

ORIGINAL RESEARCH

Recent medical graduates' attitudes towards nutrition education and its role in medical practice

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Abstract

The objective of this study was to investigate recent Dalhousie Medical School graduates' perceptions of nutrition in three domains: attitudes towards its use in medical practice generally, learned body of knowledge in medical school and residency, and satisfaction with how undergraduate and postgraduate medical education aligned their attitudes and knowledge of nutrition in medicine.

Graduates of Dalhousie University's undergraduate medical program from 2013 to 2018 were contacted to complete an internet-based questionnaire of 13 five-point Likert scale questions about attitudes, knowledge, and satisfaction with nutrition education in their undergraduate medical studies and medical practice. Responses ranged from one, "strongly disagree" to five, "strongly agree".

Most respondents (90.2%) agreed that 'nutrition counseling can make a positive difference to patient outcomes' and 80.5% agreed that 'physicians can influence patient behavior related to nutrition'. However, fewer (61.0%) agreed that 'physicians play a key role in improving patients' nutritional habits.' Even fewer participants agreed that nutritional assessment (34.1%) and nutritional counselling (41.5%) should be a routine part of care, regardless of specialty. The mean (standard deviation) overall score of participants with regards to their attitudes about nutrition assessment, counselling, and role in patient health, was 3.60 (0.633). Scores ranged from 1 to 5 with higher score indicating more positive attitude. Mean overall knowledge and satisfaction scores were 3.76 (0.702) and 2.70 (0.898), respectively.

There is a lack of consensus regarding the role of physicians in delivering nutrition care to patients, despite its perceived importance to patient health, requiring further exploration.

Introduction

The prevalence of noncommunicable diseases as a result of poor diet and obesity has increased significantly in recent years, contributing to rising health-care expenditures, morbidity, and mortality^{1,2}. Diet was ranked in second most influential risk factor contributing to disability-adjusted life years in Canada as of 2016³. Developed countries have witnessed unprecedented rises in chronic diseases such as cardiovascular disease and diabetes, which are known to be mediated largely by modifiable lifestyle factors². Lifestyle interventions are effective for the prevention and first-line management of chronic disease, or as adjuncts to other medical treatments⁴⁻⁷. The etiology of obesity and other chronic diseases is multifaceted, requiring intervention from healthcare providers at the level of individual patients as well as public policy^{8,9}.

It is well-recognized that diet has a fundamental role in health and disease; therefore, most physicians identify nutrition counseling as one of their major pro-

fessional responsibilities¹⁰⁻¹². There is evidence that doctors have the ability to improve nutrition behaviours of patients who have, or are at risk of developing, chronic diseases related to lifestyle factors¹³. Patients entrust their doctors with the task of addressing lifestyle influences such as diet and expect to receive counsel that is current and reliable^{14,15}. Despite this, physicians have consistently reported low rates of counselling patients about lifestyle^{10,16,17}. Rates of malnutrition in Canadian hospitals is high, and malnutrition often goes unrecognized by medical professionals^{18,19}. A Canadian survey reported that physicians believe hospital inpatients should have nutrition assessments performed throughout their hospitalization; however, most reported that these assessments were being completed inconsistently¹⁹. The consequences of this reality are increased length of hospital stay¹⁸, worsened patient outcomes, and elevated costs of care²⁰.

Barriers to nutrition counselling have been commonly cited by physicians, including insufficient time, lack of reimbursement, a perception that lifestyle

counselling is ineffective, and a deficiency of knowledge and confidence in the subject matter¹⁷. A Canadian study showed that physicians had an average self-assessed clinical nutrition knowledge of 5.3 on a scale of 1 to 10¹⁹. Certain medical subspecialties provide more nutritional training than others; however, practicing physicians and trainees in these fields often perceive a deficit in one or more areas of their training in nutrition^{11,21,22}.

A 2010 survey of Canadian medical students reported that 87.2% of participants thought their program should devote more time to teaching nutrition concepts²³. Of the nine medical schools that Gramlich surveyed in 2010, students of Dalhousie were from one of two schools self-reporting the lowest number of hours devoted to education in their curriculum. Recent studies investigating nutrition education in Dalhousie's undergraduate medical program reveal that students are still not satisfied with the amount of nutrition education they have received since Gramlich's 2010 study²³⁻²⁵.

While other researchers have explored the nutrition knowledge and attitudes of Canadian medical residents^{11,26}, these studies have fixated on residents of one subspecialty. Instead, we hope to draw comparisons between residents of different programs who had received the same baseline level of nutrition education in their undergraduate medicine program.

Objectives

The objective of the present study was to determine Dalhousie Medical School graduates' perceptions of nutrition in three domains: their attitudes towards its use in medical practice generally, their learned body of knowledge in medical school and residency, and their satisfaction with how their undergraduate and post-graduate medical education aligned to their attitudes and knowledge of nutrition in medicine²⁵.

Materials and Methods

Study design

The study design for this project was cross-sectional and conducted using a web-based questionnaire. The participants were recent Dalhousie medical graduates from 2013 through 2018. The study population includes participants from a range of specialties and levels of experience. The pool from which participants were drawn consisted of 685 Dalhousie medical graduates from the graduation years of interest.

The questionnaire was reviewed independently in a face and content validation by clinicians and by researchers with a significant background in nutrition and physical activity research. The questions were or-

ganized into three domains: attitudes about nutrition in medical practice, knowledge about nutrition concepts in medicine, and satisfaction with nutrition education received in medical school and residency programs. Demographics, including gender, medical subspecialty, and previous education in nutrition and/or physical activity were also collected. Attitudes, knowledge, and satisfaction with physical activity education in medical school and residency were addressed in subsequent sections, and these data will be reported and analyzed in a separate publication. Questions were designed to facilitate responses on a 5-point Likert scale with the following options: strongly disagree, disagree, neither agree or disagree, agree, or strongly agree. Participants had the option to leave additional comments, which would not be formally analyzed, but used in discussion of the study results. The questionnaire domains were analyzed based on the level of agreement with each statement and are summarized in table 1.

The research tool was administered through a secure online survey platform, Opinio version 7.11, which was emailed to Dalhousie Medical Alumni Association (DMAA) from graduating years 2013 through 2018 via the DMAA Listserv. DMAA administration were responsible for the dissemination of the email to preserve the anonymity of eligible participants. The survey was also shared to a private social media group whose membership consists of Dalhousie medical alumni. A cover letter described the nature and purpose of the study, and detailed the components of consent, privacy, confidentiality, and contact information for the lead researchers. The survey design and study were approved by the Dalhousie University Research and Ethics Board in May 2019.

Data was analyzed using SPSS software version 25 (IBM, Armonk, NY). Descriptive statistics (means/standard deviations and medians/interquartile ranges [continuous variables] and counts/percentages [categorical variables]) were used to summarize survey responses and participant characteristics. According to the 5-point Likert scale percentage agreement was analyzed, with a score of 4 (agree) or 5 (strongly agree) indicating agreement, a score of 3 indicating a neutral response, and a score of 1 (strongly disagree) or 2 (disagree) indicating disagreement. Independent samples T-tests were used to compare the results between those with and without previous nutrition education, males and females, and to compare current residents with those who had already completed residency. The scores from each domain (attitudes, knowledge, and satisfaction) were then combined and an average score was determined for each domain. Normality was confirmed for the data in each domain with the Shapiro-Wilk test of normality. Pearson correlation tests were used to

Table 1. Study questionnaire domains and statements.

Domain	Statements
Questions regarding nutrition attitudes	"Nutritional counselling can make a positive difference to patient health outcomes."
	"Physicians play a key role in improving patients' nutritional habits."
	"Nutritional assessment should be part of routine care by all physicians, regardless of specialty."
	"Nutritional counselling should be part of routine care by all physicians, regardless of specialty."
	"Physicians can influence patient behaviour related to nutrition."
Questions regarding nutrition knowledge	"I know basic nutrition concepts." (i.e. types of macro and micronutrients)
	"I understand the role of nutrition in the pathophysiology of specific diseases." (i.e. cancer, cardiovascular, respiratory diseases)
	"I understand the role of nutrition in the treatment of disease." (i.e. nutrition recommendations to lower cholesterol levels)
	"I know how and where to access credible nutrition information and/or resources." (i.e. Canada's Food Guide, Harvard Nutrition Source, a registered dietitian)
Questions regarding satisfaction with nutrition education	"The amount of time dedicated to nutrition education in my medical education and residency training seems appropriate."
	"Nutrition education is/was well integrated into various aspects of my curriculum."
	"My medical education and residency training in terms of nutrition has prepared me for my career as a physician."
	"I feel that I am able to provide my patients with adequate nutritional counselling."

assess the relationships between attitudes, knowledge, and satisfaction. The significance level for all tests was set at $\alpha \leq 0.05$.

Results

Respondent characteristics

Of the 685 eligible Dalhousie Medical graduates who were contacted, a total of 53 individuals participated in the questionnaire, of which 12 participants did not complete the demographics section and were excluded from analysis (table 2). A broad range of specialties were represented, but Family Medicine comprised the majority (56.1%) of respondents. Resident physicians made up 58.5% of the responses, and attending physicians encompassed the remaining participants. Over half of the survey respondents were female (68.3%) and 22% of study participants reported previous nutrition education, including nutrition research, university nutrition courses, clinical nutrition experiences, and independent study (defined as "other").

Attitudes regarding nutrition in medical practice

There were five statements reflecting positive attitudes towards nutrition in health, as well as nutrition assessment and counselling in medical practice, for which the participant responses could range from strongly disagree to agree on a scale of 1 to 5. Generally, respondents agreed with these statements, resulting in an average mean domain response of 3.60 (+/- 0.633).

Respondents most strongly agreed (90.2%) with the statement that, "Nutrition counselling can make a positive difference to patient health outcomes", and zero responses indicating disagreement (Figure 1). The questions exploring physician roles in nutrition care for patients yielded more variability. Regarding routine nutrition counselling by physicians of any specialty, only 41.5% of participants agreed, while 36.6% disagreed that it should take place. "Nutritional assessment should be a routine part of care by all physicians, regardless of specialty", was met predominantly with disagreement (46.3%) or neutrality (19.5%). Most physicians agreed (80.5%), however, that they are able to influence patient's nutrition behaviours (Figure 1).

Self-perceived nutrition knowledge of new physicians

This section of the questionnaire yielded the most positive responses from study participants. Among all four questions in this category, none of the respondents selected, "strongly disagree". The first statement, "I know basic nutrition concepts", resulted in the highest level of agreement (85.4%). The lowest level of agreement (61%) was produced for the statement, "I understand the role of nutrition in the pathophysiology of specific diseases". Participants expressed more confidence in their knowledge of the role of nutrition in the treatment of disease with 68.3% in agreement, as well as where they could look to find credible nutrition information, for which 80.5% of respondents agreed (Figure 1).

Table 2. Characteristics of study participants.

Demographic Characteristics	No. (%)
Gender	
Female	28 (68.3)
Male	13 (31.7)
Previous nutrition education*	
Yes	10 (24.4)
No	29 (70.7)
Other	2 (4.9)
Current medical resident	
Yes	24 (58.5)
No	17 (41.5)
Current or previous residency specialty	
Family	23 (56.1)
Other**	18 (43.9)

* Degree in nutrition or related field, Nutrition research, Nutrition course(s) post-high school, Clinical experience; Other.

** Anaesthesiology, Dermatology, Internal Medicine including subspecialties, Neurology, Pathology, Pediatrics, Physical Medicine and Rehabilitation, Psychiatry, and Surgery.

Perceived adequacy of nutrition education in medical school and residency training

The average mean satisfaction with nutrition education in medical school and residency was low (2.70 +/- 0.898). Three of four statements in this category generated mainly negative responses. Only 26.9% of study participants felt that their nutrition education in medical school and residency prepared them for their career, and furthermore, 58.5% felt that this aspect of their education was poorly integrated into the curriculum. Just 37.5% of participants agreed that they were able to provide their patients with adequate nutrition counselling (Figure 2).

Effect of demographic characteristics on survey responses

Demographic characteristics were explored for their effects on questionnaire responses, including previous participant nutrition education (yes or no), medical specialty (family medicine or other), and current medical residents versus physicians who had completed residency training. There were no significant differences in the responses between genders (Figure 3), status of nutrition education prior to medical school (figure 4), nor between family medicine specialists and other

medical specialists (Figure 5). There was only one question demonstrating a significant difference between current residents and physicians who had completed residency training ($p = 0.005$), the latter of whom were more in agreement with the statement, "The amount of time dedicated to nutrition education in my medical education and residency training seems appropriate" (Figure 6).

Correlations between attitudes, knowledge, and satisfaction

The three survey domains of attitudes, knowledge, and satisfaction were compared to determine if there were any correlations between them. There was no significant correlation between attitudes and knowledge ($r = 104$, $p = .517$), nor between attitudes and satisfaction ($r = -.258$, $p = .103$). However, there was a significant positive correlation between knowledge and satisfaction domains ($r = .584$, $p < 0.001$).

Discussion

In this survey, new physicians were largely in agreement that nutrition counselling plays an important role in patient health and that physicians can influence nutrition-related patient behaviours. Concerning more specific responsibilities of physicians, participants rated nutrition assessment as less important than nutrition counselling. Respondents identified their knowledge of basic nutrition concepts to be very strong, regardless of prior education, and yet their understanding of nutrition in the context of disease pathophysiology to be comparatively weaker. Despite this, most participants agreed that they understand the role of nutrition in disease management and where to access relevant and reliable nutrition information. Finally, the perceptions of nutrition education received in medical school and residency were strongly negative, especially regarding the amount of time allotted to nutrition education during medical training. Neither gender, prior nutrition education, medical specialty, nor residency status had a significant impact on participant responses in the three categories being assessed. Those with a higher level of satisfaction with their nutrition training also reported a higher level of nutrition knowledge in the context of medicine, and vice versa.

Compared to a 2018 study of medical students at Dalhousie University, from which the current study was modelled, there were similar results. In terms of attitudes, medical students' responses mirrored those of the new physicians, reflecting the strongest agreement with statements reinforcing the role of nutrition in patient health, and the weakest level of agreement with statements about nutrition counselling and as-

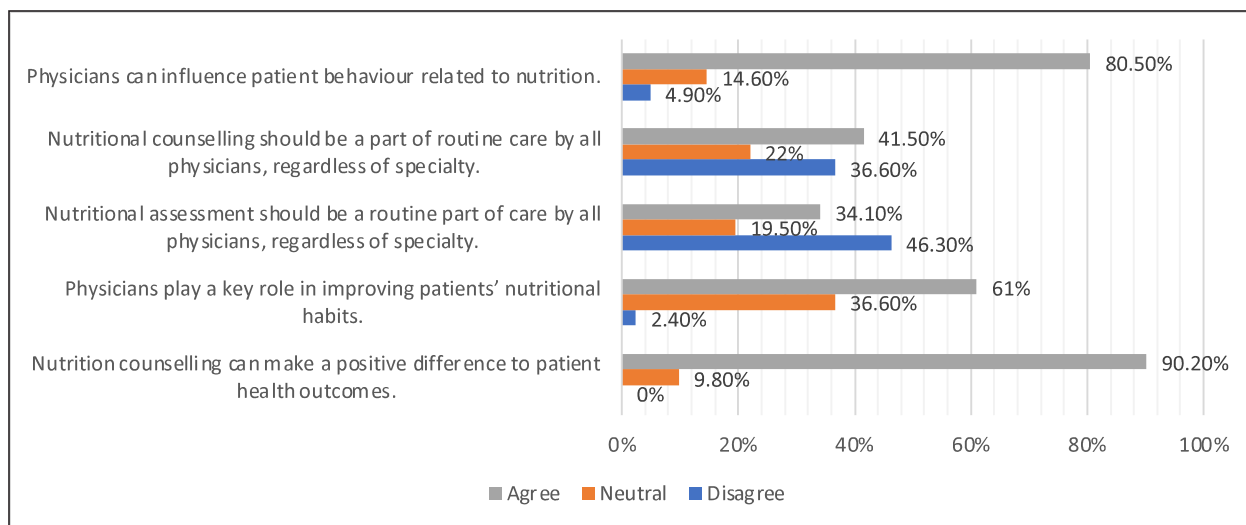


Figure 1. Recent medical school graduates' attitudes towards nutrition in medical and residency education and practice. Percentage agreement was determined according to the 5-point Likert scale, with a score of 5 (strongly agree) or 4 (agree) indicating agreement, a score of 3 (neither agree nor disagree) indicating neutral, and a score of 2 (disagree) or 1 (strongly disagree) indicating disagreement.

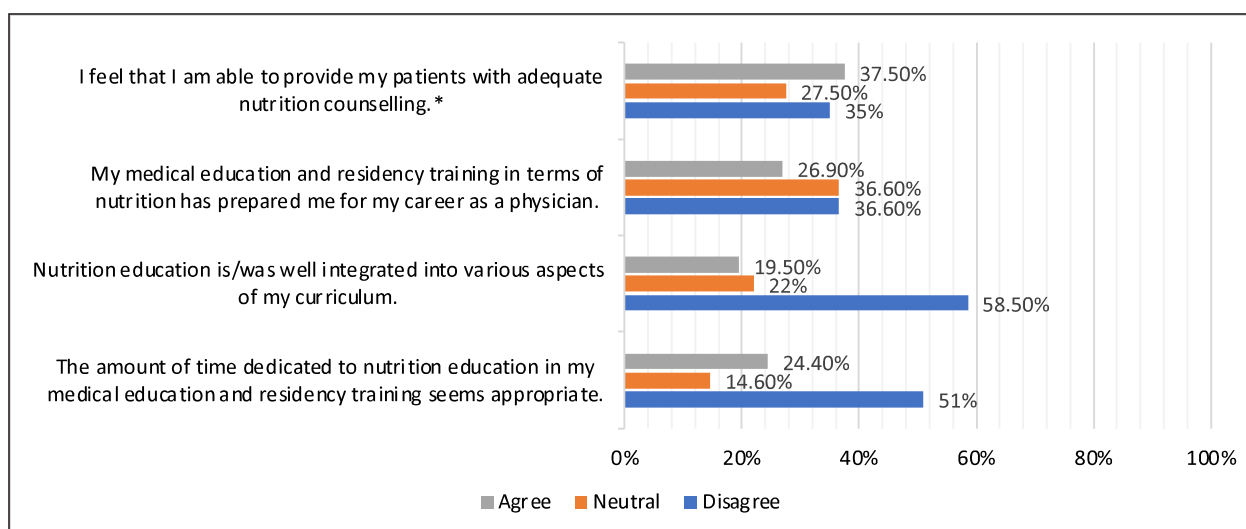


Figure 2. Recent medical school graduates' satisfaction with nutrition education in medical school and residency training. Percentage agreement was determined according to the 5-point Likert scale, with a score of 5 (strongly agree) or 4 (agree) indicating agreement, a score of 3 (neither agree nor disagree) indicating neutral, and a score of 2 (disagree) or 1 (strongly disagree) indicating disagreement.

assessment²⁵. Hanninen's study of Dalhousie medical students' perceptions of nutrition curriculum in 2019 also resulted in almost complete agreement that nutrition is important in disease prevention and management and that physicians should be involved in initiatives that promote healthy lifestyles²⁴.

In 1985 there was a survey of American medical schools which identified inadequate levels of nutrition education being offered in medical curriculums, prompting new recommendations regarding nutrition education hours and outcomes²⁷. Despite programming to encourage the adoption of these recommen-

dations, most institutions in the United States to this date do not meet them^{28,29}. In Canada, there are also concerns about the amount of nutrition education being offered in undergraduate and postgraduate medical education. Three studies have reported on medical student perceptions of nutrition education at Dalhousie's undergraduate nutrition program, agreeing that there is insufficient nutrition instruction in the curriculum^{23,24}. This is consistent with current literature demonstrating a paucity of nutrition education throughout medical school and residency in North American medical education programs^{10,26,30-32}.

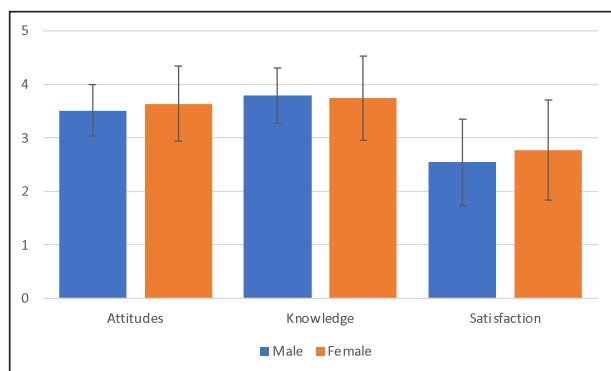


Figure 3. Attitudes, knowledge, and satisfaction among male and female participants. The score for each domain is based on the average 5 point Likert scale (1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, 5=strongly agree). There were no significant differences between either group in any of the domains.

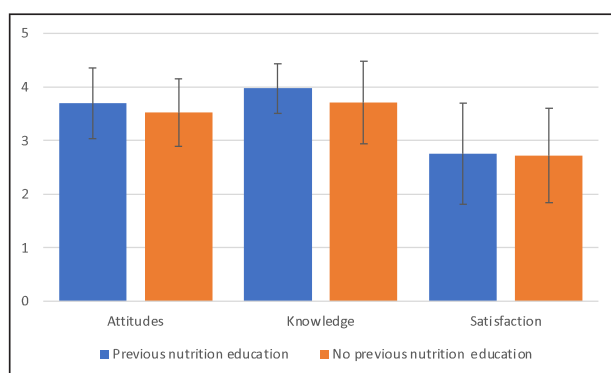


Figure 4. Attitudes, knowledge, and satisfaction between those with previous nutrition education* and those without previous nutrition education. The score for each domain is based on the average 5 point Likert scale (1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, 5=strongly agree). There were no significant differences between either group in any of the domains.*Degree in nutrition or related field; Nutrition research; Nutrition course(s) post-high school; Clinical experience; Other.

Among post-graduate medical trainees, gastroenterologists in Canada have expressed that nutrition training is underemphasized in their programs³³. Similarly a survey of American cardiologists revealed that 90% of participants did not receive nutrition education during their fellowship¹⁰. Family medicine residents have also reported barriers to nutrition education with one study reporting lack of time allotted to nutrition, time-constrained faculty, absence of expert faculty, and inconsistencies in the nutrition information they receive³⁴.

Numerous programs have aimed to address the deficiency of nutrition education during medical training, not limited to interprofessional and integrated curriculums, online modules, and nutrition-focused rotations^{21,22,35}. Despite this, there is no consensus on how

to improve nutrition education for medical students, trainees, and staff. Mentorship in nutrition throughout training can foster more favourable views of lifestyle counseling among trainees and contribute to higher levels of confidence in performing nutrition counseling with patients³⁶. Recommendations from Hanninen's study of Dalhousie medical students, were to introduce longitudinal programming of nutrition materials, utilize dietitians as expert educators, and continue to evaluate and adapt the existing curriculum²⁴.

Implications and future directions

The results of this study may help determine whether nutrition education in medical school has an impact on future practice and identify areas of nutrition education in medical training which may require further evaluation. The results of the questionnaire and comments made by participants prompt other potential research questions. For example, it may be beneficial to include a nutrition knowledge questionnaire in future studies to objectively evaluate or validate the understanding of physicians regarding important nutrition topics. Furthermore, participants could be questioned regarding what types of learning activities would most benefit them, such as expert mentorship, increased didactic teaching, or interprofessional learning opportunities. One comment, "I don't feel that physicians should be the primary people counselling on nutrition. We have dietitians for this and should use them as adjuncts just like we use physiotherapists or social workers", questions whether physicians are the most qualified persons to offer nutrition advice. Future studies should investigate how physicians and dietitians can collaborate to provide appropriate nutrition care for patients in various settings. Contrasting the results of this questionnaire with actual physician practices, such as time spent nutrition counselling, tests ordered to establish nutrition status, and the number dietitian referrals made, could be valuable. The written comments were extremely interesting to read and a qualitative study on this topic should be considered to account for the nuances of patient care in medicine.

Strengths and weaknesses

The most significant weakness of this study was the small sample size, with only 41 out of 685 eligible individuals participating. Among those who completed the questionnaire, demographic criteria were not equally represented, making it difficult to establish significant differences between groups. These factors limited the statistical analyses which could be performed, and the ability to generalize these results to the larger population. Despite this, the respondents overwhelmingly

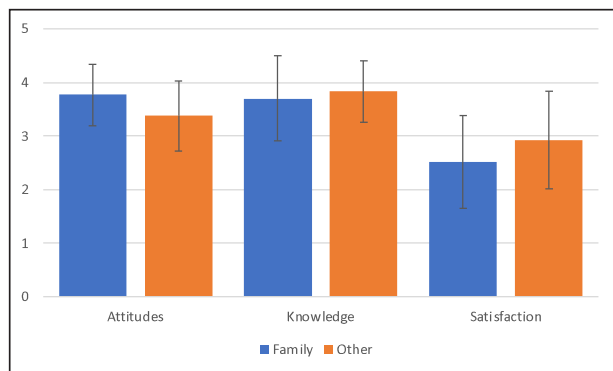


Figure 5. Attitudes, knowledge, and satisfaction between family medicine specialists and other medical specialists*. The score for each domain is based on the average 5 point Likert scale (1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, 5=strongly agree). There were no significant differences between either group in any of the domains. * Other specialists included: Anaesthesiology, Dermatology, Internal Medicine including subspecialties, Neurology, Pathology, Pediatrics, Physical Medicine and Rehabilitation, Psychiatry, and Surgery.

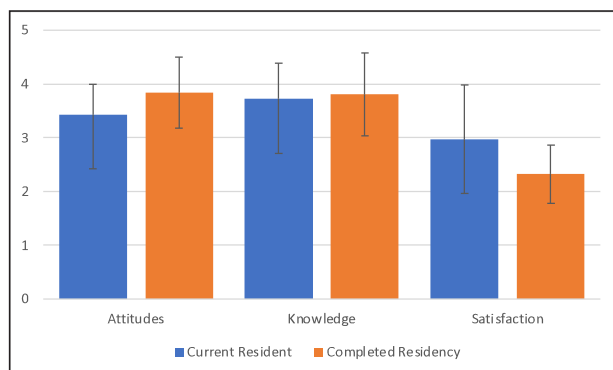


Figure 6. Attitudes, knowledge, and satisfaction between current residents and physicians who had completed residency. The score for each domain is based on the average 5 point Likert scale (1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, 5=strongly agree). There were no significant differences between either group in any of the domains

agreed that nutrition is important to patient health and that physicians have the power to change patient health behaviors, and the majority disagreed that their nutrition education in medical school was sufficient. While we cannot fully assess the significance of these results, it is reassuring to note that the responses we received are consistent with other studies' findings^{24,25}. The study included respondents graduating over a 5-year time period, but the year of graduation was not requested in efforts to protect anonymity; however, this information may have been useful to evaluate how attitudes and perceptions change with practice, and to account for variability in yearly curriculum. Although the sample size was small, it is important to recognize that some

medical school graduates had these responses, as the results from this study may inform future research or be used in curriculum planning discussions.

Another weakness of the study was the use of a questionnaire that had not been previously validated. However, the questions were based on a prior study which examined the same parameters among medical students²⁵. The inclusion criteria were restricted to graduates of Dalhousie University only, and therefore the results cannot be generalized to other medical school graduates. With greater than 1 out of 5 of participants reporting prior nutrition education and demonstrating greater confidence in their nutrition knowledge, pre-medical school training could have influenced our results; future studies should account for the influence of previous nutrition training.

The major strength of the study was in evaluating these parameters among new physicians, helping to establish whether nutrition education in medical school has an enduring impact on practicing physicians.

Conclusion

The participants had overwhelmingly positive attitudes regarding the role of nutrition in patient health, and the ability of physicians to impact patient nutrition behaviours. While they agreed that physicians do have a role in promoting healthy diet, they were less certain about their role in nutrition assessment and counseling. Overall, participants were dissatisfied with the amount of nutrition education they received throughout their medical education. Future research on the role of physicians in nutrition care, and particularly which types of medical specialists should be engaged most extensively in these practices, is needed so that the nutrition component of the medical school curriculum can be improved for training physicians.

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Appendix I

Frequency of Nutrition Questionnaire Responses (%)

Question					
Nutrition Attitudes					
	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
Nutrition counselling can make a positive difference to patient health outcomes.	0 (0.0)	0 (0.0)	4 (9.8)	18 (43.9)	19 (46.3)
Physicians play a key role in improving patients' nutritional habits.	0 (0.0)	1 (2.4)	13 (36.6)	21 (51.2)	4 (9.8)
Nutritional assessment should be a routine part of care by all physicians, regardless of specialty.	1 (2.4)	18 (43.9)	8 (19.5)	11 (26.8)	3 (7.3)
Nutritional counselling should be a part of routine care by all physicians, regardless of specialty.	2 (4.9)	13 (31.7)	9 (22.0)	15 (36.6)	2 (4.9)
Physicians can influence patient behaviour related to nutrition.	0 (0.0)	2 (4.9)	6 (14.6)	25 (61.0)	8 (19.5)
Nutrition Knowledge					
I know basic nutrition concepts. (e.g. types of macro and micronutrients)	0 (0.0)	3 (7.3)	3 (7.3)	25 (61.0)	10 (24.4)
I understand the role of nutrition in the pathophysiology of specific diseases. (e.g. cancer, cardiovascular, respiratory diseases)	0 (0.0)	8 (19.5)	8 (19.5)	20 (48.8)	5 (12.2)
I understand the role of nutrition in the treatment of diseases. (e.g. nutrition recommendations to lower cholesterol levels)	0 (0.0)	7 (17.1)	6 (14.6)	24 (58.5)	4 (9.8)
I know how and where to access credible nutrition information and/or resources. (e.g. Canada's Food Guide, Harvard Nutrition Source, a registered dietitian)	0 (0.0)	5 (12.2)	3 (7.3)	26 (63.4)	7 (17.1)
Perceptions of Nutrition Education					
The amount of time dedicated to nutrition education in my medical education and residency training seems appropriate.	12 (19.3)	13 (31.7)	6 (14.6)	8 (19.5)	2 (4.9)
Nutrition education is/was well integrated into various aspects of my curriculum.	6 (14.6)	18 (43.9)	9 (22.0)	6 (14.6)	2 (4.9)
My medical education and residency training in terms of nutrition has prepared me for my career as a physician.	3 (7.3)	12 (29.3)	15 (36.6)	9 (22.0)	2 (4.9)
I feel that I am able to provide my patients with adequate nutrition counselling.*	2 (5.0)	12 (30.0)	11 (27.5)	14 (35.0)	1 (2.5)

* One participant chose N/A for question 13, making up 2.4% of responses for that question.

Appendix 2

Mean and Standard Deviation of Questionnaire Responses

N=41 (five-point Likert scale, one = strongly disagree; five = strongly agree)

Question	
Nutrition Attitudes	
	Mean (Std. Deviation)
Nutrition counselling can make a positive difference to patient health outcomes.	4.37 (+/- 0.662)
Physicians play a key role in improving patients' nutritional habits.	3.68 (+/- 0.687)
Nutritional assessment should be a routine part of care by all physicians, regardless of specialty.	2.93 (+/- 1.058)
Nutritional counselling should be a part of routine care by all physicians, regardless of specialty.	3.05 (+/- 1.048)
Physicians can influence patient behaviour related to nutrition.	3.95 (+/- 0.740)
Nutrition Knowledge	
I know basic nutrition concepts. (e.g. types of macro and micronutrients)	4.02 (+/- 0.740)
I understand the role of nutrition in the pathophysiology of specific diseases. (e.g. cancer, cardiovascular, respiratory diseases)	3.54 (+/- 0.951)
I understand the role of nutrition in the treatment of diseases. (e.g. nutrition recommendations to lower cholesterol levels)	3.61 (+/- 0.891)
I know how and where to access credible nutrition information and/or resources. (e.g. Canada's Food Guide, Harvard Nutrition Source, a registered dietitian)	3.85 (+/- 0.853)
Perceptions of Nutrition Education	
The amount of time dedicated to nutrition education in my medical education and residency training seems appropriate.	2.39 (+/- 1.243)
Nutrition education is/was well integrated into various aspects of my curriculum.	2.51 (+/- 1.075)
My medical education and residency training in terms of nutrition has prepared me for my career as a physician.	2.88 (+/- 1.005)
I feel that I am able to provide my patients with adequate nutrition counselling.*	2.93 (+/- 1.081)

Appendix 3

Average means (\pm Standard Deviation) for questionnaire domains: Attitudes, Knowledge, and Satisfaction

(five-point Likert scale, one = strongly disagree; five = strongly agree)

Questionnaire Domain	Mean (Std.Deviation)
Attitudes	3.60 (+/- 0.633)
Knowledge	3.76 (+/- 0.702)
Satisfaction	2.70 (\pm 0.898)

Appendix 4

Participant comments

"I am in diagnostics so I do not interact with patients"

"This is easier said than done. Get some practical experience and you will see"

"I feel competent to provide basic counselling but would defer to a dietician when needed. Most physicians would likely be limited in terms of the amount of time they could spend discussing nutrition."

"I don't feel that physicians should be the primary people counselling on nutrition. We have dieticians for this and should use them as adjuncts just like we use physiotherapists or social workers."

"A place to potentially slot more nutritional education in would be professional competencies in the tone of how it would affect low SES patients."

"All specialists do not have time to provide nutritional counselling nor should it be a routine part of a consultation if not relevant. But if a patient's nutritional habits directly impact the care provided by a specialist they should be addressed."

"For specialist, nutrition counselling may be challenging because of the length of time between visits (may only see them once a year). Patient adherence is also a challenge. In depth nutrition counselling for patients only really becomes relevant if they can make a good start on the basics first."

"We had next to no nutrition in our curriculum. Anything I know is based on my own learning through various fitness programs as I am a trained fitness instructor"

"I have some serious questions regarding the evidence for the nutritional education I was given during medical school. I am not convinced that a low fat, high carbohydrate diet is healthful or that excess weight is caused by more calories in than out."

"My answer to #13 is based on SELF-STUDY and critical appraisal of literature and my formal medical education CAN NOT take credit for my current abilities in nutritional counselling, as I consider it a special interest of mine on par with obstetrics or palliative care"

"I feel the role of in-depth nutritional counselling is best suited, both in expertise and available time, to the role of a dietician. My role as family doc is to encourage and know high level"