

ORIGINAL RESEARCH

Medical students' perceptions of nutrition in medical education and future practice

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Abstract

Keywords: medical education, nutrition, medical students, physicians, undergraduate, lifestyle medicine

Background: Physicians are relied upon as knowledgeable sources of nutrition information; however, many report low nutrition knowledge.

Objective: The present study assessed first and second-year medical students' perceptions of nutrition education within the medical curriculum, in terms of their attitudes, learned body of knowledge, and satisfaction.

Methods: An online questionnaire was administered to Dalhousie University medical students completing their first or second year (N=125). Mann-Whitney U tests compared the responses of first-year to second-year students, as well as those with and without previous nutrition education.

Results: 97.6% of respondents agreed that nutritional counselling can positively influence patient outcomes, with 91.2% agreeing that physicians play a key role in nutritional counselling. Compared to second-year students, first-year students had greater self-perceived knowledge of basic nutrition concepts ($p<0.001$) and nutrition in the treatment of disease ($p=0.005$), as did students with previous nutrition education compared to those without ($p=0.019$ and 0.018 respectively). Satisfaction was <30% agreement, with first-year students more satisfied with their nutrition education than second-year students ($p<0.05$).

Conclusion: First and second-year medical students regard nutrition as an important component of medical practice that can positively impact patient outcomes. However, low satisfaction with their nutrition education suggests that additional nutrition curriculum would better prepare them for future practice.

Introduction

The importance of nutrition in achieving and maintaining good health is well recognized. A report by the World Health Organization describes a global shift in dietary habits toward an increased intake of processed, low-quality foods, contributing to the development of chronic, non-communicable diseases¹. A recent study reported that diet is the top risk factor associated with death and the second highest risk factor associated with disability in Canada². As such, diet is an important modifiable lifestyle behaviour for the health care system as well as those who provide primary care, to target.

Family physicians are relied upon as knowledgeable sources of nutrition information³. However, evidence suggests that they do not provide this type of counselling to patients, due to reasons such as perceived lack of knowledge and access to resources⁴⁻⁶. This may be attributed to a lack of nutrition education during medical school⁷ and in residency training⁸⁻¹⁰. Results

from a pivotal survey of primary care physicians demonstrated that 67% of respondents reported a lack of training in nutrition counselling⁵. Previous surveys of Canadian medical students' perceptions of nutrition education reported high perceived importance of nutrition in medical practice alongside low satisfaction with nutrition education^{11,12}. In the current Dalhousie Medical School curriculum, the primary nutrition-centered lectures are delivered in the middle of first-year of medical school during the gastroenterology unit. There is occasional integration of nutrition content dispersed throughout other units, when relevant; however, first-year is the primary source of formal, dedicated nutrition education in the medical school curriculum. Yet, no studies to date have examined first year medical students' perceptions of their nutrition education to further elucidate its current state and potential avenues for improvement.

The primary purpose of this study was to determine first and second-year medical students' perceptions of nutrition education at Dalhousie medical school,

in terms of their attitudes toward its use in general medical practice, their learned body of knowledge, and their satisfaction with how the medical school curriculum links nutrition content with its application to medical practice. Secondary goals of the current study were to determine if there are any differences in these domains according to year of study and previous nutrition educational experiences.

Methods

Subjects

Participants were first and second-year Dalhousie University medical students at the Halifax and New Brunswick campuses. The survey was administered after completion of their respective year of studies. First and second-year comprise the pre-clerkship period, when the majority of didactic teaching is provided identically to all students (same instructor, content, and delivery) prior to students entering the clinical environment where learning is less uniform. First and second-year medical students were chosen for the present study to assess medical students' perspectives on nutrition directly after lecture-based nutrition education is provided, in order to minimize the potential confounding influence of the variation of nutrition education students may receive in clinical clerkship. Upon completion of their respective years of medical school (spring-time), first and second year Dalhousie medical students were invited to participate through emails distributed by the Undergraduate Medical Education office and Dalhousie Medical Student Society, as well as through social media. This study was approved by the Dalhousie University Research Ethics Board (file # 2018-4468). All participants provided informed consent prior to participating in this study.

Survey

Because there was no existing standardized questionnaire to collect the data we required, the Nutrition and Physical Activity Education Questionnaire (NPAEQ, see Additional File 1) was developed for the present study to capture (1) attitudes towards nutrition in medical practice, (2) self-assessed knowledge of nutrition-related topics, (3) satisfaction with nutrition content within the medical curriculum, and (4) demographic information, including of year of study and previous nutrition education. These four domains were chosen after reviewing preexisting literature^{10,13-17} which assessed and evaluated curricular aspects of undergraduate medical education in order to create the optimal survey for our specific research objective. A novel survey was created by the authors

of the current study in order to examine our objectives that did not fit within the parameters of pre-existing surveys. For example, prior Canadian research on similar topics, such as that of Gramlich et al., used a broader survey. They examined medical students' perceptions of nutrition education Canada-wide, compared to our study which focused on a single institution. Gramlich et al. assessed areas such as students' preferred learning format, number of hours dedicated to nutrition education, and which topics within nutrition education were being included in the various programs¹¹. This is valuable data that provided a helpful basis for our study. Our survey was unique such that it focused specifically on students' subjective perceptions, rather than an objective evaluation of the curriculum, which was not the objective of the current study. Another reason why a novel survey was created was to maximize the response rate among busy medical students by formulating a concise yet comprehensive data collection tool that would be easy to complete.

We conducted a literature review on Google Scholar using the following terms: 'Nutrition Education,' 'Undergraduate Medical Education,' 'Undergraduate,' 'Nutrition,' 'Education,' and 'First-Year Medical School,' as well as combinations of these aforementioned terms. In the process of creating a novel survey, we critically considered each of the questions we included based on feedback from experts, thus ensuring a rigorous methodological approach and foundation for our research question. Questions were based on the 5-point Likert scale method of measuring beliefs, attitudes and opinion¹⁸. The NPAEQ contained similar questions pertaining to physical activity education, which were not included in the present study. The NPAEQ underwent a face-content validation and professional validation by graduate students and researchers in the fields of nutrition and physical activity which followed the recommended methods¹⁹⁻²¹ of assessing six survey domains: visual appropriateness, language appropriateness, relevance, clarity, representativeness and ease of online survey tool. This face-content validation was an anonymous process carried out using the same survey tool as the questionnaire sent to participants in order to also validate the survey tool itself. A Likert scale was used for the validation process to simulate the final survey and additional open-ended comments were gathered to generate both standardized and novel forms of feedback. The questionnaire was distributed using the online survey tool Opinio (version 7.11)²². The survey was open online between May 10th to June 18th, 2018.

Statistical analysis

Results were analyzed using SPSS software version

Table 1. Participant demographics.

Participant Characteristics	N (%)
Gender	
Male	41 (32.8)
Female	82 (66.4)
Prefer to self-describe	1 (0.8)
Previous Nutrition Experience	
No	91 (72.8)
Yes*	34 (27.2)
Degree in nutrition	2 (1.6)
Nutrition research	3 (2.4)
Nutrition education (e.g., post-secondary courses, workshops)	24 (19.2)
Clinical nutrition experience	14 (11.2)
Other	10 (8.0)
Year of Medical Studies	
1 st	76 (60.8)
2 nd	34 (27.2)

* Respondents could select more than one type of previous nutrition education.

19.0. Descriptive statistics were used to summarize survey responses and participant characteristics. Percentage agreement was analyzed according to the 5-point Likert scale¹⁸, with a score of 4 (agree) or 5 (strongly agree) indicating agreement, a score of 3 (neutral) indicating a neutral response, and a score of 1 (strongly disagree) or 2 (disagree) indicating disagreement. A Mann-Whitney U test was used to compare the percent agreement between the first-year students and second-year students, as well as those with and without nutrition education. The significance level was set at $p < 0.05$.

Results

Respondent characteristics

Of 220 first and second-year students, 125 students completed the survey (response rate of 57%) (Table 1), with a higher proportion of responses from first-year students (60.8%). Overall, 66% of respondents were female and 27% reported previous nutrition experience.

Students' attitudes toward nutrition in medical practice

In the first section of the survey, students were asked about their level of agreement with four

statements relating to their attitudes toward nutrition in medical practice. As shown in Figure 1, the percentage of students who agreed with statements about the importance of nutrition counselling and the role of physicians in the provision of such counselling ranged from 44 to 97.6%. Respondents reported higher levels of agreement with statements that focused on the importance of nutrition for health outcomes and the role of physicians in improving such outcomes, compared to the statements addressing nutrition assessment and counselling.

Perceived knowledge of nutrition-related information

Self-perceived knowledge of basic nutrition concepts was the highest (90.4% agreement), while the lowest percentage agreement was seen in the pathophysiology of specific diseases (56.8% agreement) (Figure 2). First-year students and students with previous nutrition education had significantly greater levels of self-perceived knowledge of basic nutrition concepts (1st year: 97.4% agreement vs. 2nd year: 79.6%, $p < 0.001$; previous nutrition education: 100% agreement vs. no previous education 86.8%, $p = 0.019$) and nutrition in the treatment of disease (1st year: 84.2% agreement vs. 2nd year: 63.3%, $p = 0.005$; previous education: 85.3% agreement vs. no previous education: 72.5%, $p = 0.018$). Students with previous nutrition education reported greater knowledge of how and where to access credible nutrition information compared to students without previous education (82.4% vs. 64.8% agreement, respectively; $p = 0.027$).

Satisfaction with nutrition education

First-year students reported significantly higher agreement with all satisfaction-related questions, compared to second-year respondents (Figure 3). Previous nutrition education was associated with higher satisfaction with the amount of time dedicated to nutrition in the medical school curriculum (29.4% agreement among students with previous education vs. 18.7% among those without; $p = 0.051$, data not shown), but was not associated with satisfaction with nutrition integration in the curriculum ($p = 0.272$), or preparedness for future medical practice ($p = 0.461$).

Discussion

In this survey study of first and second-year medical students, we found that respondents not only perceived nutrition counselling as an important component of health, but also viewed physicians as important players in providing nutrition counselling. Students at the end of their first year reported significantly higher knowledge of basic nutrition concepts and the role

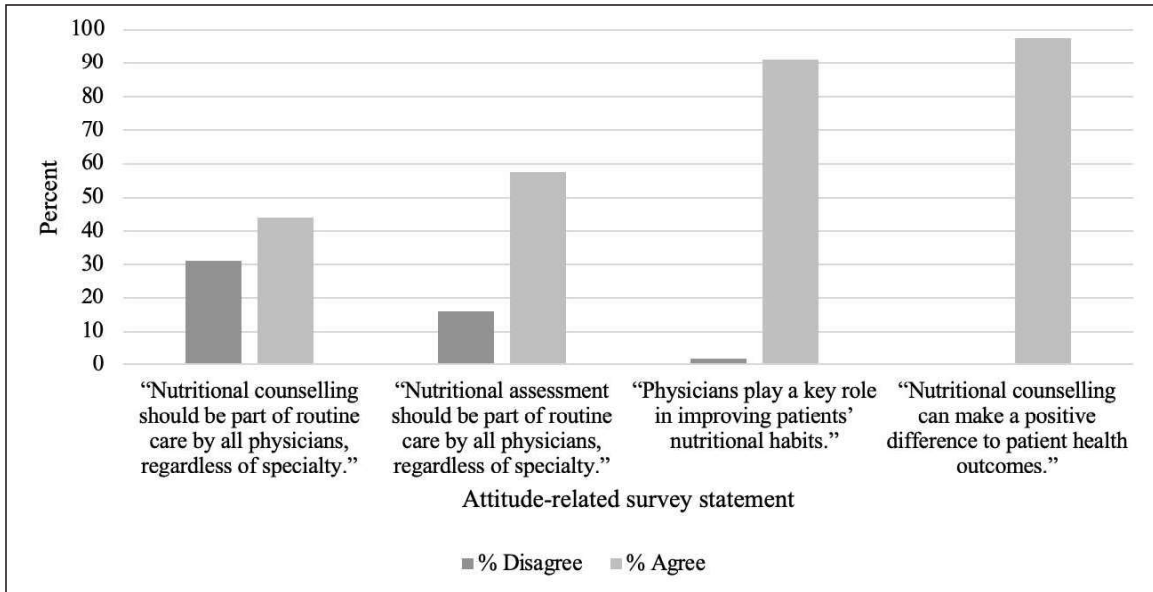


Figure 1. First and second-year students’ attitudes toward nutrition in medical education and practice. There were no significant differences in % agreement for attitude-related statements between first and second-year students or between those with or without previous nutrition education ($p > 0.05$ for all statements). Percentage agreement was analyzed using a Mann-Whitney U test according to the 5-point Likert scale, with a score of 4 (agree) or 5 (strongly agree) indicating agreement and 1 (strongly disagree) or 2 (disagree) indicating disagreement.

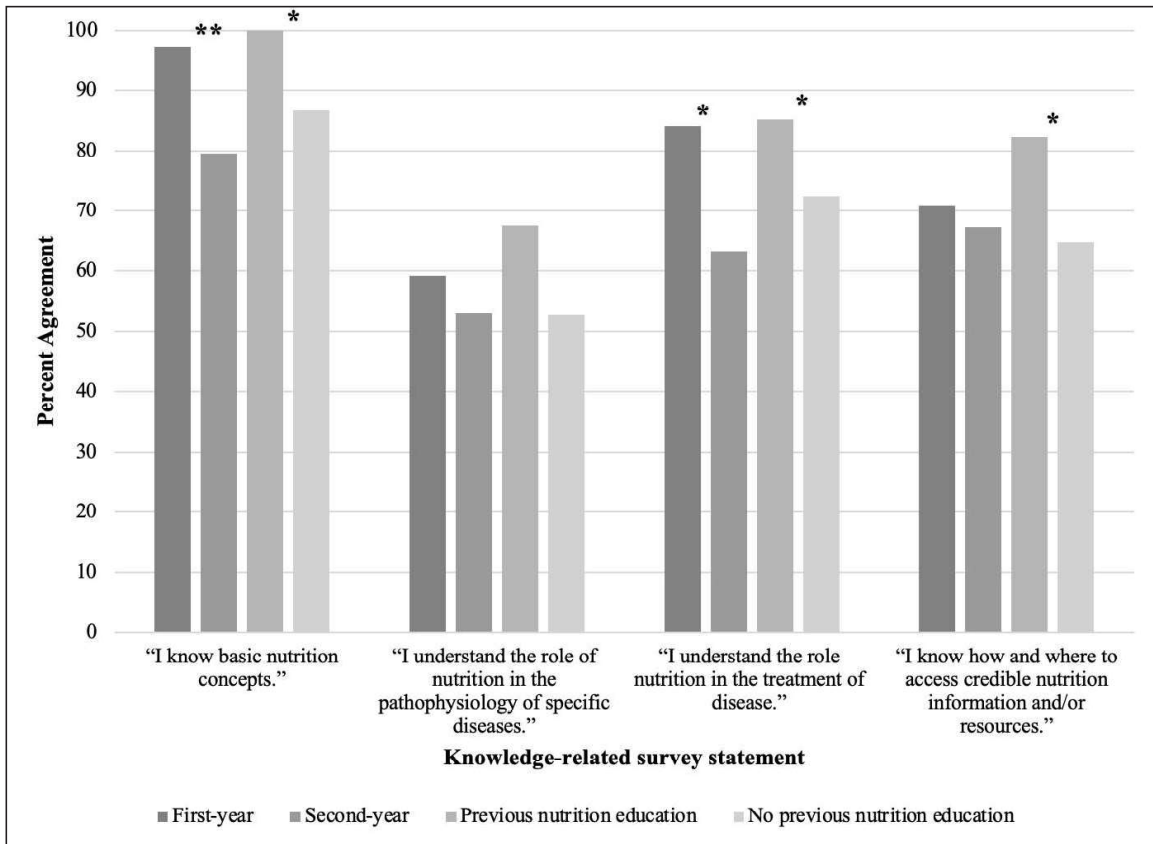


Figure 2. Self-perceived knowledge of nutrition-related subjects according to year of study and previous education. There were significant differences in % agreement between first-year and second-year students, and between students with previous nutrition education and those without previous nutrition education ($*p < 0.05$, $**p < 0.001$). Percentage agreement was analyzed using a Mann-Whitney U test according to the 5-point Likert scale, with a score of 4 (agree) or 5 (strongly agree) indicating agreement.

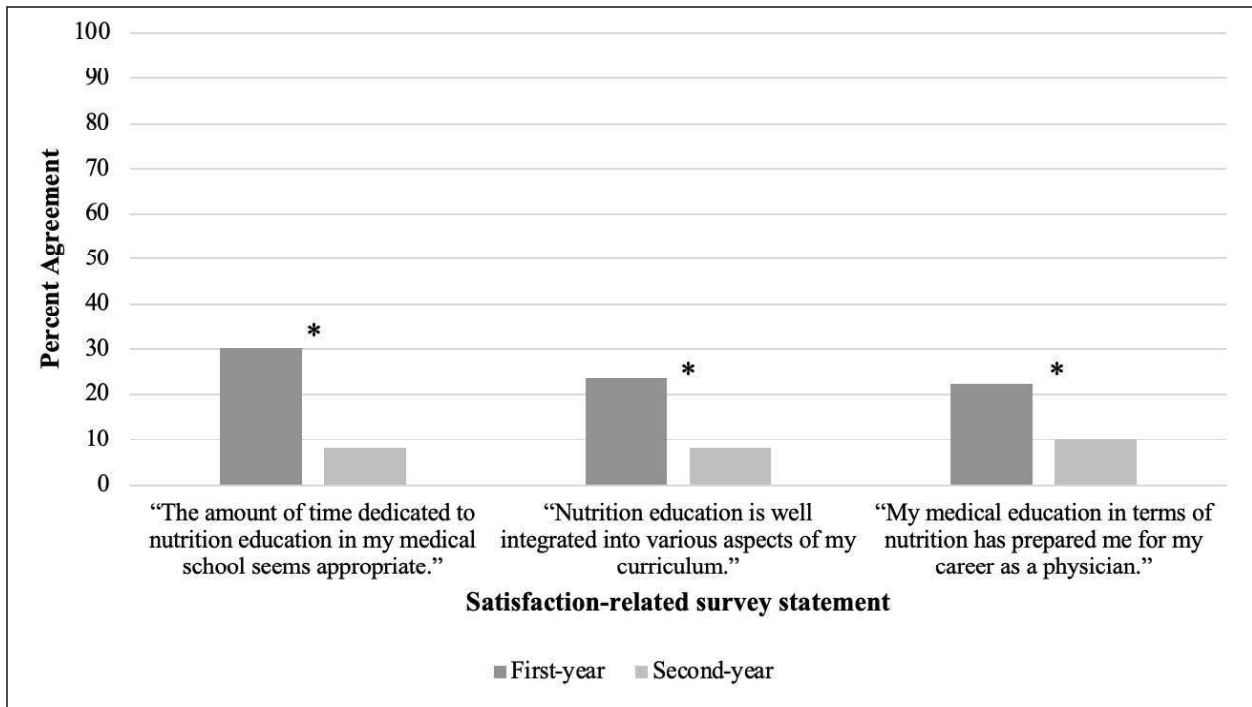


Figure 3. Satisfaction with nutrition education (% agreement) among first-year medical students compared to second-year medical students. There were significant differences in % agreement between first-year and second-year students (* $p < 0.05$) for all satisfaction-related questions. Percentage agreement was analyzed using a Mann-Whitney U test according to the 5-point Likert scale, with a score of 4 (agree) or 5 (strongly agree) indicating agreement.

of nutrition in the treatment of disease, compared to students finishing second-year. Furthermore, students with previous nutrition experience had higher agreement with most knowledge-related questions compared to students without previous nutrition education. Students' overall satisfaction with the nutrition education they receive in medical school is low. Interestingly, first-year respondents reported higher agreement with all satisfaction-related questions compared to second-year students.

Comparison to previous findings

In line with previous research, the present study observed that first- and second-year medical students believe nutrition is an important topic in medicine while feeling low satisfaction with their nutrition education. Previous research in the U.S. demonstrated that insufficient time spent on nutrition education²³, as well as other barriers, including lack of time and compensation, are contributing factors to physicians' reporting a lack of preparedness to help their patients adopt healthier eating habits^{4,5}. Canadian research has demonstrated similar results¹¹. Among the 933 medical students from all years of study who completed their survey, Gramlich et al. demonstrated that knowledge of basic nutrition concepts was higher than perceived preparedness to provide nutrition counselling.

The current study has similarities in its objective and approach to a study by Hanninen and Rashid¹², as their findings were published shortly after our research endeavours began. In their study of second, third, and fourth-year Dalhousie University medical students, upwards of 95% of students agreed on the importance of nutrition in disease prevention and treatment, as well as the role of physicians as role models for positive nutrition behaviours; however, satisfaction with their nutrition education was low, with 30.3% of respondents dissatisfied or strongly dissatisfied with the nutrition curriculum and 78.6% in agreement that more nutrition education should be provided. Their report of relatively higher satisfaction with the nutrition curriculum compared to our satisfaction results suggests there may be an increase in satisfaction that occurs in the upper years of medical school. However, their study did not find any differences in mean satisfaction level when comparing second, third and fourth-year students. As such, further research is needed to delineate whether there is indeed a difference in satisfaction based on year of study.

Although there is now an element of repetition in the body of literature on nutrition education in Canadian medical schools, this does not detract from the significance of the current research. Rather, the complementary findings highlight the discrepancy

between students' agreeable attitudes yet low levels of satisfaction with their nutrition education. Furthermore, the study published by Hanninen and Rashid excluded first-year students, as their survey was distributed early on in the academic year before these students could provide insight into the nutrition curriculum. Our study adds a unique perspective such that it was distributed at the end of the academic year, allowing us to include the first-year students immediately after they received the majority of their didactic nutrition education. Including this group of students revealed that the nutrition curriculum delivered in first-year led to increased self-perceived knowledge among this group, which reflects positively on the medical school's first-year nutrition education.

Potential explanations for findings

In today's society where there are varying opinions about which diet is optimal for health²⁴, students may not know how to appraise this information while simultaneously participating in a demanding medical curriculum. A need for increasing multidisciplinary care may also contribute to current issues surrounding the integration of nutrition into patient care²⁵. Cambridge University identified a collaborative approach among doctors, dietitians, nutritionists and nurses as a key factor in the success of their nutrition education initiative²⁶.

Our finding of differences in knowledge and satisfaction based on year of study may be a result of the structure of the Dalhousie University medical school curriculum. At Dalhousie, the majority of structured nutrition education is delivered during students' first-year, which may have influenced our survey as a result of the proximity between when the first-year students learned the nutrition content of the curriculum and the time of survey distribution. Alternatively, perhaps the higher perception of nutrition knowledge in first-year versus second-year students is an expression of Albert Einstein's adage 'the more I learn, the more I realize how much I don't know.' Previous research found that students earlier on have more positive perceptions of nutrition counselling by physicians^{11,27,28}. This may be related to a cognitive bias known as the Dunning-Kreuger effect, in which those who are less skilled in a given area often rate their knowledge as greater than those who are more experienced in the same discipline²⁹⁻³¹.

Our study found that self-perceived knowledge of basic nutrition concepts was the highest, while the lowest percentage agreement was seen in the pathophysiology of specific diseases. This suggests that a potential strength of the current Dalhousie curriculum may be teaching on basic nutrition concepts, such as

types of macronutrients and micronutrients. However, the translation of this information into understanding the impact on specific disease processes may be lacking. For example, students may be familiar with concepts related to macronutrient balance (i.e. needing a combination of carbohydrates, fat, and protein to maintain a healthy diet) but may not feel as comfortable explaining how saturated fat can contribute to the development of atherosclerosis and heart disease. This highlights a possible area for targeted improvements in the current nutrition curriculum.

Strengths and limitations

This study is based on self-report and does not include objective measurements of nutrition knowledge; however, previous research has reported that perceived quality of nutrition training in medical school is positively correlated with proficiency scores, providing evidence that self-perceived knowledge may serve as a reliable proxy for clinical proficiency³². The findings of the current research were strengthened by a response rate of 57%, which is higher than similar previous studies^{11,12,33}. Our study cohort was limited to a single institution in order to assess the current state of nutrition education at Dalhousie medical school specifically, which at the time of our literature review, had not yet been explored. Although this limits the generalizability of our findings, this research serves as a pilot-style project and a foundation for future research that may extend to other institutions.

Implications and future directions

The current study indicates that the first two years of medical school could be an appropriate time to incorporate additional nutrition education to increase physician competency in nutrition counseling. The NPAEQ may be used in future research to explore similar questions among different cohorts, such as family medicine residents who are at the front-line of primary care, an area where nutrition counselling can be used as a form of preventative medicine to reduce the prevalence of lifestyle-associated diseases. This study serves as a springboard for future nutrition education research at Dalhousie, such as comparing pre-clerkship, post-clerkship, and beyond. Moreover, future research may assess which specific areas of nutrition students would like more instruction around, as our study showed that students had relatively low self-perceived knowledge of the role of nutrition in the pathophysiology of disease processes. Research is currently being conducted by other members of our team on recent Dalhousie Medical School graduates' perceptions of nutrition, based on the methodology

and results of the current study. Further avenues for future research may extend to examining and comparing nutrition education at other institutions across Canada, with the ultimate goal of increasing nutrition competency among physicians to better the health of our population.

This research adds to the growing body of evidence supporting improved nutrition in medical education^{10,11,34}. A number of American medical schools have implemented culinary medicine electives, in which students receive cooking instruction and review principles of dietary counselling^{35,36}. The University of Toronto recently began teaching undergraduate medical students how to prepare affordable, healthy food, and ways to help support patients to do the same³⁷. Future research could evaluate education changes like these on the improvement of physician comfort and competence in providing dietary advice to patients.

Conclusion

This cross-sectional survey of first and second-year medical students found that attitudes towards nutrition in medical practice were positive; however, perceived knowledge of nutrition information and satisfaction with nutritional education were low. These findings contribute to our understanding of the status of nutrition education in the undergraduate curriculum of Canadian medical schools.

Declarations

Ethics approval and consent to participate: This study was approved by the Dalhousie University Research Ethics Board. All participants provided informed consent prior to participating in this study.

Consent for publication: Not applicable.

Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors have no conflicts of interest to disclose.

Funding: This study was funded by a Faculty of Medicine Ross Stuart Smith RIM Summer Studentship to Peri Fenwick and a University Internal Medicine Research Foundation RIM Summer Studentship to Alyson Colborne.

Authors' contributions: PF and LC conceived the study idea and design in discussions with OT and AC. PF performed the statistical analyses and drafted the manuscript under the supervision of OT and LC. All authors contributed to additional drafts of the manuscript and approved the submitted version, and each author satisfies the authorship criteria of the International

Committee of Medical Journal Editors. All authors agree to be accountable for all aspects of the work.

Acknowledgements: This project was completed as part of Dalhousie Medical School's "Research in Medicine" program, through the support of the Faculty of Medicine Ross Stuart Smith RIM Summer Studentship. We sincerely thank the participants for completing our survey.

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