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## **Nutrition Knowledge of Pre-medical Students**

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### **Abstract**

Nutrition knowledge has been shown to be increasingly critical in physician practice. Therefore, education has also become very critical. Medical schools have been working over the last few decades to include nutrition education in their curriculum, but due to many barriers, it is difficult to measure up to requirements. It is the purpose of this descriptive study to determine the nutrition knowledge of pre-medical students at the University of Arkansas and see if suggesting a nutrition class for these students would be beneficial. The average score was  $11.2 \pm 3.04$  out of a possible 23. Because the literature provides reason for improving medical nutrition education and it has been shown to be difficult to include that education in medical school, it may be beneficial to improve undergraduate pre-medical nutrition education.

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## **Introduction**

The purpose of this descriptive study was to assess the amount of nutrition knowledge of pre-medical students and to identify any significant relationships between demographic characteristics and nutrition knowledge. It was hypothesized that pre-medical students did not have sufficient nutrition knowledge. Since the 1980s nutrition education for physicians-in-training has been acknowledged as crucial. This has resulted in many improvements and policies aimed at increasing nutrition knowledge and the efficacy of that knowledge. The Academy of Nutrition and Dietetics has published the following:

*It is the position of The American Dietetic Association that nutrition education is an essential component of the curricula for the majority of health care professionals. Curricula should include nutrition principles and identification of nutrition risk factors for appropriate and timely referral to a qualified dietetics professional for comprehensive nutrition services* (Position of the American Dietetic Association: Nutrition education for health care professionals, 1998).

However, the results have not measured up to the standards that most experts set for this knowledge (Torabi et al., 2011; Walsh et al., 2011; Adams et al., 2006) . Furthermore, patients expect physicians to be knowledgeable about nutrition (Wynn et al., 2010). Therefore, it is very important that doctors have a solid background in nutrition. Starting earlier in pre-medical training with a paradigm supporting this knowledge could be beneficial.

## **Importance of nutrition for physicians**

Physicians must be able to treat a plethora of conditions which are affected greatly by diet. These include, but are not limited to, intestinal disorders, obesity, hypertension, cancer, and malnutrition (Intersociety Professional Nutrition Education Consortium, 1998). This is especially crucial in obesity management. Many researchers and policy-makers state that obesity has gained epidemic status (Jay et al., 2008). Interestingly, the most common causes of mortality in the developed world are related to obesity, such as hypertension and diabetes (Truswell et al., 2003). In a 1997 study, it was reported that

approximately 16% of episodes of illness with which doctors are presented require nutrition counseling. This includes many chronic diseases (van Weel, 1997). Intervention is crucial, because it makes a difference in patient outcomes. Patients that are advised by their doctor to lose weight are three times more likely to attempt weight loss than those who are not advised (Galuska et al., 1999).

Many physicians recognize the importance of nutrition in their practices. Most physicians in a study in Canada reported that nutrition education is important and that 60% of their patients would benefit from nutrition counseling. Over 70% of physicians surveyed said that nutrition intervention changes behavior (Wynn et al., 2010). Levine et al. showed that, when asked about nutrition attitude most physicians consider nutrition to be important in their practice. Over 75% of the respondents in that study disagreed with the statement: “nutrition education is not the responsibility of the physician”, meaning that they recognize that physicians are important in the nutrition education of their patients (Levine et al., 1993). A speaker from the United Kingdom, in an international workshop dedicated to effective nutrition interaction, gave several diet guidelines that physicians could use to advise their patients, which are largely related to the management of several chronic diseases (Truswell, 1998). However, despite the recognized weight of the issue, not many physicians actually put this into practice. Australian physicians only discussed nutrition in seven percent of visits (Britt et al., 2010). Furthermore, in the United States, less than half of primary care doctors discuss weight loss with obese patients (Kushner, 2003; Galuska et al., 1999).

Despite physicians reporting that nutrition is important in their practices, patients referred to a dietitian tend to do better than those who only saw a physician (Thompson et al., 2003). The dietitian offers detailed nutrition counseling, while the physician’s role is to coordinate the care of the patient and sees that it is conducive to treatment (Pomeroy and Cant, 2010). Dietitians are required to have continuing education on new nutrition research, which commonly includes new diet fads and nutrition misinformation (Position of the American Dietetic Association: Nutrient supplementation, 2009). This is important because that information changes frequently, so doctors may not be well informed in those

areas (Truswell et al., 2003). In a family practice setting in Memphis Tennessee, very few patients were referred to a dietitian or nutritionist. Obesity had the highest rate of referrals out of four disease states studied: diabetes mellitus, hypertension, obesity and hypercholesterolemia. However, referrals happened in only 14% of obesity cases (Britt et al., 2010). This is of concern because nutrition counseling is important in all of those, due to complex social and lifestyle factors surrounding the conditions (Truswell, 2000). In Australia, the same effect was observed. A study of general practice activity showed that dietitians received fewer referrals than podiatrists, psychologists, dentists and physiotherapists at around one percent (Splett et al., 1994). Furthermore, in Canada, it was reported that doctors and nurses with access to a dietitian had a better focus on clinical nutrition (Thorensen et al., 2008). However, it has been documented that referral to dietitians can be costly, or there might be limited access (Nicholas et al., 2003). This makes it even more important that physicians know about nutrition.

Yet, doctors still are deficient in nutrition knowledge. In one study, 48% of responding physicians reported the inability to adequately counsel patients on common obesity treatment options (Jay et al., 2008). Furthermore, in a survey of Internal Medicine and Cardiology physicians, it was shown that there was a general lack of knowledge about triglycerides in the diet. Specifically, they showed a limited understanding of how fat and carbohydrates in the diet correspond with triglycerides and HDL in the body (Truswell et al., 2003). Internal medicine physicians and cardiologists in another study also showed a lack of knowledge specifically in the area of lipid metabolism, which plays an important role in cardiac health (Flynn et al., 2003). Tests have shown that knowledge is indeed lacking among physicians. A survey of residents resulted in an average score of 66% on a nutrition knowledge test. Some of the areas that needed significant improvement were obesity, endocrine disorders and cardiovascular nutrition. Interns in this particular study were very confident about their nutritional assessment and counseling abilities, but scored poorly on that section (Vetter et al., 2008).

Even though physicians find it difficult, including nutrition in their practice is feasible. In a study conducted at the University of Alabama at Birmingham, a nutrition education program given to family

practice physicians by a physician nutrition specialist yielded beneficial results. The physicians' nutrition knowledge scores increased along with the rate at which they discussed nutrition with their patients (Lazarus, 1997). It was demonstrated that referrals to dietitians increased when doctors were more familiar with the services provided by nutrition support dietitians. In a North Dakota study, dietitian referrals increased by 30% after the doctors received promotional materials of dietetics services (Dickson and Bianchi, 1998). In international medical care, there are many examples of innovations in this area. Specifically, in Västerbotten, Sweden, there was a weight loss center that educated patients for four weeks on nutrition, exercise, and basic lifestyle changes. Participation in this program resulted in significant reductions in weight and blood pressure, even after five years (Truswell, 2000).

### **Education in medical school**

In 1985, the National Research Council began the nutrition education reformation in medical schools. The Council stated that what medical students learned about nutrition was inadequate and needed to be changed (Committee on Nutrition in Medical Education, Food and Nutrition Board, Commission on Life Sciences, National Research Council, 1985). Congress also issued a call to action on the subject in 1990, and other prominent organizations have added their voices to the call for more nutrition education (Krebs, 2006). Since then, medical schools, with the assistance of the Nutrition Academic Award (NAA), have enriched the curricula of schools across the United States. The NAA provided faculty support for starting nutrition education programs in medical schools by giving awards to successful programs. It gives the incentive needed for medical schools to meet the standards set by Congress (Van Horn, 2006). The Academy of Nutrition and Dietetics, among other organizations, has recommended that every medical school graduate should have a solid grasp on nine nutrition knowledge areas, including assessment of nutritional health and nutritional counseling (Position of the American Dietetic Association: Nutrition education for health care professionals, 1998). The American Academy of Family Physicians has also drafted guidelines being used in medical education of general practitioners (American Academy of Family Physicians, 1989).

Many experts have called for Physician Nutrition Specialists. A recent summit of the American Society of Parenteral and Enteral Nutrition determined that having a physician nutrition expert at every academic health center would be extremely beneficial (McClave et al., 2010). The primary purpose of these specialists is for advocating change in medical school curricula to include more nutrition. Their presence would increase the influence of non-physician nutrition practitioners, such as dietitians, in patient care. Unfortunately, there is limited interest in the physician nutrition specialty at this time (Heimbürger et al., 2010).

Despite efforts to improve nutrition education in medical schools, knowledge continues to be below the desired levels. In 1988, a study was conducted related to medical school students and their nutrition education. Although the interest in a more in-depth course varied, the majority was cited as unsatisfied with their current level of education (Weinsier et al., 1988). More recently, 82.7% of respondents in a Canadian study reported that their medical education should include more nutrition (Gramich, 2010). It was documented that, on average, students in medical school received 23.9 hours of nutrition education, when the required amount was 25 hours (Adams et al., 2006). A more recent study identified a decrease in the amount of nutrition education in medical schools. The 2006 study showed that 40 of 106 medical schools met the national requirements, while a 2010 study showed that only 28 of 105 schools met requirements (Adams et al., 2010).

Support for nutrition education in medical school is lacking. Experts recommended that medical school faculty and students needed more nutrition training. For example, preceptors expected medical students to counsel patients on nutrition, but were unable to provide feedback or suggest strategies (Wong et al., 2004). Another concern is a dwindling interest in nutrition, despite its crucial nature in patient care. The American Society of Parenteral and Enteral Nutrition had 1,752 members in 1990. By 2009, there were only 634 members (McClave et al., 2010). Student interest has also declined rapidly when there was no medical faculty member knowledgeable in nutrition (Kushner, 2003; Kahn, 2006).

## **Barriers to nutrition education**

Throughout most of the literature, the common barrier to nutrition education is time (Kolasa and Rickett, 2010). At the University of Alabama at Birmingham, residents identified lack of time as detrimental to including nutrition education in patient care (Lazarus, 1997). Another study of residency programs documented that 66% cited time as a barrier to including nutrition in resident education. Along with time, the sheer volume of material that must be incorporated into medical training is an issue. There has been an effort to decrease the amount of material covered in medical school in order to increase knowledge retention (Deen et al., 2003; Lo, 2000). It has been stated that if content is added into medical school curricula, something must be removed, due to “overcrowding” of the material (Ball et al., 2010). The Intersociety Professional Nutrition Education Consortium identified 14 nutrition conditions on which doctors must be able to counsel patients. These include obesity and its comorbidities, Acquired Immune Deficiency Syndrome (AIDS), cardiovascular disease, and osteoporosis, and are a small sampling of the topics that need to be covered in nutrition education (Intersociety Professional Nutrition Education Consortium, 1998). This did not include areas such as dietary supplements, about which patients often expect doctors to be knowledgeable (Truswell et al., 2003). Even in continuing medical education, the amount of information can be overwhelming for doctors to grasp (Pomeroy and Cant, 2010).

The focus of medical education has been recognized as a barrier to the inclusion of nutrition education in medical school. The traditional emphasis of medical training has been on diagnosing and treating disease rather than on preventative medicine (Intersociety Professional Nutrition Education Consortium, 1998). Nutrition is frequently taught as a component of biochemistry in medical school, which forces a disconnect of nutrition with food and diet (Truswell, 1998). Sometimes, nutrition is not even considered clinically relevant (Touger-Decker, 2004).

Adams stated that one of the reasons for substandard nutrition education is the lack of qualified instructors. The lack of preceptor understanding was cited as one of the main barriers to nutrition

education. This was demonstrated by the small number of physician nutrition specialists (Adams et al., 2006). In fact, the Intersociety Professional Nutrition Education Consortium argued that the greatest difficulty in increasing or changing nutrition education in medical school is the shortage of physician nutrition specialists (Heimbuger, 2010). Harvard medical school identified that encouraging faculty, department chairs, and deans to include nutrition in the curricula and retaining nutrition experts on staff were areas that needed improvement in medical schools (Lo, 2000). Registered Dietitians have been demonstrated to be high-quality nutrition instructors for medical students, but there are few in that position (Touger-Decker, 2004). The lack of staff with expertise was the third most common barrier in medical school programs (Deen et al., 2003). Not only were schools lacking nutrition experts, but they were also short on instructors that recognized the importance of nutrition education (Lo 2000).

Adequate education of medical students on a topic did not necessarily translate into the ability to apply that knowledge. It has been observed that students can write out the glycolytic pathway but are unable to explain the roles of various micronutrients (Lo 2000). Some researchers suggested that more instruction during clinical clerkships and residencies would resolve this problem (Vetter et al., 2008). However, Adams argues that early nutrition education is imperative (Adams et al., 2006).

## **Methods**

The purpose of this descriptive study was to assess the amount of nutrition knowledge of pre-medical students and to identify any significant relationships between demographic characteristics and nutrition knowledge. It was hypothesized that pre-medical students did not have sufficient nutrition knowledge. Nutrition knowledge was measured using a previously validated survey based on the Dietary Guidelines for Americans (Moore, 2006). The instrument contained twenty three knowledge items, with some added demographic questions, such as age, gender, ethnicity, and major in addition to pre-med. Institutional Review Board approval was granted at the University of Arkansas.

The survey was posted on the website Surveymonkey, a free online survey distribution tool. The link was sent with an explanation of the study to the Alpha Epsilon Delta email listserv by the current student president. Alpha Epsilon Delta is the pre-medical honor society and includes every student that is officially on the pre-medical track at the University of Arkansas. One request was sent via email to complete the survey and the response period was six days.

The results were downloaded in a Microsoft Excel file and analyzed with PASW Statistics 18. A mean knowledge score was calculated and a series of frequencies and t-tests were conducted.

## **Results**

The survey link was emailed to approximately 400 students. Thirty eight completed the survey, resulting in a response rate of 9.5%. The mean age was 20 years, with a range of 18 to 30 years. The sample included 27 females (71%) and 11 males (29%). Thirty three participants identified themselves as “white, non-Hispanic” (87%), with the rest categorized as “other” (13%). The “other” included Asian, Hispanic or Latino, Native Hawaiian or Pacific Islander, and other. There was one pre-medical dietetics major (3%) in the sample. The other 37 subjects were primarily biology majors with one food science major. Three subjects had taken at least one nutrition course in college and three other students had followed a special diet for medical reasons. There were no significant differences in knowledge score based on age ( $p=0.101$ ), gender ( $p=0.373$ ), ethnicity ( $0.637$ ), whether a nutrition course was taken ( $p=0.098$ ), or whether a special diet was followed ( $p=0.395$ ). There was a significantly higher knowledge score by major (dietetics)( $p=0.022$ ). However, the cell size was one and was the pre-medical dietetics student. See Table 1.

Demographic Information and mean knowledge score						
Descriptive		Frequency	Percentage	Mean	Range	p value
Age				20 ± 2.3	18-30	0.101
Gender	Male	11	29%			0.373
	Female	27	71%			
Ethnicity	White	33	87%			0.637
	Other	5	13%			
Major	DIET	1	3%			0.022
	Other	37	97%			
Nutrition class	Yes	3	8%			0.098
	No	35	92%			
Special diet	Yes	3	8%			0.395
	No	35	92%			
Knowledge score				11.2 ± 3.04	4-18	

Table 1

A perfect score on the knowledge instrument was 23. The mean knowledge score in this sample was  $11.2 \pm 3.04$  (49%) with a range of 4 to 18. Figure 1 is a histogram of the overall scores. It should be noted that it is not a bell curve, and that the most frequent score was 9.

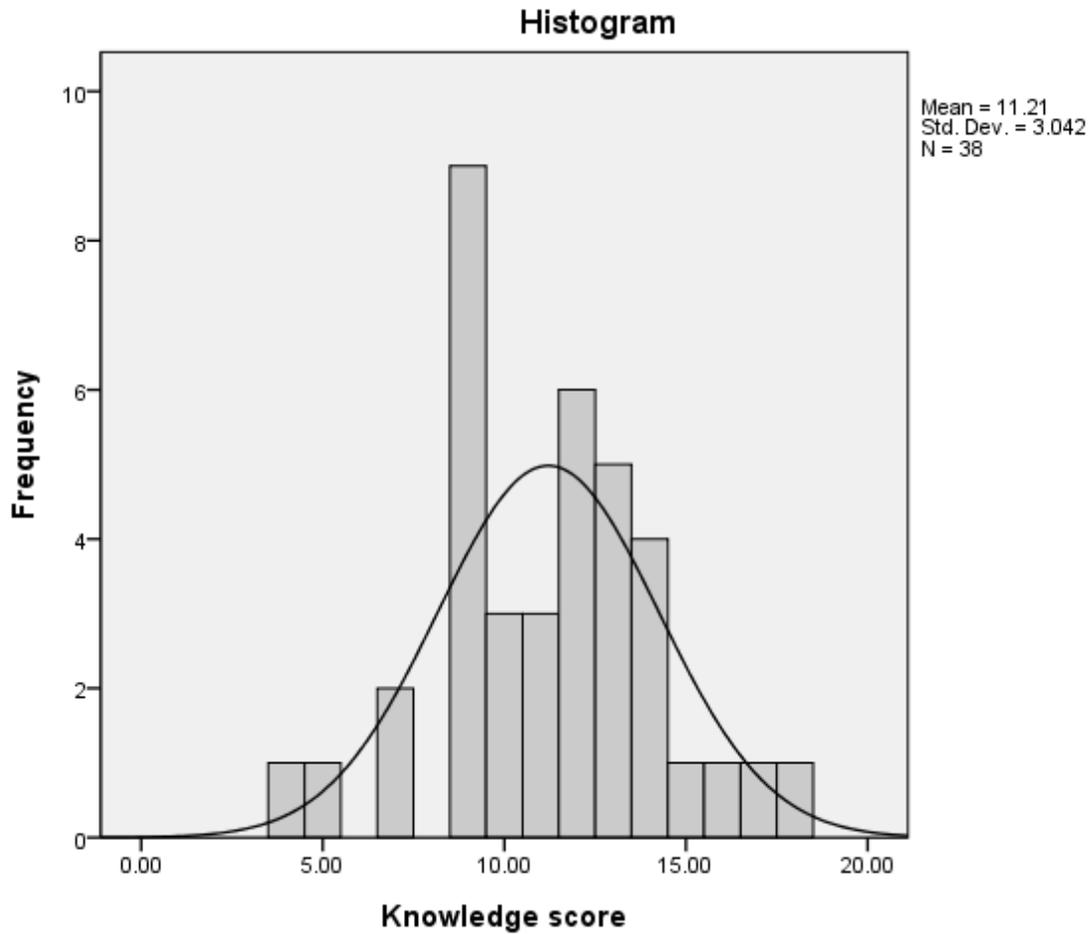


Fig 1

The 23 knowledge items were analyzed for frequencies of correct and incorrect answers. The question, “If a person ate the same weight in grams of each of the following, which would provide the most calories?” with the answer choices fat, carbohydrate, protein, and alcohol had the greatest standard deviation.

The question “The average American adult should consume \_\_\_ milk products or equivalent milk products daily” had the greatest frequency of correct answers. The correct answer was “mostly low-fat and fat-free” with the other choices of “only fat free,” “only low-fat,” and “mostly high fat.”

Two knowledge items had the lowest frequency of correct responses and both addressed the characteristics of a conventional diet. A conventional diet was defined in the survey instructions as a diet that conforms to the Dietary Guidelines for Americans. In the first question, 52.6 % of respondents answered that a conventional diet “focuses only on foods eaten and not behavior changes,” while only 13.2 % answered correctly that a conventional diet “is based on a large amount of scientific research.” Other answers to that item included “has rules about separating or combining specific foods” and “warns you to follow the diet, or certain stages of it, for limited amounts of time.” In the second question, 73.7% of respondents answered that conventional diets “lack key nutrients” and only 13.2% answered correctly that conventional diets “are not boring to follow long term.” Other answers to this item included “are low in fiber” and “result in rapid weight loss.”

Subjects were asked where they get most of their nutrition information and were allowed to select all applicable choices from a list of 13 that included the choice “other.” The manner in which the responses were allowed to be answered provided a useful analysis of frequencies but did not lend itself to comparison by knowledge score. The majority of respondents indicated that they received most of their nutrition information from family (86.7%). The next prominent source was the internet (5.6%) followed by friends (42.1%). Doctors, dietitians and nurses were not popular sources for nutrition information. See Figure 2.

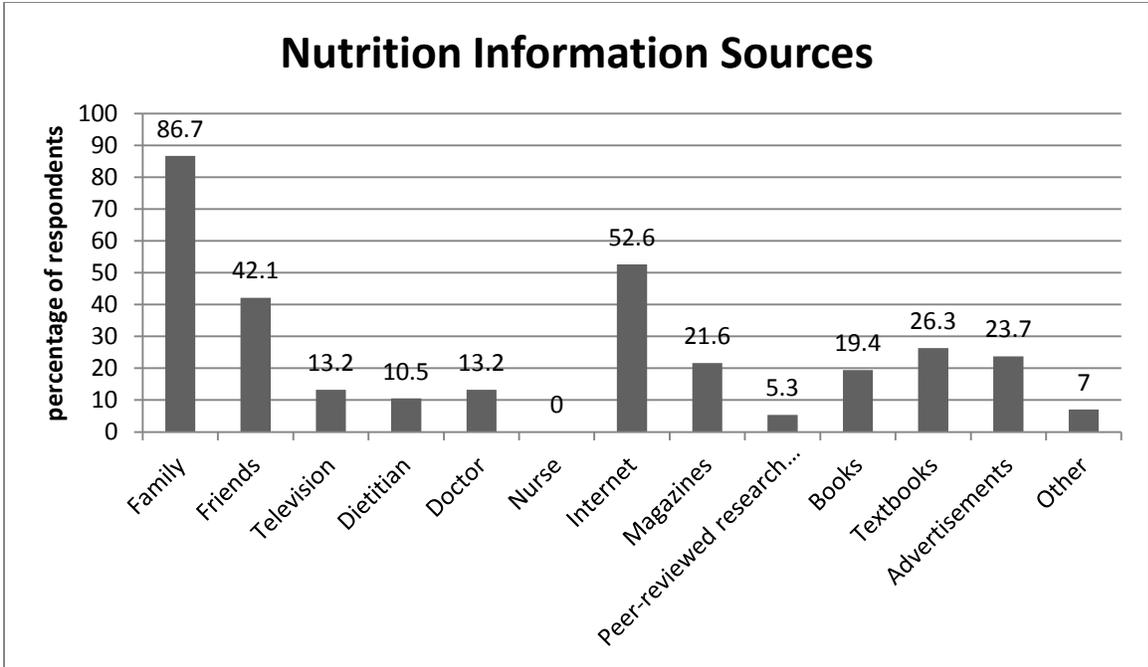


Fig 2

## Discussion

Although there was a small response rate (9.5%), the results had yielded important findings. There were no significant differences in knowledge score when compared by demographic variables except by major. That was only one subject who was a pre-medical dietetics major. A larger sample size could have identified more significant differences. Although it was not significant, there was a trend among the three participants that had taken a nutrition course. This group did show a slightly higher average score than the overall group, but that could have been the result of the one high score raising the average.

The specific knowledge items showed that students were not familiar with the Dietary Guidelines for Americans which operationalizes nutrition concepts based on the current body of peer-reviewed research.. On one item, a seldom selected correct answer choice was that a conventional diet “is based on a large amount of scientific research.” A conventional diet was defined in the survey directions as a diet based on the Dietary Guidelines for Americans. It is also possible that subjects did not read the definition of a conventional diet in the survey directions. However, the answers imply that the subjects did not understand that the nutrition guidelines and recommendations were derived from peer-reviewed research.

Also interesting to note were the sources of nutrition information. The vast majority used non-peer-reviewed sources. Only two people (5%) identified peer-reviewed research as sources of nutrition information. Healthcare providers were not popular sources also. The majority of respondents identified family and friends as their most common sources of nutrition information. There were three that answered “other” which included classes and reputable websites, including Mayo Clinic and the United States Department of Agriculture. Although many answered that they use the internet as a source, they may be getting their information from a reliable source. It is noted that some may have interpreted internet sources in general to include reputable websites as well as those that are not, but due to the lack of reliance upon peer-reviewed sources, these subjects were likely to also lack discernment of internet websites and primary sources of information for those sites.

Overall, one of the most important implications for this research is that the literature was adamant about the lack of time in medical school for nutrition education. Two of the most prominent barriers were the lack of time and the high amount of material. Both of these have caused researchers to suggest including medical nutrition education outside of medical school (Vetter et al., 2008). This either could be done before or after. Since resident nutrition education has been shown to also be lacking the solution would be either to improve that area or include nutrition education in undergraduate pre-medical education.

It is important to note that, although the highest score was obtained by an individual with a pre-medical dietetics major and the research advocates that medical students need know more about nutrition, the results of this study did not imply that pre-medical students must major in dietetics. The results supported the overwhelming body of literature which suggested the need for nutrition education in the preparation of physicians. This has been demonstrated in the literature and has been acknowledged in opinions of students and physicians (Krebs, 2006; Committee on Nutrition in Medical Education, Food and Nutrition Board, Commission on Life Sciences, National Research Council, 1985; Truswell et al., 2003). This study and the current body of research on the nutrition knowledge of current physicians and medical students support the need to recommend nutrition coursework in the education of pre-medical students.

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