott, & Coombs, 2003). The lack of nutrition training directly affects the amount of PCPs who are offering nutrition education and counseling to patients.

Physicians-in-training. To the best of our knowledge, few studies have investigated the nutrition knowledge and attitudes of medical students or physicians in-training. In one study conducted with incoming and current medical interns from an allopathic program, the average score on a nutrition knowledge test is 66% indicating
major gaps in basic nutrition concepts (Vetter et al., 2008). In this study conducted by Vetter et al., the greatest areas of inadequate knowledge are nutrition assessment with obese patients, endocrine disease nutrition, and cardiovascular disease nutrition. In addition, 77% of participants agreed nutrition assessment should always be included in routine primary care visits, and 94% agreed it is their duty to discuss nutrition with patients, but only 14% reported adequate nutrition training (Vetter et al., 2008). Most also agreed that detailed advice on how to change dietary habits could help some patients, but 86% agreed that most physicians are not sufficiently trained to discuss nutrition and nutrition related issues with patients (Vetter et al., 2008). A survey conducted with allopathic medical students at Case Western Reserve University looked at where students choose to find nutrition information. The study found that 42% of medical students selected professional resources, 38% used consumer websites, and 20 percent reported using no nutrition resources (Connor et al., 2015). This is alarming in that many of the medical students who responded to this survey may be getting nutrition information from resources that are not reliable (Connor et al., 2015).

These studies demonstrate that PCPs and physicians in-training feel nutrition is important enough that they should discuss it with patients; however, most have low confidence in their ability to assess nutritional needs or discuss general nutrition guidelines.

Nutrition Education Recommendations in Medical Education Programs

Nutrition education reform began in medical schools after a survey in 1985 conducted by the National Academy of Science (NAS) found that nutrition education was
inadequate (Committee on Nutrition in Medical Education, 1985). The NAS was commissioned to evaluate the current state of nutrition training for future physicians by surveying 46 allopathic medical schools. They found that only 21 hr of nutrition instruction were required but only 27% of the surveyed schools had a separate nutrition course (Committee on Nutrition in Medical Education, 1985). The National Heart, Lung, and Blood Institute created a Nutrition Academic Award (NAA) in 1997 to help encourage nutrition education in medical schools; however, this has led to little increase (Pearson et al., 2001). The NAA is still currently offered to allopathic and osteopathic medical programs and provides medical schools with a grant to support the continued growth and enhancement of nutrition education for medical students, current residents, and practicing physicians (Pearson et al., 2001). A 2006 study that surveyed 106 allopathic medical schools found that 93% of the schools provide nutrition instruction, however the average number of nutrition instruction hours is only 23.9, and only 41% of the schools provide the minimum NAS recommended 25 hr or more (Adams et al., 2006). Though a small percentage of allopathic medical schools meet the nutrition education requirement, hours of nutrition instruction are also not always direct nutrition education.

Specifically in regards to osteopathic programs, a recent study looked at the current nutrition curriculum of 26 of the 31 accredited osteopathic medical schools. This study found that 8% do not require any nutrition education, and the overall average hours of required nutrition education is only 17.0 hr (Briggs Early, Adams, & Kohlmeier, 2015). However, the hours of nutrition instruction are not solely direct nutrition education. The greatest number of hours of nutrition education are taught as part of an
integrated course in conjunction with biochemistry, physiology, or other integrated courses (Briggs Early et al., 2015). These data exhibiting shortcomings in nutrition education at medical schools have large health ramifications in physicians not being adequately trained to counsel patients on nutrition.

**Allopathic vs. Osteopathic Medical Education Programs**

Allopathic and osteopathic medical programs are similar in that each produces physicians; however, the philosophies behind each program differ. Allopathic medicine is defined as medical practice that treats disease by use of medications that are thought capable of producing the same symptoms in healthy people as the disease itself (National Institutes of Health, n.d.). Osteopathic medicine is considered a more holistic system of health care and emphasizes patient-centered care with prevention of disease and maintaining good health (American Association of Colleges of Osteopathic Medicine, n.d.). The medical education received by an osteopathic physician and an allopathic physician is shown in Table 4 (American Association of Colleges of Osteopathic Medicine, n.d.).
Table 4

**Osteopathic vs. Allopathic Education**

<table>
<thead>
<tr>
<th></th>
<th>Osteopathic</th>
<th>Allopathic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philosophies</td>
<td>Holistic approach</td>
<td>Disease treatment through drug therapy</td>
</tr>
<tr>
<td></td>
<td>Manipulation techniques</td>
<td></td>
</tr>
<tr>
<td>Undergraduate degree</td>
<td>4 year degree with prerequisites</td>
<td>4 year degree with prerequisites</td>
</tr>
<tr>
<td>requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curricula</td>
<td>4 year medical science education</td>
<td>4 year medical science education</td>
</tr>
<tr>
<td></td>
<td>(2 years classroom</td>
<td>(2 years classroom</td>
</tr>
<tr>
<td></td>
<td>2 years clinical training)</td>
<td>2 years clinical training)</td>
</tr>
<tr>
<td></td>
<td>+ 200 hours training in Osteopathic Manipulative</td>
<td></td>
</tr>
<tr>
<td></td>
<td>medicine</td>
<td></td>
</tr>
<tr>
<td>Licensure exams</td>
<td>Comprehensive Osteopathic Medicine Licensing Exam</td>
<td>U.S. Medicine Licensing Exam</td>
</tr>
<tr>
<td>Credential</td>
<td>Doctor of Osteopathic Medicine (DO)</td>
<td>Doctor of Medicine (MD)</td>
</tr>
</tbody>
</table>


Allopathic and osteopathic medical programs are very similar and are becoming more similar. In fact, a single accreditation process is currently underway for both allopathic and osteopathic programs and will be fully implemented in July 2020 (OUHCOM, 2015). The greatest difference between osteopathic and allopathic programs is that osteopathic programs require additional hours of osteopathic manipulative medicine training. This osteopathic manipulative medicine training involves techniques to influence the body and alleviate pain, restore motion, and enhance function (American
Association of Colleges of Osteopathic Medicine, n.d.). However, despite an osteopathic physician’s emphasis on treating the whole person in a holistic manner, the education requirements only differ in offering osteopathic manipulative medicine, not in nutrition education.

**Ohio University Heritage College of Osteopathic Medicine**

Ohio University Heritage College of Osteopathic Medicine was established in 1975 to educate physicians committed to practice in Ohio, emphasizing training of primary care physicians (OUHCOM, 2015). The College now has three campuses in Ohio located in Athens, Cleveland, and Dublin and students are taught via an interactive video conferencing system (OUHCOM, 2015). Across the three campuses, a total of 611 students are currently enrolled in the medical school, with approximately 424 students in their first or second year (OUHCOM, 2015). The medical college offers an osteopathic program in which students are taught that a patient should be treated as a whole person and all body systems are integrated. This is done through approximately 200 hours of additional training in osteopathic manipulative medicine (OUHCOM, 2015).

To gain admission into the Heritage College of Osteopathic medicine, a student must show proficiency in many areas of science coursework, with no nutrition classes required (OUHCOM, 2015). During years one and two, the medical students take part in preclinical education, and during years three and four, students take part in clinical education (OUHCOM, 2015). Table 5 lists the curricula for the Ohio University Heritage College of Osteopathic Medicine preclinical education.
Table 5

*Ohio University Heritage College of Osteopathic Medicine Curricula*

<table>
<thead>
<tr>
<th>Year</th>
<th>Curricula</th>
</tr>
</thead>
</table>
| One  | Introduction to Primary Care Medicine  
Clinical Anatomy Immersion  
Medical Knowledge 1 (Musculoskeletal, Blood, and Infection & Immunity blocks)  
Clinical Skills 1-2  
Medical Knowledge 2 (Cardiovascular, Respiratory, Gastrointestinal, Urogenital blocks) |
| Two  | Osteopathic Manipulative Medicine Honors  
Medical Knowledge 3 (Neurology; Eyes, Ears, Nose, Throat; & Psychiatric blocks)  
Clinical Skills 3-4  
Medical Knowledge Spring (Evaluation & Management, Obstetrics/Gynecology, Pediatrics, Geriatrics, Addiction, Pain and Palliative Care blocks) |


The curricula at Ohio University Heritage College of Osteopathic Medicine is consistent with other osteopathic medical programs and is accredited by the Commission on Osteopathic College Accreditation of the American Osteopathic Association (OUHCOM, 2015). Additionally, approximately 48% of Ohio University Heritage College of Osteopathic Medicine graduates are practicing as PCPs, which is consistent with the strong heritage of osteopathic programs producing physicians who want to work in primary care settings (American Association of Colleges of Osteopathic Medicine; OUHCOM, 2015)
Summary

Nutrition is a component to all healthcare concerns, including many preventable chronic diseases. Preventable chronic disease accounts for an immense majority of healthcare costs in the United States. PCPs are the healthcare professionals who regularly see patients with chronic disease, yet they are inadequately trained to offer nutrition education and counseling. Medical schools, specifically osteopathic programs, are falling short in the number of recommended hours of nutrition education leading to poorly trained physicians, in regards to nutrition assessment, knowledge, and counseling of patients. Patients are not receiving enough nutrition education leading to a lack of prevention and management of non-communicable, chronic diseases. The purpose of this study is to better understand the current status of nutrition education in Ohio University Heritage College of Osteopathic Medicine in order to be able to design curriculums that provide adequate nutrition knowledge and nutrition counseling skills to help future practicing physician.
Chapter 3: Methodology

In this descriptive cross-sectional survey study, nutrition knowledge and education will be assessed among osteopathic medical students. Specifically, measured will be (a) nutrition knowledge; (b) attitudes and beliefs toward nutrition; and (c) nutrition counseling skills. The Ohio University’s Institutional Review Board approved the protocol and all recruitment procedures and materials.

Subjects

First and second year medical students enrolled at the Ohio University Heritage College of Osteopathic Medicine were invited to participate in a survey about knowledge, attitudes and beliefs about nutrition. Participation was voluntary. Inclusion criteria included all first and second year medical students enrolled in Ohio University’s Heritage College of Osteopathic Medicine at the Athens campus, Dublin campus, and Cleveland campus. Of the 424 students invited to participate, 257 students signed the consent form for a response rate of 60.6%. All 257 students who signed the consent form did not complete the survey in its entirety. Participants were invited to participate in the study via an email.

Instruments

Participants completed a short demographic form (see Appendix A) and open-ended short answer questions about perceived importance of nutrition in medical education and previous nutrition-related experiences (see Appendix B). In addition, participants completed the following measures (see Appendix C):
**Nutrition in Patient Care Survey.** For this study, questions were adapted from a 45-item scale measuring attitudes about nutrition in patient care (McGaghie et al., 2001). The scale contains five subscales: (a) nutrition in routine care (8 items); (b) clinical behavior (20 items); (c) physician–patient relationship (8 items); (d) patient behavior/motivation (3 items); and, (e) physician efficacy (6 items). Each subscale yields good internal consistency ($\alpha = 0.67$ to $0.82$) and stability (test–retest reliability $= 0.50$-0.81). Questions were selected from each category based on value added to this study. (Note: Results from this measure are not included in Chapter 4 and can be found in Appendix G.)

**Self-Reported Nutrition Proficiency Survey.** For this study, the survey was adapted from a 31-item survey measuring nutrition proficiency or perceived confidence using a Likert rating scale, where 5 indicates “Strongly Agree;” 3 indicates “uncertain;” and 1 indicates “Strongly Disagree” (Mihalynuk et al., 2003). The measure yields five subscales: (a) nutrition and prevention/wellness; (b) macronutrients in health, including food safety; (c) women, infants and children; (d) micronutrients in health, including herbal supplements; (e) nutrition and disease management. The measure demonstrates good reliability of the total survey ($\alpha = 0.916$) and individual factors ($\alpha = 0.678$ to $0.809$). Questions were selected from each subscale category based on value added to this study. (Note: Results from this measure are not included in Chapter 4 and can be found in Appendix G.)

**Nutrition knowledge quiz.** A 20-item multiple choice quiz was adapted from the 40-item multiple choice quiz measuring students’ nutrition knowledge (Vetter et al.,
Questions assessed general nutrition knowledge and specific nutrition interventions, including obesity, endocrine nutrition, and cardiovascular nutrition. This quiz is not validated, but was created using questions from a nutrition textbook. Quiz scores were calculated by summing the number of correct responses divided by total questions multiple by 100 to yield a percentage score.

**Data Collection**

Students completed the survey online via the online questionnaire service Qualtrics (Provo, UT: Qualtrics). Qualtrics permitted our research team to download participants’ survey responses into a spreadsheet without including identifying information (i.e., email address, name) to protect their confidentiality. Students were recruited via an email distribution list sent to first and second year medical students enrolled at the Ohio University Heritage College of Osteopathic Medicine. The email included a brief introduction to the study and a web link that directed them to the survey (see Appendix D). The survey link was distributed the first week of January 2016 and again as a reminder, the third week of January 2016. The students were only permitted to take the survey once.

All participants provided informed consent prior to participation. Consent occurred online. To consent, participants were asked to click a radio button indicating, "Yes, I consent to participate in this study. I may withdraw my participation at any time." In order to decline, participants clicked a radio button indicating, "I decline to participate." To avoid coercion, the online screen to the survey and the informed consent document both specify the voluntary nature of participation. Potential participants were
explicitly informed that their responses have no bearing on their standing as a medical student and that they can decline participation at any time during the process. No researchers were present when potential participants decided to participate or decline, and thus they may have felt less pressure than in a face-to-face consent process (see Appendix E). Participation in the study lasted approximately 30 min. This study currently has IRB approval (see Appendix F). After completing the survey, each participant was directed to an additional survey to be compensated with a $15.00 Amazon gift card.

Data Analysis

Basic sociodemographic characteristics of participants were assessed using descriptive statistics. Frequencies of individual question responses also were calculated. t-tests were used to examine differences for each survey question by grade level and gender. Statistical significance is defined as a p-value less than 0.05. All analyses were conducted with SPSS statistical software version 21.0 (Chicago, IL: SPSS Inc.).

The open-ended short answer questions were analyzed using standard qualitative techniques. Specifically, two experienced researchers (EH, EAB) performed content analysis (Krippendorf, 2004) by independently marking and categorizing key words, phrases, and texts to identify codes that describe how osteopathic medical students’ view nutrition education and the role of nutrition counseling in medicine. All short answer responses were coded and reviewed to establish intercoder reliability (Neuendorf, 2002). Qualitative counts were provided to group the findings.
Chapter 4: Osteopathic Medical Students’ Nutrition Knowledge

Abstract

**Background:** Nutrition is often overlooked in everyday healthcare despite the definitive connection between diet and health. Many practicing physicians and medical students feel unqualified to discuss specific dietary recommendations with patients, which may be attributed to inadequate nutrition education during medical school. The purpose of this study was to determine osteopathic medical students’ nutrition knowledge and skills in order to determine the need for incorporating these skills/knowledge into the curriculum, to help future practicing physicians. **Methods:** We employed a descriptive, cross-sectional study design to evaluate first and second year osteopathic medical students’ nutrition knowledge and attitude towards nutrition counseling. We developed a survey to assess participants’ perception and attitude towards nutrition in primary care and utilized a pre-existing nutrition knowledge quiz. **Results:** Two hundred and fifty-seven first and second year medical students (mean age = 24.8 ± 3.4 years, 53.0% female, and 79.0% white/Caucasian) completed the survey. The mean score on the nutrition knowledge quiz was 69.9% with a significant difference between first-and second-year

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1This chapter represents a prepublication manuscript. The format has been adapted slightly to conform to Ohio University’s thesis format. Authors are Emily J. Hargrove (School of Applied Health Sciences and Wellness, College of Health Sciences and Professions, Ohio University, Athens, OH), with Elizabeth A. Beverly (Department of Family Medicine, Heritage College of Osteopathic Medicine, Ohio University, Athens, OH), Darlene E. Berryman (Department of Biomedical Sciences, Heritage College of Osteopathic Medicine, Ohio University, Athens, OH), and Jennifer Yoder (Department of Applied Health Sciences and Wellness, Ohio University, Athens, OH).
students (66% vs. 74%, \( p < 0.001 \)). 59% \((n = 143)\) of students felt comfortable counseling patients on nutrition recommendations, but only 12% \((n = 213)\) are aware of the current Dietary Reference Intakes, which represent the most current scientific knowledge on nutrient needs of healthy individuals. Qualitatively, most students noted the importance of nutrition in medical school, particularly in providing patient education, overall health and wellness, and preventing and treating disease. **Conclusion:** Despite the perceived importance of nutrition education and comfort level with counseling patients, most students lacked nutrition knowledge and information about dietary guidelines. These findings provide empirical support for the integration of more nutrition education into medical school curricula.

**KEYWORDS:** Nutrition, Medical Education, Osteopathic Medicine

**Introduction**

The foundation for a health-promoting lifestyle is a balanced diet with a variety of nutrient-dense foods and beverages consumed in moderation along with ample physical activity (Academy of Nutrition and Dietetics, n.d.; Freeland-Graves, & Nitzke, 2013). Despite the importance of eating a well-balanced diet, most Americans are not eating a diet with sufficient or quality proportion of nutrients. Many are over-consuming total kilocalories, sugars, and fats, while under-consuming important vitamins and minerals. For example, the estimated proportion of adults in the US with a poor quality diet is 45.6%, and less than 10% of US adults are meeting the recommended consumption for fruits and vegetables (Rehm, Penalvo, Afshin, & Mozaffarian, 2016). These imbalances
are a major cause for concern because poor dietary habits can lead to overweight and obesity, and in turn, chronic disease or poor management of existing diseases.

Currently, more than 33% of adults in the United States are classified as obese, and obesity-related diseases and conditions (e.g., coronary artery disease, stroke, type 2 diabetes, some cancers) contribute between $147 and $210 billion in healthcare costs per year (Cawley & Meyerhoefer, 2012; Ogden, Carroll, Kit, & Flegal, 2014). These obesity-related diseases and conditions could be reduced and better managed with proper nutrition education, and healthcare providers, at all levels, provide an opportunity for this needed education. The member of the healthcare team most proficient in providing medical nutrition therapy or nutrition education and counseling is the Registered Dietitian (RD) or Registered Dietitian Nutrition (RDN) (Academy of Nutrition and Dietetics, n.d.). Ideally, a physician would refer patients in need of nutrition counseling to RDs/RDNs. However, most patients are not referred due to countless physician barriers, including time, lack of insurance coverage, finances, and confidence in a patient’s willingness to change behaviors (Pomeroy & Cant, 2010). For this reason, primary care physicians (PCPs) are often the sole source of nutrition education or nutrition counseling (Darer, Hwang, Pham, Bass, & Anderson, 2004). In fact, a specific goal of Healthy People 2020 is to increase the proportion of physician office visits that includes counseling or education related to nutrition or weight (Healthy People, 2015). While physicians are more knowledgeable in the treatment of disease, the literature shows that many practicing physicians as well as medical students feel ill-prepared to discuss specific dietary recommendations with patients (Anis et al., 2004; Connor, Cialdella-Kam, & Harris,
Physicians’ and medical students’ perceived lack of nutrition proficiency may be attributed to inadequate nutrition education during medical school. Prior research with allopathic medical students found that schools do not contain the recommended number of hours of nutrition education (Adams, Lindell, Kohlmeier, & Zeisel, 2006). However, to the best of our knowledge, osteopathic students have not been studied extensively with respect to nutrition. Research on osteopathic students is necessary because approximately 56% of osteopathic medical students become PCPs, compared to only 35% of allopathic medical students, meaning the importance of having nutrition education is vital in this trainee population since they will be the future caregivers most likely to provide nutrition advice (American Osteopathic Association, 2015). Therefore, the purpose of this study was to better understand the nutrition knowledge and attitudes toward nutrition counseling among medical students at a large midwestern osteopathic medical school.

**Methodology**

In this descriptive cross-sectional survey study, we assessed first- and second-year osteopathic medical students’ knowledge about nutrition and attitudes about nutrition counseling. The Ohio University Institutional Review Board approved the protocol and all recruitment procedures and materials.

**Participants.** We invited first- and second-year medical students enrolled at the main campus and two distance campuses of Ohio University Heritage College of Osteopathic Medicine to participate in an assessment of nutrition knowledge and attitudes
about nutrition counseling. We selected first- and second-year medical students because they are enrolled in the preclinical curriculum, consisting of medical knowledge and clinical skills. The medical knowledge courses are divided into blocks of curricular content (e.g., Gastrointestinal Block), further segmented into weekly modules identified by theme or clinical presentation (e.g., dysphagia). Students must earn a 72.5% or higher to pass each block. All participants provided informed consent prior to participation.

**Measures.** Participants completed a short demographic form as well as questions pertaining to their beliefs about PCPs’ role in nutrition counseling, awareness of Dietary Reference Intakes (DRIs), comfort level with nutrition counseling, and perceived importance of nutrition education in medical school. These questions were developed specifically for use in this study. Lastly, participants completed a nutrition knowledge quiz. The Nutrition Knowledge Quiz (Vetter et al., 2008) is a 20-item multiple choice quiz adapted from the 40-item multiple choice quiz created to measure medical interns’ nutrition knowledge. The quiz is not validated, but was created using questions from a reliable nutrition textbook. Questions assessed general nutrition knowledge and specific nutrition interventions, including obesity, endocrine nutrition, cardiovascular nutrition, and basic nutrient information.

**Data collection.** Participants completed the survey online without identifying information via the online questionnaire service Qualtrics (Provo, UT: Qualtrics). Qualtrics permitted the research team to download students’ survey responses into a spreadsheet without including identifying information (i.e., email address, name) to insure anonymity at the level of data. We recruited first and second year medical students
via an email that included a brief introduction to the study and a web link that directed them to the survey. Potential participants were invited to participate the first week of January 2016. A follow-up email was sent one week after the initial email was sent to remind participants about the study.

Consent occurred online. To consent, we asked participants to click a radio button indicating "Yes, I consent to participate in this study. I may withdraw my participation at any time." In order to decline, participants clicked a radio button indicating "I decline to participate." To avoid coercion, the online screen to the survey and the informed consent document both specified the voluntary nature of participation. The informed consent document explicitly informed potential participants that their responses had no bearing on academic performance and that they could decline participation at any time during the process. No researchers were present when potential participants decided to participate or decline, and thus they may have felt less pressure than in a face-to-face consent process. We directed participants with questions about the study to email or phone the research investigators. Completion of the survey took approximately 30 min. Participants received a gift card as compensation for participating in the study.

**Data analysis.** Basic sociodemographic characteristics of participants were assessed using descriptive statistics. Frequencies of individual question responses were also calculated. Nutrition quiz scores were calculated by summing the number of correct responses divided by total questions multiple by 100 to yield a percentage score. We used independent $t$-tests to examine differences in quiz scores by age, gender, and year in medical school. Statistical significance was defined as a $p$-value less than 0.05. All
analyses were conducted with SPSS statistical software version 21.0 (Chicago, IL: SPSS Inc.).

The open-ended short answer questions were analyzed using standard qualitative techniques. Specifically, two experienced researchers (EJH, EAB) performed content analysis (Krippendorff, 2004) by independently marking and categorizing key words, phrases, and texts to identify codes that described the perceived importance of nutrition education in medical school. All short answer responses were coded and reviewed to establish intercoder reliability (Neuendorf, 2002). Qualitative counts were then provided to group the findings.

**Results**

Of the approximately 424 students enrolled in school at a large midwestern osteopathic medical school with three campuses, 257 completed the survey for a response rate of 60.6% although not all students completed all questions. The mean age of the students was 24.8 ± 3.4 years, 53.0% \( n = 134 \) were women, 79% \( n = 197 \) were white/Caucasian, and 35% \( n = 88 \) grew up in a town (2,500-50,000 people). Over half (55%, \( n = 139 \)) of the participants were first year medical students, 70% \( n = 175 \) attended the main campus, and 43% \( n = 107 \) planned to pursue a career in primary care. Additional demographic data are presented in Table 6.
Table 6

Demographic Characteristics ($n = 253$)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Participants $n$ (%)</th>
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<tbody>
<tr>
<td>Age (years)</td>
<td>24.8 ± 3.4</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
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<tr>
<td>Female</td>
<td>134 (53)</td>
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<tr>
<td>Male</td>
<td>118 (47)</td>
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<td>Ethnicity</td>
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<td>White/Caucasian</td>
<td>197 (79)</td>
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<td>Black/African American</td>
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<td>Mixed</td>
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<td>Pacific Islander</td>
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<tr>
<td>Other</td>
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<tr>
<td>Community participant grew up in</td>
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<tr>
<td>Major metropolitan area (&gt;1 million)</td>
<td>15 (6)</td>
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<td>Metropolitan area (500,001-1 million)</td>
<td>27 (11)</td>
</tr>
<tr>
<td>City (100,001-500,000)</td>
<td>50 (20)</td>
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<td>Small city (50,001-100,000)</td>
<td>41 (16)</td>
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<td>Town (2,500-50,000)</td>
<td>88 (35)</td>
</tr>
<tr>
<td>Rural area (fewer than 2,500)</td>
<td>30 (12)</td>
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<tr>
<td>Year in medical school</td>
<td></td>
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<tr>
<td>First year</td>
<td>139 (55)</td>
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<td>Second year</td>
<td>112 (45)</td>
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<td>Campus of attendance</td>
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<td>Distant campus 2</td>
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<td>Planning on a career in primary care</td>
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<td>Yes</td>
<td>107 (43)</td>
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<tr>
<td>No</td>
<td>144 (57)</td>
</tr>
<tr>
<td>Previous nutrition course in undergraduate or graduate education</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>67 (28)</td>
</tr>
<tr>
<td>No</td>
<td>176 (72)</td>
</tr>
</tbody>
</table>
Fifty-four % ($n = 132$) of students stated they know the role of a registered dietitian, but qualitatively, they did not fully understand the RD’s role in the healthcare team and 71% ($n = 171$) thought that nutrition counseling and meal plans are the responsibility of the PCP. However, only 12% ($n = 30$) of participants were aware of the current Dietary Reference Intakes (DRI), which denote the most current scientific knowledge on healthy individual’s different nutrient needs. Moreover, 59% ($n = 143$) felt at least somewhat comfortable counseling patients on nutrition recommendations and 36% ($n = 86$) felt at least somewhat comfortable designing a nutrition plan for a patient to follow. Additionally, the average test score ($n = 234$) on the nutrition knowledge quiz was a 69.9%, and 55.6% ($n = 130$) of students had a score below the school’s passing rate of 72.5%. The distribution of scores is listed in Table 7. There was no significant difference in test scores between males vs. females (mean = 69% versus 70%; $p = 0.587$); however, second-year medical students performed better on the nutrition compared to first-year medical students (mean = 74% vs 66%; $p < 0.001$). Finally, the most frequently missed quiz questions were about weight loss, diabetes diets, and dietary steps to lower high blood pressure and cholesterol.
Table 7

*Student Scores on Nutrition Knowledge Quiz (n = 234)*

<table>
<thead>
<tr>
<th>Score distribution</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (range)</td>
<td>69.9 (15-100)</td>
</tr>
<tr>
<td>Distribution of scores</td>
<td></td>
</tr>
<tr>
<td>95% and above</td>
<td>5 (2.1)</td>
</tr>
<tr>
<td>85-94%</td>
<td>26 (11.1)</td>
</tr>
<tr>
<td>75-84%</td>
<td>73 (31.2)</td>
</tr>
<tr>
<td>65-74%</td>
<td>66 (28.2)</td>
</tr>
<tr>
<td>55-64%</td>
<td>50 (21.4)</td>
</tr>
<tr>
<td>Below 55%</td>
<td>14 (6.0)</td>
</tr>
</tbody>
</table>

A majority of medical students noted the importance of nutrition in overall health and quality of life, and 68% (n = 166) rated nutrition as very important in medical school. Qualitatively, most students reported the value of nutrition education in medical school for providing patient education and treating disease. The categories for osteopathic student’s perceived importance of nutrition were for patient education (24), overall health and wellness (29), prevention (30), and disease management/treatment (18). Table 8 represents relative quotations for the question: “How important is nutrition education in medical school? Please explain.”
### Table 8

**Osteopathic Medical Students Perceived Importance of Nutrition (n = 101)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Representative quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient education</td>
<td>“As a physician, you are the person that people will go to for information on nutrition first. The likelihood that a person will see a nutritionist before asking their primary care doctor questions is minimal. It is important that the physician knows what they are talking about and can provide help.”</td>
</tr>
<tr>
<td></td>
<td>“I think it’s important to be taught and learn what we’ll eventually have to talk to patients about in practice. Dietary modifications to benefit the health of our patients will inevitably come up, so we need to be trained on what advice to provide. It won’t be enough to just tell patients to “eat healthy”; we’ll be expected to provide examples and direct our patients to more appropriate foods with their health in mind, so we should be trained to do so.”</td>
</tr>
<tr>
<td>Overall health and wellness</td>
<td>“It is the basis of our osteopathic education to get the body in the most prime shape to fix/preserve itself and nutrition is a large part of that.”</td>
</tr>
<tr>
<td></td>
<td>“I think that nutrition is extremely important because everyone needs to eat. This is something that everyone can relate to, and with the growing obesity epidemic, it is imperative that we make resources more accessible and transparent. Proper nutrition follows the path toward greater overall health. As primary care physicians we are the patient’s first point of access and must be able and will to provide education or resources pertaining to nutrition.”</td>
</tr>
<tr>
<td>Prevention</td>
<td>“Preventative medicine is as important as therapeutic medicine.”</td>
</tr>
<tr>
<td></td>
<td>“In my personal opinion, I think nutrition education needs to be much more valued in medical school because where our country is in terms of morbidity and mortality, it comes down to chronic disease conditions that can be prevented with lifestyle. Unfortunately, I don't think prevention is as important as treating symptoms in the eyes of the medical schools….”</td>
</tr>
</tbody>
</table>
Table 8: continued

<table>
<thead>
<tr>
<th>Disease management/treatment</th>
<th>“Chronic illnesses cannot be treated with medication alone, what you put in your body is just as important.”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“Nutrition is the most basic form of medical therapy. Improper nutrition accounts for many of the preventable disease we will encounter regularly in our practice.”</td>
</tr>
</tbody>
</table>

*Note. Participants who completed the short answer question did not differ by age, gender, race, community, or year in medical school compared to participants who did not complete the question.*

**Discussion**

Findings from this descriptive cross-sectional survey study on preclinical medical students’ nutrition knowledge and attitudes about nutrition counseling found that the majority recognizes the importance of nutrition education. Qualitatively, most students valued nutrition education in medical school, particularly for providing patient education, promoting overall health and wellness, and preventing and treating disease. Further, the majority of students reported feeling “very or somewhat comfortable” in counseling patients on nutrition recommendations. Despite the perceived importance of nutrition education and comfort level with counseling patients, most students lacked nutrition knowledge (55.6% did not pass the quiz) and information about DRIs (88% did not know DRIs). This suggests that students lack basic nutrition knowledge and sufficient awareness of nutrition guidelines.

Nutrition education in medical school is vital because PCPs are the first line of contact with patients and provide continuing patient care (American Academy of Family Physicians, n.d.). This study revealed that participants know about RDs, but do not fully appreciate how to utilize them as part of their healthcare team. A majority of patients will
never see a RD/RDN so they expect their PCP to be the source of credible nutrition information. However, a survey conducted in 2011 found that less than 50% of PCPs surveyed reported always discussing diet with patients (Smith et al., 2011). A separate study found that a majority of PCPs thought nutrition should be a part of every primary care visit; however, they reported not having adequate nutrition training to do so (Vetter et al., 2008). Adequate nutrition training is especially important in osteopathic medical programs because a majority of graduates from osteopathic programs become practicing PCPs (American Association of Colleges of Osteopathic Medicine, n.d.).

This study builds upon previous work and confirms findings from allopathic medical schools showing that nutrition education is lacking. In a 2008 study conducted with incoming and current medical interns, the average score on a nutrition knowledge quiz is a 66%, indicating major gaps in basic nutrition concepts (Vetter et al., 2008). In our study, the level of knowledge reflected by respondents in response to several questions did not adhere to the expectations set by Osteopathic Medicine guidelines. Specifically, nonmedication methods should be considered first when treating conditions such as hypertension and high cholesterol, but the medical students did not know the dietary approaches for managing these conditions (American Osteopathic Association, n.d.). In our study, as expected, second-year students performed significantly better on the nutrition quiz compared to first-year students. Second-year students have an additional year of education and training in medical knowledge, which most likely improved their quiz score. Additionally, our study is in accord with a study that surveyed primary care residents on their preparedness to provide obesity and nutrition counseling.
The study by Smith et al. (2015) concluded that primary care residents have room for improvement in regards to assessment and management methods for obesity and nutrition. However, unlike other studies, our study showed that the majority of students feel comfortable offering nutrition counseling despite their lack of nutrition knowledge. Prior research identified insufficient training and lack of counseling skills as barriers to providing nutrition education and counseling to patients (Kushner, 1995; Vetter et al., 2008). For our study, students’ confidence to discuss general nutrition guidelines without knowledge of those guidelines is disconcerting.

Many studies have examined the amount and quality of nutrition education in medical education programs. A survey conducted in 1985 by the National Academy of Science (NAS) found that nutrition education was inadequate in allopathic medical schools, so the NAS recommended a minimum of 25 hr of nutrition instruction (Committee on Nutrition in Medical Education, 1985). However, a study conducted in 2006 shows that the average number of nutrition instruction hours falls below the recommended 25 hr and is often a part of another course (Adams et al, 2006). Specifically in regards to osteopathic programs, a recent study indicates that the average hours of required nutrition education is only 17.0 hr and that the nutrition instruction is often a part of an integrated course and not direct nutrition education (Briggs Early, Adams, & Kohlmeier, 2015). Furthermore, a study assessing the current state of graduate nutrition training in residency programs illustrates that only 26.4% have a formal nutrition course and 13.9% report no form of nutrition training whatsoever (Daley et al., 2015). Further, the format of nutrition education varies significantly from a single 45 min
lecture to multiple 1 hr sessions and can include lectures, informal rounds, conferences, and web-based learning programs (Daley et al., 2015). These studies show multiple shortcomings in nutrition education at medical schools, which can have large health ramifications if physicians are not adequately trained to educate and counsel patients on nutrition. The qualitative responses from participants in this study demonstrate that students understand the vast importance of having nutrition education in medical school in regards to patient care, but the training and education is still missing.

To encourage nutrition education in medical schools, the National Heart, Lung, and Blood Institute created a Nutrition Academic Award (NAA) with a grant to support the growth and enhancement of nutrition education for medical students, residents, and practicing physicians (Pearson et al., 2001). However, the creation of the NAA has had little impact on increasing nutrition education in medical schools (Pearson et al., 2001). Of the 141 accredited allopathic medical schools and 31 accredited osteopathic medical schools, only 21 medical schools have been awarded the NAA (National Heart, Lung, and Blood Institute, 2014). Another suggestion for improving nutrition education in medical school is to require students to shadow a RD/RDN to better understand their role in the healthcare team. Over half of the participants in this study agree to knowing what a RD/RDN is, but they did not understand their value in regards to overall patient care. Finally, at least one nutrition lecture should be included in each medical education block because every organ system benefits from proper nutrition and every disease associated with the organ system has specific dietary needs.
Limitations

Study limitations include homogeneity of the study sample from one osteopathic medical school with three campuses in a midwestern state, the cross-sectional study design, and participants’ self-reported data. The relatively small, homogenous study sample limits the ability to generalize the findings to all U.S. osteopathic medical schools. However, it should be noted that the three campuses for this single medical school reside in very different geographical regions across the state. Further, only students who were enrolled in preclinical education (year 1 and year 2) were included in the study; medical students in clinical education (year 3 and year 4) did not have the opportunity to participate. We chose to exclude third- and fourth-year students because clinical exposure to nutrition education varies by rotation site. Future research should assess third- and fourth-year students clinical exposure to nutrition education during rotations. Moreover, only 59.6% of the first- and second-year medical students enrolled at the university completed the survey. The participating students who volunteered may have been more willing or motivated to answer questions regarding nutrition compared to the students who did not participate. Therefore, the self-reported findings are susceptible to selection bias. Future research with a larger, more heterogeneous sample should involve medical students enrolled in clinical education, as well as students from multiple osteopathic medical schools. Further, longitudinal assessment by year of medical school is needed to see if nutrition knowledge and attitudes change between preclinical and clinical years.
Conclusion

This study represents one of the first assessments of preclinical osteopathic medical students’ nutrition knowledge and attitudes about nutrition counseling. To address the growing rate of obesity and obesity-related chronic diseases in the United States, improved nutrition education in medical schools is necessary. The findings from this study indicate that osteopathic medical students do not know enough about nutrition to be able to provide basic nutrition education to patients. This is especially important in osteopathic medical programs because they produce the most PCPs, with 56% of all practicing Doctors of Osteopathic Medicine working in primary care (American Osteopathic Association, 2015). The NAS recommends a minimum of 25 hr of nutrition education, but this guideline is not being met at most medical schools. There needs to be a set of nutrition-related competencies that must be met by all osteopathic medical schools with their curriculum. Furthermore, adding nutrition-related questions on the board certification exam would ensure that students value the content. Although PCPs will never have the nutrition training that RD/RDNs have, PCPs have the opportunity to offer basic nutrition education to a large number of patients. They need the foundation and tools to achieve this goal.

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http://dx.doi.org/doi:10.1155/2015/181502

http://dx.doi.org/10.1177/0148607115571155


http://dx.doi.org/10.1016/j.jand.2012.12.013


Chapter 5: Conclusion

Main Findings of Research

The main finding of this research study is that nutrition knowledge is lacking at the Ohio University Heritage College of Osteopathic Medicine. Future physicians need to have knowledge on basic nutrition concepts. The literature shows that physicians, especially PCPs, are often seen as the expert professionals for patients seeking all health-related information. To be able to best educate patients about nutrition, physicians need to have access to that knowledge in medical school. This finding implies that the curriculum needs to be adjusted to include more nutrition education. With the current curriculum, students are ill equipped to provide nutrition education and counseling to patients after their preclinical years.

Another major finding from this study is that the majority of students feel comfortable counseling patients on nutrition information. This self-reported comfort level with an inadequate knowledge base is alarming. A final major finding is that the students do not fully understand the role of the RD/RDN. PCPs will never have the same level of nutrition education and training as RDs/RDNs, so knowing what RDs/RDNs can do and how to utilize them in the healthcare team is critical. The implication is that more nutrition education is needed throughout medical school and more interprofessional experience is key.

Limitations and Future Research

Future research is needed to expand upon this study. First and foremost, more osteopathic schools should be included in the study. One of the major limitations of this
study is the homogeneity of the sample size. By surveying more osteopathic schools, the results would be more generalizable and we would have a greater understanding of nutrition knowledge and attitudes among the majority of osteopathic medical schools. For example, the study only captured the nutrition knowledge and attitudes of Ohio University’s Heritage College of Osteopathic Medicine. This osteopathic school could be very unlike other osteopathic schools and offer more or less nutrition instruction to preclinical students. Additionally, including more osteopathic schools would provide a much larger sample size and statistics could be further subdivided (e.g., analyzed based on undergraduate major or previous life experiences with a RD). For example, it would have been ideal to compare students who majored in nutrition for their undergraduate degree versus those who did not. However, the sample size of students who majored in nutrition was way too small to be comparable to those who did not. Of the participants, only two students stated an undergraduate major of nutrition, whereas the majority of students majored in the sciences, including biology, chemistry, or biochemistry. If the sample sizes and subsample were larger, a comparison could be made between those who majored in nutrition and those who did not.

Another interesting addition to the research study would be to objectively assess the medical school lectures for each block. This would allow the research team to see what type of information is being counted as “nutrition instruction.” It could also provide opportunities to determine how and where more nutrition instruction would fit into the curriculum.
In addition to including more osteopathic schools and objectively assessing lectures, including students who are in the clinical years would offer a unique aspect to the study. It would be interesting to determine if nutrition knowledge and attitudes change with clinical exposure. It would also be informative to include questions regarding nutrition exposure, such as how often and what type of nutrition education or counseling the participant has offered to patients. Interprofessional education is increasing, but currently there is no collaboration between the American Association of Colleges of Osteopathic Medicine and the Academy of Nutrition and Dietetics (Interprofessional Professionalism Collaborative, 2016). All members of the healthcare team are vital and interprofessional education needs to include nutrition. Finally, no healthcare professional will have the nutrition education and training that the RD/RDN has, so promoting interprofessional exchange is key. A patient is best cared for when the healthcare team understands the role of each member, in order to do this, education is necessary.

There are many ways to improve upon this study. I feel the data we have gathered from the initial survey responses are a great starting point, but there is so much more to learn on this topic. I hope to expand upon this study in the future and offer a needed change to nutrition education in medical school curricula.
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Appendix A: Demographic Questionnaire

Demographic Questions

Gender: M F Other Prefer not to answer

How old are you: __________

Do you consider yourself to be Hispanic or Latino? Yes No

What do you consider to be your race:

Asian
American Indian
Pacific Islander
Black/African American
White/Caucasian
Mixed
Other: ______________________

In which of the following communities did you grow up:

Major Metropolitan Area (over a million people)
Metropolitan Area (500,001-1,000,000 people)
City (100,001-500,000 people)
Small City (50,001-100,000 people)
Town (2,500-50,000 people)
Rural Area (fewer than 2500 people)

Are you married? Yes No

What year in medical school are you? 1 2 3 4

Which campus do you attend? Athens Dublin
Cleveland

Do you plan on pursuing a medical career in primary care? Yes No

What specialty do you plan to pursue after medical school?

Anesthesiology
Cardiology
Critical Care Surgery
Dermatology
Diagnostic Radiology
Emergency Medicine
Family Medicine
General Surgery
Geriatics
Internal Medicine
Nephrology
Neuromuscular Medicine/OMT
Neurological Surgery
Neurology
Obstetrics & Gynecology
Oncology
Orthopedic Surgery
Ophthalmology
Otolaryngology
Facial Plastics
Pathology
Pediatrics
Physical Medicine & Rehabilitation
Proctology
Psychiatry
Public Health & Preventative Medicine
Radiology
Sports Medicine
Other (Please specify) _________________________________

What was your undergraduate major? _________________________________

Have you completed any graduate degrees? Yes No

If yes, please indicate what degree(s) you have received:
________________________

What was your graduate degree major(s):
________________________

What is your height? _________________

What is your current weight? _____________________

What is your usual fruit and vegetable intake per day?
What is your current physical activity level? (Based on minimum of 30 minutes each time)

<table>
<thead>
<tr>
<th>No exercise</th>
<th>1-3 times per week</th>
<th>3-5 times per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-7 times per week</td>
<td>Greater than 7 times per week</td>
<td></td>
</tr>
</tbody>
</table>

Do you follow a special diet (vegetarian, vegan, gluten free)? Yes  No

If yes, specify ____________________

Have you ever participated in the CHIP program? Yes  No

N/A
Appendix B: Previous Knowledge Questionnaire

In your undergraduate and/or graduate education, have you ever taken a nutrition course(s)?

Yes  No

If yes, please describe the nutrition course(s):

_____________________________________________________________________
_____________________________________________________________________

Have you ever met with a registered dietitian as part of your healthcare? Yes  No

If yes, please explain the nature of your visit:

_____________________________________________________________________
_____________________________________________________________________

Have you ever shadowed a registered dietitian as part of your medical training? Yes  No

If yes, please describe your experience:

_____________________________________________________________________
_____________________________________________________________________

While on a Clinical and Community Experiences (CCE), have any of your preceptors provided nutritional counseling to their patients? Yes  No

If yes, please describe how they provided nutrition counseling:

_____________________________________________________________________
_____________________________________________________________________

In your osteopathic medical education, have you received any training (clinical or medical knowledge) on nutrition? Yes  No

If yes, please describe the nutrition training:

_____________________________________________________________________
_____________________________________________________________________

How important is nutrition education in medical school?

Very important
Somewhat important
Not very important
It does not matter
Please explain:

____________________________________________

____________________________

___

_________

____________________________________________________________

Do you know the role of a registered dietitian?    Yes    No

If yes, please explain

____________________________________________________________

As an osteopathic medical student, do you believe it is more important to learn about nutrition compared to students in a doctor of medicine program?

Yes, nutrition education is more important in DO education
No, nutrition education is equally important in DO and MD education
No, nutrition education is more important in doctor of medicine (MD) education
No, nutrition education is not important in DO or MD education

Are you aware of the current Dietary Reference Intake nutrition guidelines?  Yes  No

If you were in clinical practice today, how comfortable do you feel counseling patients on nutrition recommendations?

Very comfortable
Somewhat comfortable
Not too comfortable
Not at all comfortable

If you were in clinical practice today, how comfortable do you feel designing a nutrition plan for a patient?

Very comfortable
Somewhat comfortable
Not too comfortable
Not at all comfortable

In your opinion, how much time is necessary to counsel a patient on nutrition in order to bring about lifestyle change? (minutes)

Do you feel nutrition counseling and meal plans are the responsibility of a primary care physician?  Yes  No

Where do you get your nutrition information? (Please check all that apply)
Healthcare provider, please specify:
Scientific journals
Medical school lectures
Clinical and Community Experiences (CCE)
Magazines
TV
Radio
Social media, please specify:
Family members
Friends
Other, please specify:

Do you or any close family members have any medical problems that require greater than average attention to nutrition (i.e. Diabetes, IBS, etc).

Yes
No
If yes, please specify: ________________________________
Appendix C: Nutrition Attitudes Questionnaire and Nutrition Quiz

Please indicate response to the following questions using the scale below:

1- Strongly disagree
2- Disagree
3- Uncertain
4- Agree
5- Strongly agree

1. A change towards a healthier lifestyle is important in any stage of life. 1 2
   3 4 5

2. Nutrition assessment and counseling should be included in any routine appointment, just like diagnosis and treatment. 1 2
   3 4 5

3. I have an obligation to improve the health of my patients including discussing nutrition with them. 1 2
   3 4 5

4. All physicians, regardless of specialty, should counsel high-risk patients about dietary change. 1 2
   3 4 5

5. Most obese patients want to lose weight but feel frustrated and confused about how to do it. 1 2
   3 4 5

6. Nutrition counseling should be part of routine care by all physicians regardless of specialty. 1 2
   3 4 5

7. Most physicians are NOT adequately trained to discuss nutrition issues with patients. 1 2
   3 4 5

8. Specific advice about how to make dietary changes could help some patients improve their eating habits. 1 2
   3 4 5

9. After receiving nutrition counseling, patients with poor eating habits will make major changes in their eating behavior. 1 2
   3 4 5

10. Patients need ongoing counseling following my initial instruction to maintain behavior changes consistent with a healthier diet. 1 2
    3 4 5

11. Patients will only change their eating patterns if faced with a significant health problem. 1 2
    3 4 5

12. Most patients will try to change their lifestyle if I advise them to. 1 2
    3 4 5

13. Physicians can have an effect on a patient’s dietary behavior if they
take the time to discuss the problem.

14. Patient motivation is essential to achieving dietary change

15. My patient education efforts will be effective in increasing patients’ compliance with nutrition recommendations.

16. Nutrition counseling is NOT an effective use of my time.

17. Individual physicians can have little impact on a patient’s ability to lose weight.

18. It is NOT worth my time to counsel patients with poor dietary patterns about nutrition.

19. For most patients, health education does little to promote adherence to a healthy lifestyle.

20. Preventative health care is boring.

21. Patients are not motivated to change unless they are sick.

22. After receiving nutrition counseling, patients with poor eating patterns will make moderate changes in their eating behavior.

23. I feel comfortable with my ability to discuss strategies for osteoporosis prevention and treatment, including nutrition and lifestyle.

24. I feel comfortable providing nutrition education for a patient recently diagnosed with HIV.

25. I feel comfortable in assessing the total calories and saturated fat per portion of food by using the food label.

26. I know how many calories are in a gram of fat, protein, and carbohydrate and their basic metabolic roles.

27. I feel comfortable assessing fluid needs based on activity level and health.

28. I know how to calculate BMI and waist-to-hip ratio based on gender.

29. I am knowledgeable about indications for use of single vitamins or
multivitamin supplements.

345

30. I am knowledgeable about the role of omega-3 and omega-6 acids in heart health.

345

31. I am knowledgeable about nutrition concerns of patients with GI intolerances, maldigestion or malabsorption.

345

32. I am knowledgeable about the reported health risks of high protein/high fat diets.

345

33. I am knowledgeable about the roles of genetics, diet, and pharmacology.

345

34. I am comfortable providing examples of serving sizes of meat or dairy

345

35. I am knowledgeable about the role of food constituents in health (phytonutrients, dietary fiber, soy, etc).

345

36. I am knowledgeable about the potentially harmful interactions of medications with herbal supplements.

345

37. I am knowledgeable about the definition of moderate alcohol consumption and its role and health and disease.

345

38. I am comfortable providing nutrition strategies for patients losing weight due to chronic illnesses.

345

39. I am knowledgeable about recognizing warning signs and symptoms of patients with eating disorders.

345

40. I am knowledgeable about indications for enteral and parental nutrition.

345

41. I am knowledgeable about the role of dietary cholesterol, saturated fat, and trans fat in elevating blood lipids.

345

42. I am comfortable recommending dietary patterns for patients with non-insulin dependent (Type 2) diabetes.

345

43. I am comfortable with recognizing nutrition risk in elderly patients.

345
It is important that I: circle

Yes or No

44. Address the importance of diet whenever I care for a patient
   Yes   No

45. Assess each patient’s intake of vitamin, mineral, and dietary supplements
   Yes   No

46. Counsel patients regarding their use of supplements
   Yes   No

47. Whenever possible, recommend dietary changes prior to initiating drug therapy
   Yes   No

48. Assess each patient’s fat, fiber, and fruit/vegetable intake as a preventive strategy
   Yes   No

49. Encourage patients to ask diet-related questions and refer them for additional assistance when warranted.
   Yes   No

50. Identify risk factors in patients by assessing diet and energy balance
   Yes   No

51. Request that patients bring a food record or perform another dietary assessment measure when they come in for routine visits.
   Yes   No

52. Perform at least some level of nutrition assessment with every patient
   Yes   No

53. Refer patients with diet-related problems to registered dietitians or other qualified nutrition staff.
   Yes   No

54. Evaluate patients’ alcohol intake as part of their overall nutrition status
   Yes   No

55. Assess each patient’s stage of change prior to initiating dietary intervention
   Yes   No

56. Assess dietary sodium, potassium, and calcium intake especially among patients for high risk of hypertension, osteoporosis, and stroke
   Yes   No

57. Refer patients with diabetes for detailed dietary counseling
   Yes   No

58. Advocate diet and activity balance to promote weight control
   Yes   No

59. Assess my patient’s ability to read a food label
   Yes   No

60. Advocate a diet for weight control
   Yes   No
Nutrition Quiz
Select the best answer

61. Sara is a 50-year-old woman who wants to reduce her caloric intake enough to lose 1 pound per week. By how many calories must she reduce her intake each day to achieve her goal?
   a. 500 calories
   b. 1000 calories
   c. 250 calories
   d. 2000 calories

62. The Body Mass Index (BMI) is a useful clinical tool for diagnosing obesity. At what BMI level can the diagnosis of obesity be made?
   a. BMI $\geq$ 18
   b. BMI $\geq$ 23
   c. BMI $\geq$ 30
   d. None of the above

63. Energy is provided by the oxidation of dietary protein, fat, carbohydrate, and alcohol. How many calories are in a gram of protein?
   a. 9 calories
   b. 3 calories
   c. 4 calories
   d. 7 calories

64. Metabolism of 150g carbohydrate, 20g fat, and 20g protein yields approximately how many kilocalories?
   a. 300 kcals
   b. 550 kcals
   c. 820 kcals
   d. 1000 kcals

65. Which of the following medical conditions are associated with obesity?
   a. Diabetes
   b. Cardiovascular disease
   c. Osteoporosis
   d. All of the above

66. Amanda is a 54-year-old postmenopausal woman who wants to lose weight. She is 5’6” and weighs 190 lbs. What is her BMI?
   a. 19
   b. 24
   c. 31
   d. 36
67. What is the major reason why an individual will lose weight on a high fat/protein and low carbohydrate diet?
   a. Carbohydrates stimulate appetite
   b. Ketosis allows for the breakdown of fatty tissue
   c. Protein and fat increase metabolic rate
   d. Calorie deficit

68. JD is a 54-year-old man who recently underwent cardiac bypass surgery. He comes to the preventive cardiology clinic for an evaluation. What percent of his total calories should be coming from saturated fat?
   a. <7%
   b. 8-10%
   c. 15%
   d. <30%

69. RJ is a 50-year-old woman with one risk factor for heart disease. At what LDL cholesterol level should dietary therapy be initiated?
   a. 100 mg/dL
   b. 130 mg/dL
   c. 160 mg/dL
   d. 200 mg/dL

70. What dietary factor is most responsible for raising serum cholesterol levels?
   a. Dietary cholesterol
   b. Unsaturated fat
   c. Saturated fat
   d. Simple sugars

71. The Dietary Approaches to Stop Hypertension (DASH) diet has been clinically shown to reduce blood pressure levels in moderately hypertensive patients. Which of the following medical nutrition therapies are recommended to reduce hypertension?
   a. Reduce dietary sodium intake
   b. Increase dietary potassium and calcium intake
   c. Moderate alcohol intake
   d. All of the above

72. All of the following are major sources of monounsaturated fats EXCEPT:
   a. Olives
   b. Tomatoes
   c. Nuts
   d. Avocados

73. Which of the following disease may contribute to the development of hypertension?
a. Hepatic steatosis  
b. Acute pancreatitis  
c. Obesity  
d. None of the above  

74. Susan is a 31-year-old woman who reports gastroesophageal reflux that occurs most often when she is sleeping. All of the following recommendations may help alleviate this condition EXCEPT:  
a. Reducing alcohol and caffeine consumption  
b. Slightly elevating the head when sleeping  
c. Increasing consumption of fatty acids  
d. Waiting at least 2 hours after eating to lie down  

75. Which of the following foods would be considered a good source of insoluble fiber?  
a. White bread  
b. Mashed potatoes  
c. Raisin bran  
d. Watermelon  

76. Individuals with celiac disease are advised to avoid foods containing rye, wheat, and barley because they are especially sensitive to which of the following proteins?  
a. Albumin  
b. Gluten  
c. Soy protein  
d. Casein  

77. One serving of carbohydrates is equivalent to how many grams of carbohydrates?  
a. 5g  
b. 10g  
c. 15g  
d. 20g  

78. Individuals who are at increased risk for insulin resistance include which of the following?  
a. Patients with a history of hypercholesterolemia  
b. Patients with a “pear-shaped” body  
c. Patients with a first-degree relative with type 2 diabetes  
d. Patients with a first-degree relative with hypertension  

79. Medical nutrition therapy for patients with obstructive sleep apnea syndrome should focus on which of the following?  
a. Weight reduction  
b. Protein repletion  
c. Vitamin and mineral deficiencies
d. Fluid repletion

80. The medical nutrition therapy approach that is selected for the patient should be done on the basis of
a. Educational status
b. Motivation level
c. Applicability to patient’s lifestyle
d. All of the above
Appendix D: Sample Email

Dear Student:

Emily Hargrove, Elizabeth A. Beverly, PhD and Darlene Berryman, PhD are studying osteopathic medical students’ knowledge and attitudes about nutrition in medical practice, trigger warnings, and distance learning. We invite you to participate in a 30-minute survey about your knowledge, beliefs and attitudes about nutrition in medical practice, trigger warnings, and distance learning.

You are eligible to participate if you are a medical student at Ohio University Heritage College of Medicine.

Here is a link to the survey:
[sample: www.qualtrics.com]

This link will direct you to information about the study and what it means to consent to participate. This link is uniquely tied to this survey and your email address. Please do not forward this message.

Thanks for your participation!

Sincerely,

Emily Hargrove, Elizabeth A. Beverly, PhD and Darlene Berryman, PhD
Appendix E: Informed Consent Form

Ohio University Adult Consent Form with Signature

Ohio University Consent Form

Title of Research: Nutrition, trigger warnings, and distance learning among osteopathic medical students

Researchers: Emily Hargrove, BSH, Elizabeth A. Beverly, PhD, Darlene Berryman, PhD

You are being asked to participate in research. For you to be able to decide whether you want to participate in this project, you should understand what the project is about, as well as the possible risks and benefits in order to make an informed decision. This process is known as informed consent. This form describes the purpose, procedures, possible benefits, and risks. It also explains how your personal information will be used and protected. Once you have read this form and your questions about the study are answered, you will be able to consent or decline to participate. You should copy and print this consent form from your browser, or you can email Julie Creech (jc637913@ohio.edu) or Dr. Beverly (beverle1@ohio.edu) for a PDF copy. If you have any questions about this research, please contact Dr. Beverly at (740) 593-4616.

Explanation of Study

This study is being done because we want to better understand osteopathic medical student’s knowledge and attitudes about nutrition in medical practice. In addition, we are interested in your thoughts about trigger warnings and experience with distance learning.

If you agree to participate, you will be asked complete a short survey about nutrition and a brief demographic form. The survey items pertain to your knowledge and beliefs about nutrition in medical practice, thoughts on trigger warnings, and experience with distance learning.

These are surveys, not tests. There are no "right" or "wrong" responses to these items. None of the information you provide will be used to evaluate your performance at Ohio University in any way.

Your participation in this online study will last no more 30 minutes.

Risks and Discomforts

No risks or discomforts are anticipated from participation in this research. Neither your choice of whether to participate, nor how you might respond to the surveys, will have any bearing whatsoever on your standing or privileges at Ohio
University. This is research, NOT a test or an evaluation of you. The questionnaires in this study are not diagnostic; they do not have score ranges that create any labels, positive or negative, for any individual. You may decline to participate at any time in the process without explanation.

Benefits

This study is important to society because the information and insights derived from this study may lead to an improvement in medical school curriculum.

You will not receive any direct personal benefit by participating in this study.

Confidentiality and Records

Your participation in this study is anonymous. Your study information will be kept anonymous by 1) not collecting identifying information (i.e., your name, your email address); 2) creating an arbitrary “participant number” to use as an identifier; 3) only using the arbitrary “participant number” during data entry and statistical analysis, and 4) only presenting aggregate/summarized data, not individual data, in any presentations or published research reports based on this study.

Additionally, while every effort will be made to keep your study-related information confidential, there may be circumstances where this information must be shared with the representatives of the Ohio University Institutional Review Board as part of their responsibility to oversee research.

Compensation

As compensation for your time/effort, you will receive a $15.00 gift card. If you would like receive the gift card, please click on the link at the end of the survey. This link will take you to a new Qualtrics survey. Here you can provide your name and email address. We have taken this extra step so that your survey responses are not linked to your identity. When the study is completed, we will contact you via email with your gift card. You will then need to provide your name and address in order for the study team to keep track of the compensation that was provided for the Ohio University Finance division’s records. You can return the signed “Receipt of Compensation” via email, campus mail, or in-person.

Contact Information
If you have any questions regarding this study, please contact Emily Hargrove at Eh547709@ohio.edu or 740-243-0710, Dr. Elizabeth Beverly at beverle1@ohio.edu or 740-593-4616 and Dr. Darlene Berryman at
If you have any questions regarding your rights as a research participant, please contact Dr. Chris Hayhow, Director of Research Compliance, Ohio University, (740)593-0664 or hayhow@ohio.edu.

By signing below, you are agreeing that:

• you have read this consent form (or it has been read to you) and have been given the opportunity to ask questions and have them answered;
• you have been informed of potential risks and they have been explained to your satisfaction;
• you understand Ohio University has no funds set aside for any injuries you might receive as a result of participating in this study;
• you are 18 years of age or older;
• your participation in this research is completely voluntary;
• you may leave the study at any time; if you decide to stop participating in the study, there will be no penalty to you and you will not lose any benefits to which you are otherwise entitled.

Please note:
1. You may revoke consent at any time.
2. Your consent below allows you to participate in this online survey
3. Your name and email address will not be linked to your survey responses in order to keep your responses anonymous.

By clicking "Yes" below, you will consent to participate in this survey. Do you consent to participate in this study?

_____ YES, I consent to participate. (I may withdraw consent at any time.)
_____ NO, I decline to participate.

Version Date: [11/17/2015]
Appendix F: IRB Approval

A determination has been made that the following research study meets the criteria for exemption under the following category(-ies):

2

Project Title: Nutrition, Trigger Warnings, and Distance Learning Among Osteopathic Medical Students

Primary Investigator: Emily Hargrove

Co-Investigator(s): Elizabeth Beverly

Advisor: Darlene Berryman

Department: AHSW

The approval remains in effect provided the study is conducted exactly as described in your approved application. Any additions or modifications to the project must be reviewed and approved by the IRB (as an amendment) prior to implementation.

IRB approval does not supersede other regulatory requirements, such as HIPAA, FERPA, PPRA, etc.

Adverse events/unanticipated problems must be reported to the IRB promptly.
## Appendix G: Additional Results

Medical Students’ Responses to Nutrition Attitudes Questionnaire, $n = 244$

<table>
<thead>
<tr>
<th>Please indicate response to the following:</th>
<th>Disagree (Strongly Disagree and Disagree responses) $n$ (%)</th>
<th>Neither Agree nor Disagree $n$ (%)</th>
<th>Agree (Strongly Agree and Agree Responses) $n$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A change towards a healthier lifestyle is important in any stage of life</td>
<td>1 (0.41)</td>
<td>0 (0)</td>
<td>242 (99.5)</td>
</tr>
<tr>
<td>2. Nutrition assessment and counseling should be included in any routine appointment, just like diagnosis and treatment.</td>
<td>12 (4.9)</td>
<td>39 (16)</td>
<td>192 (79)</td>
</tr>
<tr>
<td>3. I have an obligation to improve the health of my patients including discussing nutrition with them.</td>
<td>2 (0.8)</td>
<td>8 (3.3)</td>
<td>232 (95.6)</td>
</tr>
<tr>
<td>4. All physicians, regardless of specialty, should counsel high-risk patients about dietary change.</td>
<td>20 (8.2)</td>
<td>31 (12.8)</td>
<td>192 (79)</td>
</tr>
<tr>
<td>5. Most obese patients want to lose weight but feel frustrated and confused about how to do it.</td>
<td>27 (11.2)</td>
<td>64 (26.4)</td>
<td>151 (62.4)</td>
</tr>
<tr>
<td>6. Nutrition counseling should be a part of routine care by all physicians regardless of specialty.</td>
<td>41 (16.9)</td>
<td>71 (29.2)</td>
<td>131 (53.9)</td>
</tr>
<tr>
<td>7. Most physicians are NOT adequately trained to discuss nutrition issues with patients.</td>
<td>11 (4.5)</td>
<td>80 (32.9)</td>
<td>152 (62.6)</td>
</tr>
<tr>
<td>8. Specific advice about how to make dietary changes could help some patients improve their eating habits.</td>
<td>1 (0.4)</td>
<td>9 (3.7)</td>
<td>233 (95.9)</td>
</tr>
<tr>
<td>9. After receiving nutrition counseling, patients with poor eating habits will make major changes in their eating behavior.</td>
<td>92 (37.9)</td>
<td>117 (48.1)</td>
<td>34 (14.0)</td>
</tr>
<tr>
<td>10. Patients need ongoing counseling following my initial instruction to maintain behavior changes consistent with a healthier diet.</td>
<td>1 (0.4)</td>
<td>20 (8.2)</td>
<td>222 (91.4)</td>
</tr>
<tr>
<td>11. Patients will only change their</td>
<td>76 (31.4)</td>
<td>80 (32.9)</td>
<td>86 (35.5)</td>
</tr>
</tbody>
</table>
eating patterns if faced with a significant health problem.

12. Most patients will try to change their lifestyle if I advise them to.  
13. Physicians can have an effect on a patient’s dietary behavior if they take the tie to discuss the problem.
14. Patient motivation is essential to achieving dietary change.
15. My patient education efforts will be effective in increasing patients’ compliance with nutrition recommendations.
16. Nutrition counseling is NOT an effective use of my time.
17. Individual physicians can have little impact on a patient’s ability to lose weight.
18. It is NOT worth my time to counsel patients with poor dietary patterns about nutrition.
19. For most patients, health education does little to promote adherence to a healthy lifestyle.
20. Preventative health care is boring.
21. Patients are not motivated to change unless they are sick.
22. After receiving nutrition counseling, patients with poor eating patterns will make moderate changes in their eating behavior.
23. I feel comfortable with my ability to discuss strategies for osteoporosis prevention and treatment, including nutrition and lifestyle.
24. I feel comfortable providing nutrition education for a patient recently diagnosed with HIV.
25. I feel comfortable in assessing the total calories and saturated fat per portion of food by using the food label.
26. I know how many calories are in a gram of fat, protein, and carbohydrate and their basic metabolic roles.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Agree (%)</th>
<th>Disagree (%)</th>
<th>Neutral (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>101 (41.7)</td>
<td>111 (45.9)</td>
<td>30 (12.4)</td>
<td></td>
</tr>
<tr>
<td>5 (2.0)</td>
<td>29 (11.9)</td>
<td>210 (86.0)</td>
<td></td>
</tr>
<tr>
<td>3 (1.2)</td>
<td>1 (0.4)</td>
<td>238 (98.3)</td>
<td></td>
</tr>
<tr>
<td>12 (4.9)</td>
<td>74 (30.5)</td>
<td>157 (64.6)</td>
<td></td>
</tr>
<tr>
<td>204 (84.0)</td>
<td>23 (9.5)</td>
<td>16 (6.6)</td>
<td></td>
</tr>
<tr>
<td>187 (76.6)</td>
<td>36 (14.8)</td>
<td>20 (8.2)</td>
<td></td>
</tr>
<tr>
<td>213 (87.7)</td>
<td>19 (7.8)</td>
<td>11 (4.5)</td>
<td></td>
</tr>
<tr>
<td>131 (53.9)</td>
<td>66 (27.2)</td>
<td>46 (18.9)</td>
<td></td>
</tr>
<tr>
<td>204 (84.0)</td>
<td>19 (7.8)</td>
<td>20 (8.2)</td>
<td></td>
</tr>
<tr>
<td>93 (38.3)</td>
<td>63 (25.9)</td>
<td>87 (35.8)</td>
<td></td>
</tr>
<tr>
<td>32 (13.2)</td>
<td>122 (50.4)</td>
<td>88 (36.4)</td>
<td></td>
</tr>
<tr>
<td>89 (36.6)</td>
<td>62 (25.5)</td>
<td>92 (37.7)</td>
<td></td>
</tr>
<tr>
<td>187 (77.0)</td>
<td>36 (14.8)</td>
<td>20 (8.2)</td>
<td></td>
</tr>
<tr>
<td>54 (22.3)</td>
<td>30 (12.4)</td>
<td>158 (65.3)</td>
<td></td>
</tr>
<tr>
<td>94 (38.8)</td>
<td>32 (13.2)</td>
<td>116 (47.9)</td>
<td></td>
</tr>
</tbody>
</table>
27. I feel comfortable assessing fluid needs based on activity level and health.

28. I know how to calculate BMI and waist-to-hip ratio based on gender.

29. I am knowledgeable about indications for use of single vitamins or multivitamin supplements.

30. I am knowledgeable about the role of omega-3 and omega-6 acids in heart health.

31. I am knowledgeable about nutrition concerns of patients with GI intolerance, maldigestion, or malabsorption.

32. I am knowledgeable about the reported health risks of high protein/high fat diets.

33. I am knowledgeable about the role of genetics, diet, and pharmacology.

34. I am comfortable providing examples of serving sizes of meat or dairy.

35. I am knowledgeable about the role of food constituents in health (phytonutrients, dietary fiber, soy, etc.).

36. I am knowledgeable about the potentially harmful interactions of medications with herbal supplements.

37. I am knowledgeable about the definition of moderate alcohol consumption and its role in health and disease.

38. I am comfortable providing nutrition strategies for patients losing weight due to chronic illnesses.

39. I am knowledgeable about recognizing warning signs and symptoms of patients with eating disorders.

40. I am knowledgeable about indications for enteral and parenteral nutrition.

41. I am knowledgeable about the role
of dietary cholesterol, saturated fats, and trans fat in elevating blood lipids.

42. I am comfortable recommending dietary patterns for patients with non-insulin dependent (Type 2) diabetes. 129 (53.1) 46 (18.9) 68 (28.0)

43. I am comfortable with recognizing nutrition risk in elderly patients. 125 (51.4) 57 (23.5) 61 (25.1)

*Note:* Values missing for the following Questions: Q1 (n=1), Q2 (n=1), Q3 (n=2), Q4 (n=1), Q5 (n=2), Q6 (n=1), Q7 (n=1), Q8 (n=1), Q9 (n=1), Q10 (n=1), Q11 (n=2), Q12 (n=2), Q14 (n=2), Q15 (n=1), Q16 (n=1), Q17 (n=1), Q18 (n=1), Q19 (n=1), Q20 (n=1), Q21 (n=1), Q22 (n=2), Q23 (n=1), Q24 (n=1), Q25 (n=2), Q26 (n=2), Q27 (n=2), Q28 (n=2), Q29 (n=1), Q30 (n=1), Q31 (n=2), Q32 (n=1), Q33 (n=1), Q34 (n=1), Q35 (n=1), Q36 (n=1), Q37 (n=2), Q38 (n=1), Q39 (n=1), Q40 (n=3), Q41 (n=1), Q42 (n=1), Q43 (n=1)
**Medical Students’ Perception of Nutrition in Patient Care, N=243**

<table>
<thead>
<tr>
<th>It is important that I:</th>
<th>Yes n (%)</th>
<th>No n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Address the importance of diet whenever I care for a patient.</td>
<td>228 (93.8)</td>
<td>15 (6.2)</td>
</tr>
<tr>
<td>2. Assess each patient’s intake of vitamin, mineral, and dietary supplements.</td>
<td>198 (81.5)</td>
<td>45 (18.5)</td>
</tr>
<tr>
<td>3. Counsel patients regarding their use of supplements.</td>
<td>225 (92.6)</td>
<td>18 (7.4)</td>
</tr>
<tr>
<td>4. Whenever possible, recommend dietary changes prior to initiating drug therapy.</td>
<td>234 (96.7)</td>
<td>8 (3.3)</td>
</tr>
<tr>
<td>5. Assess each patient’s fat, fiber, and fruit/vegetable intake as a preventative strategy.</td>
<td>213 (87.7)</td>
<td>30 (12.3)</td>
</tr>
<tr>
<td>6. Encourage patients to ask diet-related questions and refer them for additional assistance when warranted.</td>
<td>236 (97.1)</td>
<td>7 (2.9)</td>
</tr>
<tr>
<td>7. Identify risk factors in patients by assessing diet and energy balance.</td>
<td>233 (96.7)</td>
<td>8 (3.3)</td>
</tr>
<tr>
<td>8. Request that patients bring a food record or perform another dietary assessment measure when they come in for routine visits.</td>
<td>136 (56.2)</td>
<td>106 (43.8)</td>
</tr>
<tr>
<td>9. Perform at least some level of nutrition assessment with every patient.</td>
<td>218 (89.7)</td>
<td>25 (10.3)</td>
</tr>
<tr>
<td>10. Refer patients with diet-related problems to registered dietitians or other qualified nutrition staff.</td>
<td>235 (97.1)</td>
<td>7 (2.9)</td>
</tr>
<tr>
<td>11. Evaluate patient’s alcohol intake as part of their overall nutrition status.</td>
<td>240 (98.8)</td>
<td>3 (1.2)</td>
</tr>
<tr>
<td>12. Assess each patient’s stage of change prior to initiating dietary intervention.</td>
<td>229 (94.2)</td>
<td>14 (5.8)</td>
</tr>
<tr>
<td>13. Assess dietary sodium, potassium, and calcium intake especially among patients for high risk of hypertension, osteoporosis, and stroke.</td>
<td>231 (95.5)</td>
<td>11 (4.5)</td>
</tr>
<tr>
<td>14. Refer patients with diabetes for detailed dietary counseling.</td>
<td>236 (97.5)</td>
<td>6 (2.5)</td>
</tr>
<tr>
<td>15. Advocate diet and activity balance to promote weight control.</td>
<td>241 (99.2)</td>
<td>2 (0.8)</td>
</tr>
<tr>
<td>16. Assess my patient’s ability to read a food label.</td>
<td>202 (83.1)</td>
<td>41 (16.9)</td>
</tr>
<tr>
<td>17. Advocate a diet for weight control.</td>
<td>230 (94.7)</td>
<td>13 (5.3)</td>
</tr>
</tbody>
</table>

Values missing for the following questions: Q4 (n=1), Q7 (n=2), Q8 (n=1), Q10 (n=1), Q13 (n=1), Q14 (n=1).