

# Accepted Manuscript



## A Deficiency of Nutrition Education and Practice in Cardiology

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## A Deficiency of Nutrition Education and Practice in Cardiology

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### **Authorship**

All authors had access to the data and a role in writing the manuscript

### **Disclosures:**

Dr. Karen Aspry performs contracted research for Ionis, AMGEN, and AKCEA-Ionis.  
Dr. O'Keefe has a major ownership interest in CardioTabs.

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## ABSTRACT

### Purpose

Nutrition is one of the foundations of cardiovascular guidelines for risk reduction and treatment. However, little is known about whether cardiologists, cardiology fellows-in-training, and cardiovascular team members have the nutrition education and knowledge necessary to implement these guidelines. The aim of this study was to describe the educational experiences, attitudes, and practices relating to nutrition among cardiovascular professionals.

### Methods

Surveys completed by cardiologists, fellows-in-training, and cardiovascular team members inquired about their personal dietary habits, history of nutrition education, and attitudes regarding nutrition interventions.

### Results

- A total of 930 surveys were completed. Among cardiologists, 90% reported receiving no or minimal nutrition education during fellowship training, 59% reported no nutrition education during internal medicine training and 31% reported receiving no nutrition education in medical school. Among cardiologists, 8% described themselves as having “expert” nutrition knowledge. Nevertheless, fully 95% of cardiologists believe that their role includes personally providing patients with at least basic nutrition information. The percentage of respondents who ate  $\geq 5$  servings of vegetables and fruits per day was: 20% (cardiologists), 21% (fellows-in-training), and 26% (CV team members).

### Conclusions

A large proportion of cardiovascular specialists have received minimal medical education and training in nutrition, and current trainees continue to experience significant education and training gaps.

## INTRODUCTION

Among the top 17 risk factors, poor diet quality has been identified by the US Burden of Disease Collaborators as the leading cause of premature deaths and disability in the United States (1). Ischemic heart disease, influenced markedly by dietary factors, is the condition most responsible for years of life lost due to premature death. Although the mortality rate from cardiovascular disease had been on the decline for more than a decade, a concerning plateau in that trend has emerged recently, largely fueled by the high prevalence of diet-related obesity and diabetes (2).

The recent 2015-2020 Dietary Guidelines for Americans (3) recommend healthy dietary patterns, including a Healthy Mediterranean Style Eating Pattern and Healthy Vegetarian Eating Pattern. A Mediterranean-style diet was shown to significantly benefit both primary and secondary prevention. The Primary Prevention of Cardiovascular Disease with a Mediterranean Diet trial (PREDIMED) achieved a 30% reduction in major cardiovascular events, largely driven by reduction in stroke. In secondary prevention, the Lyon Diet Heart study (4) documented a 72% reduction of myocardial infarction and cardiac deaths. A low-fat vegetarian diet was a component of the Lifestyle Heart Trial, a multi-modality lifestyle intervention study that demonstrated angiographic regression of coronary disease (5). Additionally, in a non-randomized study of patients with coronary disease who followed a vegan no added oil diet, the rate of major cardiovascular events over 3.7 years was 0.6% (6).

The total annual cost related to heart and vascular diseases in the US is a staggering \$315 billion; of this, \$193 billion is due to direct medical costs (7). Given the documented cardiovascular event reduction of 30% to 70% or more from dietary changes, the potential for cost savings achievable by emphasizing nutrition education and practice is substantial.

In order to learn more about the knowledge, attitudes, and practices related to nutrition counseling in cardiovascular care, a survey was conducted of cardiologists, fellows-in-training, and non-physician cardiovascular team members.

## METHODS

An online survey was developed that asked cardiovascular specialists to describe their nutrition education, as well as knowledge, attitudes and practice related to nutrition counseling. The survey was sent to the American College of Cardiology (ACC) CardioSurve panel, a group of Fellows of the American College of Cardiology selected by a random selection technique to obtain a representative sampling of U.S. cardiologists among key demographics. Surveys were also sent to members of four ACC specialty listservs (academic, early career, imaging, interventional), fellows in training listserv, and non-physician cardiovascular team listserv members from September 9 to October 8, 2015 and February 11 to March 28, 2016. This survey was conducted by American College of Cardiology staff including survey programming, fielding and analysis.

Statistical analysis of the responses was performed using SPSS version 23. Chi-square tests were used to calculate significant differences with statistical significance defined as  $p < 0.05$ .

## RESULTS

### *Survey Respondent Demographics (see Table 1)*

From the 20,608 surveys distributed, a total of 930 (4.5%) were completed. Within the limited dataset obtained regarding tenure and gender, the tenure of respondents mirrored the ACC membership at large (1-10 years 33% vs. 36%, 11-20 years 24% vs. 25%, 21 years or more 43% vs. 39%). More cardiologist respondents were female (88% vs 81%,  $p < 0.05$ ).

### *Nutrition Education (see Figure 1)*

#### *Medical School*

Overall, 31% of cardiologists and 21% of fellows-in-training did not recall receiving any nutrition education during medical school. More extensive nutrition education, consisting of a series of lectures in medical school, was reported by 21% of cardiologists and 39% of fellows-in-training.

*Internal Medicine Residency*

During internal medicine residency training, 59% of cardiologists did not recall receiving any nutrition lectures, 9% recalled only a single lecture, and 6% reported receiving a series of nutrition lectures.

*Cardiovascular Fellowship Training*

Among cardiologists, 90% reported receiving no or minimal nutrition education during fellowship training (57% and 33%, respectively). Only 8% had a “solid nutrition education” that they considered “adequate” and 1% reported a “high level of nutrition education that gave me excellent skills for counseling patients.”

The experience of nutrition education for current fellows-in-training, of whom 46% were in their third year of fellowship or beyond, was similar to that of practicing cardiologists with 56% reporting that they did not receive any nutrition education to date in their fellowship program.

*Continuing Medical Education in Nutrition*

Following cardiovascular fellowship training, 56% of cardiologists described receiving no formal education in nutrition, and 20% received 2 or more hours/year.

Among cardiologists surveyed, 53% reported that they would be likely to participate in an online series of webinars discussing nutrition and lifestyle, followed by 40% inclined to attend a local lifestyle education program, and 35% who would participate in a lifestyle track at a national meeting.

*Attitudes Regarding the Impact of Dietary Interventions (see Figure 2)*

A total of 89% of cardiologists and 87% of fellows-in-training believe that “dietary interventions are likely to provide substantial additional benefit to patients with cardiovascular disease who adhere to guideline based pharmacologic therapy.”

*Cardiologist Perception of Their Role in Delivering Nutrition Counseling (see Figure 3)*

Fully 95% of cardiologists believe that their role includes personally providing patients with at least “basic nutrition information”. There was no difference between cardiologists in university-based practices who held this view (66%) compared to those in non-university settings (72%), NS.

A relationship was noted in cardiologists between their personal dietary behavior and their attitude regarding nutrition counseling: 74% of cardiologists who ate 5 servings or more of vegetables and fruit per day felt that their role included personally delivering “more detailed dietary information” to patients, while only 61% of those who ate 1-2 servings of vegetables and fruit endorsed that statement,  $p<0.05$ .

*Fellow-in-Training Personal Beliefs and Perception of Mentor Attitudes About Nutrition*

Responses from fellows-in-training showed 63% felt that their role included providing more detailed nutrition counseling. However, only 40% of fellows-in-training believed that their closest clinical mentor shared that view.

Conversely, 3% of fellows-in-training reported that they did not believe their role included counseling patients about nutrition, while 16% of fellows-in-training reported that their closest mentor did not consider nutrition counseling to be their personal responsibility,  $p<0.05$ .

*Time Spent Counseling About Nutrition*

During an average patient appointment, 4% of cardiologists reported not discussing nutrition, 18% reported spending 1 minute or less on nutrition, 40% spent 2-3 minutes per visit, 25% estimated 5 minutes per visit, 8% reported 10 minutes per visit, and 4% spent 15 minutes or more. Nutrition counseling time reported by fellows-in-training was similar to the cardiologists.

Among all physicians (cardiologists and fellows-in-training), women spent more time with nutrition counseling than men: 18% of women estimated spending 10-15 minutes per clinic visit devoted to nutrition, but only 6% of men did so,  $p<0.05$ .

### *Self-Assessment of Nutrition Expertise and Comfort in Patient Counseling*

Among cardiologists, just 8% described themselves as having “expert” knowledge in nutrition and agreed with the statement “I feel that I keep up to date and able to answer any question thrown my way.” Knowledge was self-assessed by 22% of cardiologists as better than average, 23% average, 27% adequate, and 18% described “feeling uncomfortable teaching patients on this topic.”

### *Dietary Habits of Cardiovascular Professionals (see Figure 4)*

Among cardiologists, 20% consume a total of 5 or more servings of fruit and vegetables/day, as do 21% of fellows-in-training, and 26% of CV team members. Considering all physician respondents (cardiologists and fellows-in-training), a non-significant trend was observed for more women than men eating 5 or more servings of fruit and vegetables per day (27% vs 15%, respectively,  $p<0.07$ ).

## **DISCUSSION**

This cross-sectional survey of practicing cardiovascular specialists documents the deficiency of nutrition education, lack of self-assessed knowledge and counseling skills, and low personal adherence to a heart healthy diet pattern. The reasons for the lack of nutrition training are multifactorial, and certainly include lack of adequately trained physician mentors, as well as lack of financial incentives that drive various aspects of practice and, consequently, clinical training.

### *Cardiology Guidelines Emphasize the Importance of Nutrition But Training Does Not*

The 2013 ACC/AHA Guideline on the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults (8) emphasizes the importance of a healthy diet.

In view of our finding that only 30% of cardiologists described their nutrition knowledge as “mostly up to date” or better, it is difficult to reconcile how cardiologists could effectively implement these guidelines. Moreover, given that 59% of cardiologists reported spending 3 minutes or less per visit discussing nutrition with their patients, the attention to nutrition and lifestyle advised in the guidelines appears to be poorly realized in practice.

*Nutrition Education in Medical School*

In our survey, nearly a third of cardiologists did not recall receiving any nutrition education during medical school. The National Academy of Sciences recommends a minimum of 25 required hours of nutrition instruction (9). In a recent survey conducted in accredited U.S. medical schools between 2008-2009 found that only 25% provided a dedicated nutrition course compared to 30% just several years earlier (10).

Of concern, studies show that incoming medical students generally arrive with a strongly positive view of the role of nutrition in health, but often leave medical school with somewhat diminished enthusiasm. In a study of students from 11 medical schools, 74% of newly arrived medical students believed that nutrition would be important for their careers, but only 59% held that view by the end of medical school (11).

*Nutrition Education in Graduate Medical Training*

The Accreditation Council for Graduate Medical Education (ACGME), in conjunction with representatives of medical specialty groups, establishes training requirements for graduate medical education. In the 38-page ACGME (12) document for training in cardiovascular disease, as well as the 39-page training program requirement document for internal medicine, the words “nutrition” and “diet” are absent.

The lack of requirements for teaching nutrition in internal medicine (13) and cardiovascular fellowship training (12) is reflected in the results of the current survey, that found 59% of cardiologists unable to recall any nutrition lectures during internal medicine residency, and 57% reporting not even a single nutrition lecture during fellowship training. Furthermore, there is no evidence for a trend toward more nutrition education in current cardiovascular fellowship trainees, as 56% of current fellows-in-training stated that they have not received any nutrition training.

The American College of Cardiology has issued recommendations for training in cardiology (which go beyond the ACGME requirements), published in a Core Cardiology Training Statement (COCATS). COCATS calls for a dedicated 1-month rotation for cardiology fellows in preventive cardiology, however a recent survey found only 24% of training programs in compliance (14).

*Fellows-In-Training and Mentor Attitudes About the Role of Cardiologists In Nutrition Counseling*

Of note, 69% of cardiologists believed that their role included personally providing more detailed nutrition counseling—very similar to 63% of fellows who endorsed that same viewpoint.

It is revealing to note that the fellows perceived their mentors to be less invested in delivering nutrition counseling than they are, with fellows believing that only 40% of their mentors took personal ownership for offering detailed nutritional counseling to their patients. This suggests a discrepancy between attitudes and behaviors on the part of mentors regarding their role in providing nutrition counseling.

*Recommendations to Enhance Nutrition Education of Cardiologists*

As demonstrated in this survey, there are considerable gaps in nutrition education across all stages of training of cardiovascular specialists. Several strategies may be considered to close this gap.

Beginning in undergraduate studies, it has been suggested that nutrition science may be a preferred replacement for organic chemistry as the high stakes pre-requisite for matriculation to medical school (15). Once in medical school, greater attention must be directed to teaching clinically relevant nutrition science, and to identify clinical mentors who can guide/facilitate the application of nutrition knowledge into clinical practice. Finally, all graduate medical education programs need to include a core curriculum in nutrition and lifestyle, along with the development of competencies in motivational interviewing and counseling.

After the completion of formal training in cardiology, continuing education programs, including those required for maintenance of certification (MOC), need to be developed that include review topics, as well as introduction of new advances in clinical nutrition. An important objective of continuing education in nutrition is to foster the development of cardiology role models with expertise in nutrition science and counseling, an essential, but often absent resource in current training programs.

*Range of Potential Roles for Cardiologists to Provide Direct Nutrition Counseling*

Cardiovascular specialists with a solid background in nutrition will be well positioned to deliver effective nutritional counseling (16,17). Nevertheless, many patients, especially those with multiple

chronic illnesses, have complex nutritional needs or require detailed meal planning that exceed the expertise or time that can reasonably be delivered by cardiovascular specialists. In those cases, the patient is clearly best served by referral to a registered dietitian or nutritionist. A team-based approach to care is becoming increasingly important to deal with the growing burden of chronic diseases and the needs associated with an aging population (18).

Despite the well-documented benefits of team-based patient care, there continues to be poor referral by physicians to other healthcare professionals for diet and lifestyle interventions, including cardiac rehabilitation program (19). Of note, an intensive multi-disciplinary cardiac rehabilitation program documented to reverse heart disease that incorporates dietary changes, smoking cessation, stress management, and group support has recently been approved for Medicare coverage (20).

#### *Personal Dietary Habits of Cardiologists*

A single aspect of the dietary history of health professionals was surveyed-consumption of vegetables and fruit. The finding of low intake of vegetables and fruit by cardiologists, with only 20% reporting intake of  $\geq 5$  servings/day, is relevant for several reasons.

This finding suggests, that in large numbers, the personal diet of cardiologists is deficient in this foundational element of a heart healthy diet. But the suboptimal dietary patterns of cardiologists have even broader implications; there is strong evidence that physicians with healthier personal health behaviors are far more likely to counsel their patients about lifestyle changes than are physicians with less favorable lifestyle habits (21). Our findings were consistent with this observation, as cardiologists with the most vegetable and fruit consumption were also more likely to believe it was their responsibility to discuss detailed dietary information with their patients. Therefore, it is conceivable that one way to improve patient counseling-and health-is for physicians to optimize their own diet.

#### *Study Limitations*

The response rate to the distributed surveys was relatively low. Therefore, it is possible that the results do not accurately reflect the experience and attitudes of the larger group of cardiologists and cardiovascular team members. It could easily be speculated, however, that cardiovascular specialists

who did not respond to the nutrition survey might have even less education and engagement with clinical nutrition than those who did respond. As such, even the relatively low level of nutrition education and counseling among cardiologists identified in this survey could well underestimate the true extent of the problem. Compounding this possibility is the common tendency to color survey responses to present a more favorable description than a more objective assessment might render.

Nevertheless, to our knowledge, this survey is the largest ever performed among physicians and health care professionals regarding education, attitudes, and practice of nutritional counseling-and the only such survey of cardiologists.

## CONCLUSION

Although nutrition is described in cardiovascular guidelines as a foundation of care, neither education nor practice among cardiologists and cardiovascular team members reflect that priority. Cardiologists report inadequate training in nutrition, with minimal education in medical school, and often none during internal medicine residency and cardiovascular fellowship training. Fellows in cardiology perceive that they have greater interest in nutrition than their senior mentors.

The current report, while highlighting deficiencies in nutrition education and practice, can also be viewed as spotlighting tremendous opportunities to improve cardiovascular care. The urgency to act quickly is brought to light by the recent plateau in the previous declining trend in cardiovascular mortality-fueled largely by substantial increases in the prevalence of obesity and diabetes (2). It is hoped that the survey presented in this report will serve as a call to action for much greater emphasis on nutrition in the training and practice of cardiovascular specialists, and serve as a template for similar engagement in a wide range of lifestyle interventions.

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**TABLE 1**

Title: Respondent Demographics

Legend: Stage of training/practice, gender, and setting of respondents

Survey Source	n=930	Gender	%
CardioSurve Panel	n=149	Female Cardiologists (n=276)	18%
Interventional Listserv	n=184	Male Cardiologists (n=63)	82%
Academic Listserv	n=133	Female Fellows-in-Training (n=20)	27%
Imaging Listserv	n=115	Male Fellows-in-Training (n=55)	73%
Early Career Listserv	n=65	Female CV Team Members (n=186)	89%
Fellows-in-Training Listserv	n=75	Male CV Team Members (n=21)	11%
Non-Physician CV Team Listserv	n=209		
		Years in Practice (n=551)	%
Stage of Fellowship Training (n=75)	%	10 years or less	28%
1 <sup>st</sup> year	27%	11 to 20 years	26%
2 <sup>nd</sup> year	27%	21 years or more	43%
3 <sup>rd</sup> year	23%		
Subspecialty Fellowships/Unspecified	23%	Physician Practice Setting (n=851)	%
		University based group practice	34%
CV Team Breakout (n=209)	%	Hospital non-university group practice	38%
Nurse Practitioner (and Advanced)	51%	Free standing group practice	13%
Registered Nurse	20%	Solo practitioner	6%
Physician Assistant	14%	VA/Government health facility	5%
Pharmacist	7%		
Other	8%		

## FIGURE TITLES AND LEGENDS

### Figure 1

**Title:** Nutrition Education from Medical School to Fellowship

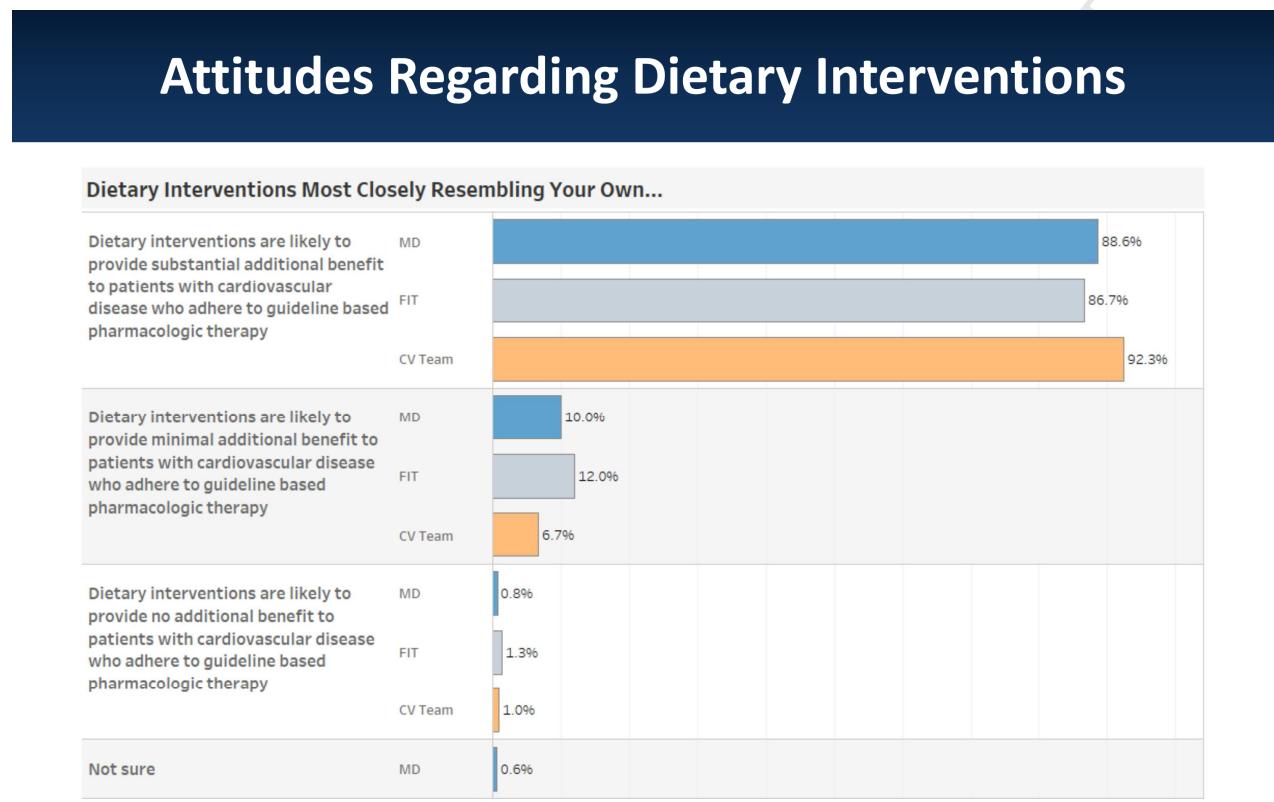
**Legend:** *Q: Did you ever receive a formal, practical lecture, series, or discussion on the role of nutrition and diet in overall health during medical school? Q: Did you receive a formal, practical lecture, series, or discussion on the role of nutrition and diet on overall health during residency? Q: Which statement best describes your recollection of nutrition education during cardiovascular fellowship training?*

## Nutrition Education From Medical School to Fellowship

	During Medical / Professional School		During Residency	
	FIT	MD	FIT	MD
Yes, part of one lecture	0%	4%	7%	2%
Yes, one lecture	24%	17%	21%	9%
Yes, a series of lectures	39%	21%	5%	6%
Yes, a bedside discussion on teaching rounds	0%	3%	11%	7%
No	21%	31%	43%	59%
Don't recall	16%	24%	13%	17%

During Fellowship Training...	FIT	MD
I recall receiving a high level of nutrition education that gave me excellent skills for counseling patients.	0%	1%
I recall receiving a solid nutrition education during my fellowship training that adequately prepared me for counseling patients.	9%	8%
I recall receiving minimal nutrition education during my fellowship training that did not adequately prepare me for counseling patients.	35%	33%
I do not recall receiving any nutrition education during my fellowship training.	56%	57%

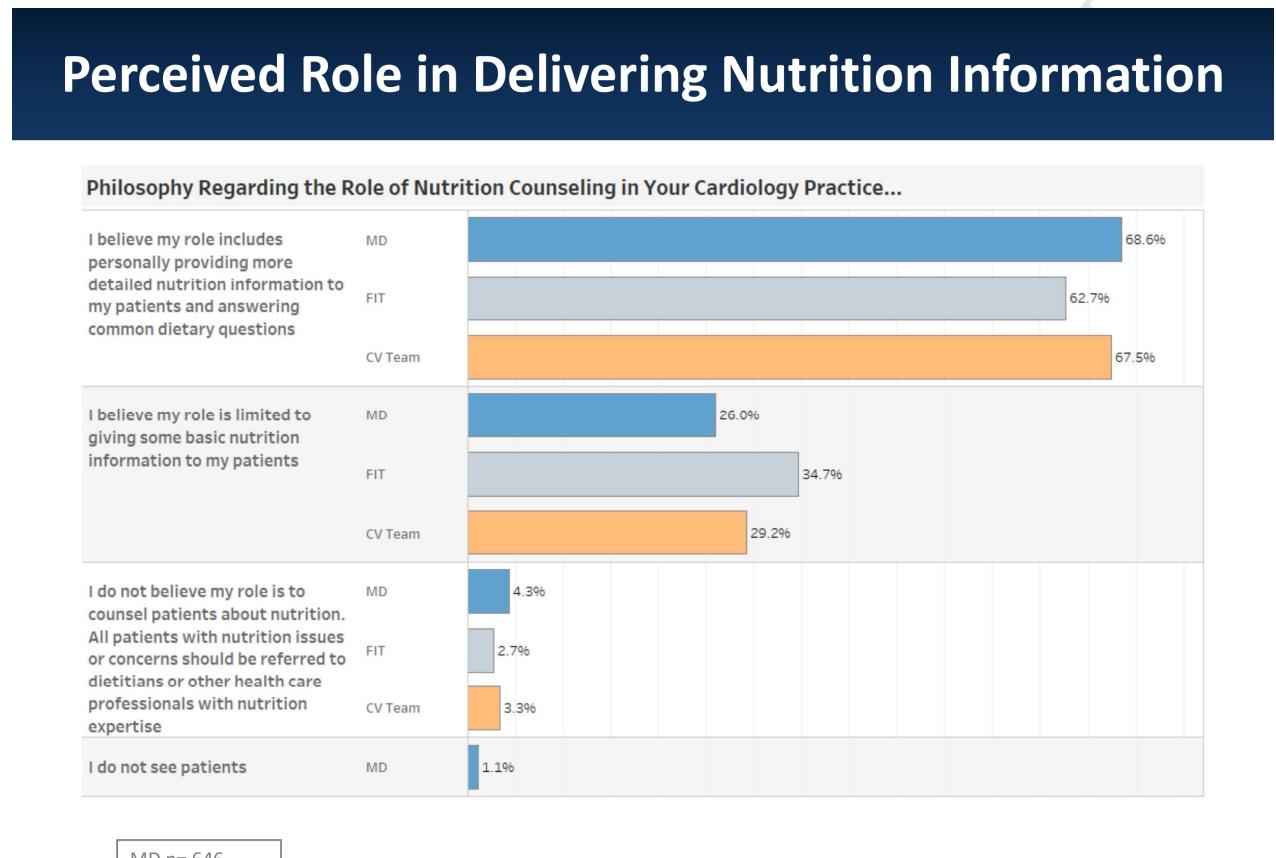
MD n= 646  
FIT n= 75

**Figure 2**Title: Attitudes Regarding Dietary InterventionsLegend: Q: Which of the following perspectives on dietary interventions most closely resembles your own?

**Figure 3**

Title: Perceived Role in Delivering Nutrition Counseling

Legend: Q: Which statement best describes your philosophy regarding the role of nutrition counseling in your cardiology practice?

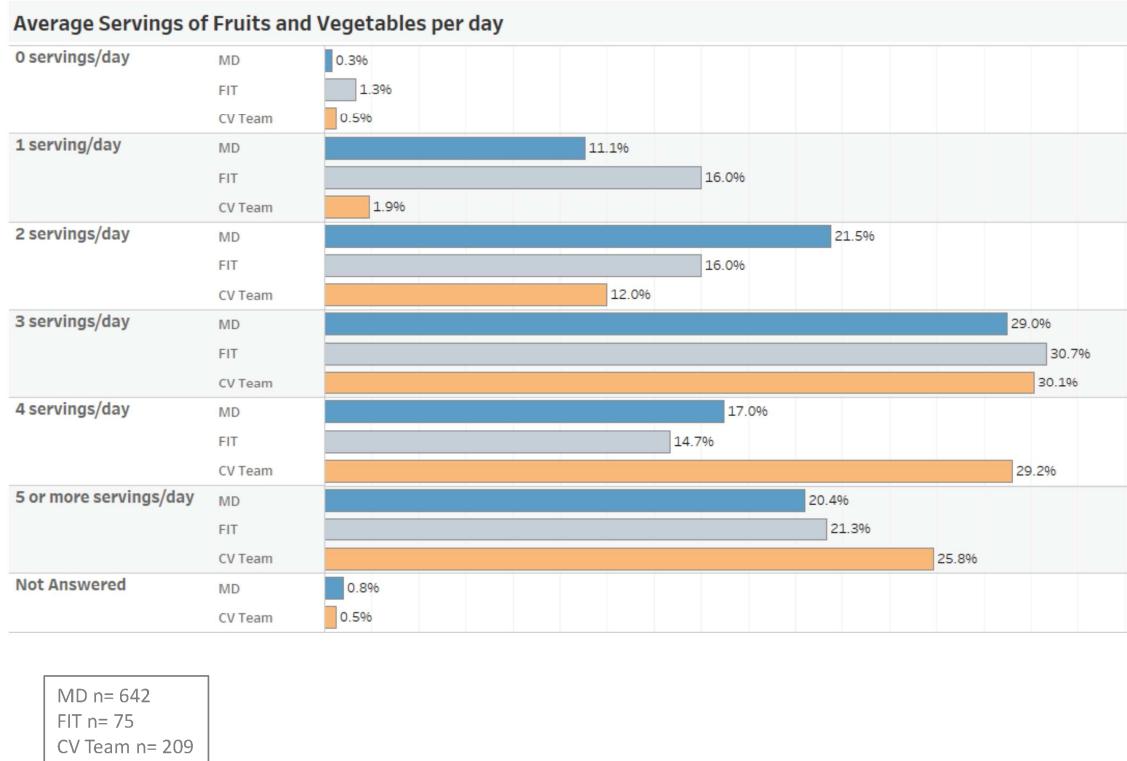


**Figure 4**

Title: Dietary Habits of Cardiovascular Professionals

Legend: *On average, how many servings of fruits and vegetables do you eat every day? (1 cup of uncooked green leafy vegetables = 1 serving; ½ cup of other cooked vegetables peoples = 1 serving)*

## Dietary Habits of Cardiovascular Professionals



## A Deficiency of Nutrition Education and Practice in Cardiology

### *Clinical Significance*

- 90% of surveyed cardiologists reported receiving no or minimal nutrition education during fellowship training
- Nevertheless, 95% of cardiologists believe that their role includes personally providing patients with at least basic nutrition information
- Nutritional interventions are the foundation of clinical care guidelines, yet cardiovascular specialists lack the nutrition education to effectively implement these guidelines