Health Professions Education

Volume 4 | Issue 1 Article 6

2018-02-21

Nutrition in Medicine: Medical Students' Satisfaction, Perceived Relevance and Preparedness for Practice

Victor Mogre
Department of Health Professions Education and Innovative Learning, School of Medicine and Health Sciences, University for Development Studies, Ghana, vmogre@uds.edu.gh

Fred Stevens
Department of Educational Development and Research, School of Health Professions Education, Faculty of Health, Medicine and Life Sciences, Maastricht University, The Netherlands

Paul A. Aryee
Department of Community Nutrition, School of Allied Health Sciences, University for Development Studies, Ghana

Albert J.J.A. Scherpbier
Department of Educational Development and Research, School of Health Professions Education, Faculty of Health, Medicine and Life Sciences, Maastricht University, The Netherlands

Recommended Citation

Mogre, Victor; Stevens, Fred; Aryee, Paul A.; and Scherpbier, Albert J.J.A. (2018) "Nutrition in Medicine: Medical Students' Satisfaction, Perceived Relevance and Preparedness for Practice," *Health Professions Education*: Vol. 4: Iss. 1, Article 6.
DOI: 10.1016/j.hpe.2017.02.003
Available at: https://hpe.researchcommons.org/journal/vol4/iss1/6

Available online at www.sciencedirect.com

ScienceDirect

Health Professions Education 4 (2018) 31–38

www.elsevier.com/locate/hpe

Nutrition in Medicine: Medical Students' Satisfaction, Perceived Relevance and Preparedness for Practice

Victor Mogre[a,*], Fred Stevens[b], Paul A. Aryee[c], Albert J.J.A. Scherpbier[b]

[a]*Department of Health Professions Education and Innovative Learning, School of Medicine and Health Sciences, University for Development Studies, Ghana*

[b]*Department of Educational Development and Research, School of Health Professions Education, Faculty of Health, Medicine and Life Sciences, Maastricht University, The Netherlands*

[c]*Department of Community Nutrition, School of Allied Health Sciences, University for Development Studies, Ghana*

Received 13 November 2016; received in revised form 27 January 2017; accepted 3 February 2017

Available online 7 February 2017

Abstract

Purpose: Doctors play a critical role in providing nutrition care and supporting patients to adopt healthy dietary habits. Improving the quality of nutrition education in medical schools is necessary to build the capacity of doctors to deliver effective nutrition care to help reduce malnutrition especially for sub-Saharan Africa. This study investigated Ghanaian undergraduate clinical level medical students' satisfaction with their current nutrition education, preparedness to provide nutrition care, perceived relevance of nutrition education to their future practice and their relationships.

Method: A survey among 207 clinical level medical students was conducted. An 11-item questionnaire with subscales was used to assess students' demographic characteristics, satisfaction with current nutrition education, preparedness to provide nutrition care and perceived relevance of nutrition education to their future practice.

Results: Ninety-two percent ($n=187$) of the students considered nutrition education to be relevant to their future practice. However, the majority of the students (70%) were dissatisfied with the amount of time dedicated to nutrition education in their curriculum; integration of nutrition into organ-system based modules (62.0%); inclusion of nutrition materials to promote independent study (62.8%) and nutrition course content (59.0%). Only 22.2% felt adequately prepared by their current nutrition education to provide nutrition care in the general practice setting. Satisfaction with current education in nutrition was positively related to students' preparedness to provide nutrition care in the general practice setting.

Discussion: Students were dissatisfied with their current education in nutrition, felt inadequately prepared to provide nutrition care and considered nutrition education to be highly relevant to their future practice. The findings of this study provide additional evidence that suggests changes in the current format and content of nutrition education in medical education.

Keywords: Nutrition education; Medical students; Satisfaction; Ghana; Sub-Saharan Africa

1. Introduction

Malnutrition is a global public health problem. As affluent societies are grappling with overweight/obesity, diabetes and other chronic and non-communicable

*Corresponding author.

E-mail address: vmogre@uds.edu.gh (V. Mogre).

Peer review under responsibility of AMEEMR: the Association for Medical Education in the Eastern Mediterranean Region.

http://dx.doi.org/10.1016/j.hpe.2017.02.003

diseases; low-income countries are confronted with rising prevalence of these chronic diseases and/or non-communicable diseases in addition to under nutrition and infectious diseases. In 2013, 36.9% of men and 38.0% of women aged ≥20 years were overweight globally.[1] Recent studies estimate the prevalence of overweight and obesity in adults to range from 10% to 40% in Ghana and Nigeria.[2–5] In 2011, one in seven Ghanaian children under the age of five was moderately or severely underweight; 23% stunted; and 6% wasted.[6] Studies report that these diseases may decline if medical doctors provide nutrition and dietary advice to their patients.[7,8]

Ghana is one of the countries signed unto the Scaling up Nutrition (SUN) movement that have outlined strategic processes to overcome malnutrition in member countries.[9] Interventions to reduce micronutrient deficiencies and to tackle maternal and child under nutrition have also been outlined and widely known.[10] Paramount to the success of these approaches is the availability of adequately trained healthcare professionals including doctors. Evidence from the US and other high income countries consider doctors to be important and credible sources of information on health and nutrition and possess the ability to motivate their patients to adopt healthy lifestyle behaviours.[11–13] Doctors in the general practice setting can be effective in enhancing patients' dietary and nutrition behaviour through nutrition counselling.[14–17] However, the delivery of nutrition care by doctors has been reported to be less frequent.[18–21]

Evidently, most doctors report receiving inadequate nutrition education from medical school and feel inadequately prepared and less self-efficacious to provide nutrition care.[20–28] Several studies also indicate that majority of medical students and incoming interns are unsatisfied with their medical nutrition education.[29–31]

Although the situation of nutrition education in medical education has been explored extensively in high income countries, it has not been frequently investigated in Ghana and other parts of sub-Saharan Africa.[32,33] In our search of the literature we only came across two studies investigating this phenomenon. The Sodjinou et al.[32] study evaluated nutrition education in medical and other health professional schools in West Africa but did not consider medical schools separately and did not also evaluate the views of medical students regarding their nutrition education. Oyewole and colleagues[33] evaluated strategies through which nutrition education could be incorporated into the medical curricula in Nigeria and did not also sought the views of students. Thus, studies evaluating medical students' perception of nutrition education in Ghana and the rest of the sub-region are non-existent. It is also unclear to what extend the evidence reported from high income countries could be applied to healthcare and educational systems of countries in sub-Saharan Africa, experiencing both infrastructural and human resource constraints.[34,35] An evaluation of this potential gap is a necessary step to designing interventions to improve nutrition education in medical education. It is also needed to build the capacity of future doctors with the needed tools to implement effective nutrition interventions to help reduce the burden of malnutrition in Ghana and in other parts of Sub-Saharan Africa.This study intends to answer the following research questions.

i. What are students' level of satisfaction with their current nutrition education and preparedness to provide nutrition care in the general practice setting?
ii. What are students' perceptions of the relevance of nutrition education to their future practice?
iii. Does students' satisfaction relate to preparedness to provide nutrition care and relevance of nutrition education?
iv. Do students' satisfaction, preparedness and relevance differ by level of training?

2. Methods

2.1. Setting and participants

The University for Development Studies, School of Medicine and Health Sciences (UDS-SMHS) follows a problem-based learning/Community-based Education and Service (PBL/COBES) curriculum for the teaching and learning of its medical students.[36] Teaching and learning is organised through integrated theme-based, problem-based learning blocks. Nutrition does not have a dedicated block and is mostly taught as integrated topics during preclinical year two and three and less frequently during the clinical years. Students spend the first three years learning normal anatomy and functioning of the human body and pathophysiology of diseases in the fourth year. Students then start a coordinated discipline-based clinical training from 5th to 7th year of medical school. The community-based education and service component allows students to live and work for at least 4 weeks per year in a rural community in Ghana during medical year 2–4. During these periods, students work with community members, health personnel and volunteers to undertake community health diagnosis, profiling, problem identification and intervention strategies. Details of how teaching and learning

activities is undertaken for the entire curriculum is published elsewhere.[36]

Participants of this study included undergraduate clinical level medical students (clinical year 1–3). Our choice of these participants was premised on the assumption that these groups of students have experienced more than 50% of the entire curriculum.

Ethical approval was granted by the Navrongo Health Research Centre Institutional Review Board (NHRCIRB) (Ethics Approval ID: NHRCIRB209), Ghana.

2.2. Recruitment and data collection procedures

Prior to the commencement of data collection, students were informed of the study and were recruited to participate through a series of announcements that were made before or at the end of usual lecture times. Data was collected using a paper-based, self-administered questionnaire. The questionnaire was distributed to all students after an end of rotation examination. Students were required to complete and submit the questionnaire before leaving the examination room. Students were informed that their participation in the study was voluntary and they were at liberty to stop at any stage of the process. A consent form and an information sheet detailing the purpose of the study were included in the questionnaire. Students were given two pieces of candy if they returned a completed questionnaire. From a total of 215 questionnaires distributed, 207 were returned (response rate = 96%).

2.3. Measures

All data was collected using an 11-item questionnaire covering the following.

2.3.1. Satisfaction with current education in nutrition

Students' satisfaction with the quality and quantity of their current nutrition education was assessed using six items on a 5-point Likert scale in which 1 indicated very dissatisfied; 2 = Dissatisfied; 3 = neither satisfied nor dissatisfied; 4 = satisfied and 5 = very satisfied. Items were derived from a previously validated and widely used survey instrument.[37,38] This scale yielded a Cronbach's alpha of 0.79, indicating a good level of internal consistency.

2.3.2. Perceived preparedness to provide nutrition care

Students were asked to indicate the extent to which they felt adequately prepared by their current nutrition education to provide nutrition care using a 5-point Likert scale (i.e. 1 = very inadequate; 2 = inadequate; 3 = neither adequate nor inadequate; 4 = adequate and 5 = very adequate).

2.3.3. Perceived relevance of nutrition education to future practice

Students were asked to what extent they perceived nutrition education to be relevant to their future practice as medical doctors using a 5-point Likert scale (1 = very irrelevant; 2 = irrelevant; 3 = neither relevant nor irrelevant; 4 = relevant and 5 = very relevant).

Questions relating to format of learning nutrition, unmet nutrition-related educational needs, age, sex and level of clinical training were also included into the questionnaire. The questionnaire was reviewed by a panel of experts in nutrition and health professions education and was found to be content valid. It was also pretested on a sample of 10 students to assess understanding and comprehensibility.

2.4. Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics 21.0 and Graphpad prism version 5.0. Relationship among continuous and categorical variables was determined using independent *t*-test and one-way ANOVA where appropriate. Pearson product-moment correlation was used to examine associations between all continuous variables. A *p*-value of less than 0.05 was considered significant in all statistical tests of significance. Graphs were drawn using Graphpad prism version 5.0.

3. Results

3.1. Demographics

With a mean (SD) age of 25.13 (2.56) years, 59.9% ($n = 124$) were males, 38.2% ($n = 79$) in clinical year two and 30.9% ($n = 64$) each in both clinical year one and three.

3.2. Satisfaction with the quality and quantity of current education in nutrition

The majority of students were dissatisfied with all aspects of their nutrition education assessed (shown in Table 1). Clinical year three (10.25 (4.08)) students were more satisfied (F (1, 196) = 5.01, $p = 0.01$, $\eta 2 = 0.05$)) with their current nutrition education than clinical year one (8.70 (3.20)) and two (8.21 (3.92)) students.

Table 1
Students' perceived satisfaction with the quality and quantity of their current education in nutrition.

Perceived satisfaction (Max. score=20)	Mean (SD)	Dissatisfied	Neither satisfied or dissatisfied	Satisfied
Amount of time dedicated for nutrition (n=202)	2.15 (1.06)	141(69.8%)	32(15.8%)	29(14.4%)
Integration of nutrition content into organ-system based blocks (n=200)	2.32 (1.11)	124(62.0%)	39(19.5%)	37(29.8%)
Inclusion of materials to promote independent study of nutrition (n=199)	2.20 (1.09)	125(62.8%)	47(23.6%)	27(13.6%)
Nutrition course content (n=200)	2.32 (1.09)	118(59.0%)	50(25.0%)	32(16.0%)
Mean (SD) perceived Satisfaction score (n=197)	8.95 (3.83)			

Frequencies do not add up to 207 due to missing responses.

3.3. Students' perceived preparedness to provide nutrition care

Reporting a mean (SD) preparedness score of 2.55 (1.08), only 22.2% (n=45) of the students said they felt adequately prepared to provide nutrition care in the general practice setting, 51.7% (n=105) inadequately prepared, and 26.1% (n=53) unsure. These results did not differ by level of clinical training ((F (2, 200)=2.43, p=0.09, $\eta 2$=0.02)).

3.4. Perceived relevance of nutrition education to future practice

Students recorded a mean (SD) relevance score of 4.18 (0.97) (maximum score=5) with less than 10% saying nutrition education was irrelevant. Students' responses did not differ by level of clinical training (F (2, 201)=1.60, $\eta 2$=0.02, p=0.20).

3.5. Format of learning nutrition and preferred format of nutrition education

As shown in Table 2, majority (86.4%) of the students said they will benefit from further training in nutrition education with 60% saying they will prefer such training from a nutritionists/dietician. Clinical year one (90.6%) and two (91.0%) students were more likely ($\eta 2$=0.18, p=0.04) than clinical year three (75.4%) students to say they will benefit from further training in nutrition.

3.6. Relationship between satisfaction, perceived preparedness and relevance of nutrition education

Using Pearson correlation analysis satisfaction correlated with preparedness to provide nutrition care (r=0.489, $p < 0.001$). However, there was no significant correlation between perceived preparedness and relevance (r=0.046, p=0.356) as well as satisfaction and relevance (r=−0.032, p=0.485).

Table 2
Format of nutrition education and students' preferred format of nutrition education.

Variable	Frequency (%)
Current format of learning about nutrition	
Separate course in nutrition (n=205)	26(12.7%)
Lectures on selected topics in nutrition (n=203)	147(72.4%)
Nutrition concepts integrated into course work/ block (n=203)	120(59.1%)
Nutrition-related educational needs	
Has unmet nutrition-related educational need	143(71.9%)
Will benefit from further training in nutrition	172(86.4%)
Students' preferred format of learning about nutrition (n=196)	
Training provided by a nutritionists/dietician in the general practice setting	122 (62.2%)
Dedicated courses for nutrition	64(32.7%)
Online training programs	10(5.1%)

4. Discussion

4.1. General discussion

In this study we assessed clinical medical students' satisfaction with their current nutrition education, perceived preparedness to provide nutrition care and their perceptions of the relevance of nutrition education to their future practice.

In agreement with previous studies majority of the students considered their nutrition education to be inadequate.[24,29,30,38–41] Given the current situation one may recommend increasing the instruction time and content of nutrition education in the curriculum, however this may be problematic due to complaints of the medical curriculum being overloaded [32] and matters of priorities. Adoption of a multifaceted curriculum for nutrition education that brings to bear the basic principles of

nutrition and their application to clinical practice and the development of a dedicated nutrition course supported by a comprehensive integration of nutrition content throughout the curriculum may be a better option.[42]

Similar to findings from other parts of the world, a large proportion of the students felt unprepared by their current nutrition education to provide nutrition care.[43–45] This is a concern because we may be producing doctors who feel inadequate to provide nutrition counselling to their patients and to make appropriate clinical decisions on nutrition-related issues.[28,46,47]

Unsurprisingly, and in consonance with previous studies,[30,31,38,41,48] most of the students regarded nutrition education to be highly relevant to their future practice. This demonstrates the high value students place on nutrition education and may utilize every opportunity given them to learn about nutrition. Curriculum planners and medical educators appear not to make use of this opportunity to improve nutrition education as the status of nutrition education in medical education is still questionable.[32,49,50]

Giving credence to inter-professional collaboration in nutrition education, most of the students said they preferred training provided by a dietician/nutritionist in the hospital setting to help meet their unmet nutrition-related educational needs. Inter-professional collaboration to provide nutrition education to medical students is very critical towards improving the delivery of nutrition care.[25,51,52] This is however confronted with barriers such as the lack of faculty trained in nutrition, lack of physician nutrition specialists or other nutrition educators on faculty as these professionals serve as role models to both medical students and residents for addressing nutrition in patient interactions.[53–55]

Importantly, we found that students who were more satisfied with their current nutrition education felt more adequately prepared to provide nutrition care in the general practice setting. This is similar to the findings reported by Mihalynuk et al.[38] who found positive correlations between perceived quality of nutrition education and self-reported nutrition proficiency in a sample of practicing family physicians in Washington State. Thus, improving students' satisfaction in nutrition education may be important towards improving preparedness and confidence to provide nutrition care.

Although, students were generally unsatisfied with their current nutrition education, their satisfaction differed by level of clinical training. Clinical year three students compared to clinical year one and two students reported being more satisfied with their current nutrition education. Notwithstanding the absence of a linear trend, students in the junior years of clinical training might have been less satisfied with their current nutrition education so far because they were yet to be exposed to some aspects of the curriculum that those in clinical year three have already experienced.

Contrary to the findings of Spencer et al.[30] students perception of the relevance of nutrition education to their future practice did not differ by level of clinical training. The lack of differences in this study could be due to the inclusion of only clinical level students who may be sharing similar perceptions or to the more urgent and visible need for nutrition care in African countries than in high income countries.

4.2. Implications to practice and future studies

Our findings add to the evidence that nutrition is inadequate in the medical curriculum. It provides important insights into avenues that could inform future curriculum planning and development. Improving students' satisfaction and adequacy of nutrition education are some of the avenues curriculum planners could utilise. Given that this is the first study in Ghana and in the sub-region to evaluate the nutrition education of medical students; its findings serve as a basis for future studies in this subject. They may stimulate discussions and research regarding this topic among medical educators in Ghana and Sub-Saharan Africa. Future research should explore the influence of the current findings on students' nutrition-related knowledge, attitudes towards, and self-efficacy in nutrition care. In addition, studies should explore qualitatively students' opinions on the factors that may be contributing to the inadequacy of nutrition education. Meanwhile, innovative teaching and learning methodologies should be adopted for nutrition education. Inter-professional collaboration in the teaching and learning of nutrition should also be encouraged.

4.3. Strengths and limitations

The use of previously validated survey items and nutrition experts to examine the content validity of the survey items enhanced confidence in the findings of the study. Furthermore, using an instrument that is based on items relevant to nutrition issues of the study setting may help facilitate the recognition and prioritization of nutrition content in medical education.

Our study is not without limitations. Its cross-sectional nature makes it difficult to establish causality. Nonetheless it gives a snapshot of the situation of nutrition education in Ghana and in the sub-region. This study reports on the nutrition education of a single medical school. This makes it difficult to generalize its

findings. As an obvious limitation of survey-based studies, the findings of this study may be subject to social desirability bias. However, the questionnaires were self-administered and most students gave self-critical responses to the survey items, thereby, minimising the effect of this bias on the findings.

5. Conclusion

Students regarded nutrition to be relevant to their future practice, felt unsatisfied with the quality and quantity of their current nutrition education and inadequately prepared to provide nutrition care. Satisfaction with the quality and quantity of nutrition education may be important in making students feel adequately prepared to provide nutrition care. Level of clinical training may also be important in determining students' satisfaction with their nutrition education.

Disclosure

None.

Ethical approval

Ethical approval has been granted from the Navrongo Health Research Centre Institutional Review Board (NHRCIRB) (Ethics Approval ID: NHRCIRB209), Ghana.

Funding

None.

Other disclosure

None.

Acknowledgement

Authors wish to thank the students of the University for Development Studies, School of Medicine and Health Sciences for their support and acceptance to take part in the research.

References

1. Ng M, Fleming T, Robinson, M, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014.
2. Mogre V, Mwinlenaa P, Oladele J, Amalba A. Impact of physical activity levels and diet on central obesity among civil servants in Tamale metropolis. *J Med Biomed Sci* 2012;1:2.
3. Mogre V, Atibilla J, Kandoh B. Association between breakfast skipping and adiposity status among civil servants in the Tamale metropolis. *J Med Biomed Sci* 2013;2(3):1–7.
4. Benkeser R, Biritwum R, Hill A. Prevalence of overweight and obesity and perception of healthy and desirable body size in urban, Ghanaian women. *Ghana Med J* 2012;46(2):66–75.
5. Chukwuonye II, Chuku A, John, C, et al. Prevalence of overweight and obesity in adult Nigerians–a systematic review. *Diabetes Metab Syndr Obes Target Ther* 2013;6:43.
6. Ghana Statistical Service. Ghana Multiple Indicator Cluster Survey with an Enhanced Malaria Module, 2011, Final Report and Biomarker; Accra 2011.
7. Horrocks P, Blackmore R, Wright A. A long-term follow-up of dietary advice in maturity onset diabetes: the experience of one centre in the UK prospective study. *Diabet Med* 1987;4(3): 241–244.
8. Ammerman AS, Devellis RF, Carey, TS, et al. Physician-based diet counseling for cholesterol reduction: current practices, determinants, and strategies for improvement. *Prev Med* 1993;22(1):96–109.
9. Sun Movement. The SUN Movement Strategy and Roadmap (2016–2020) Available at: ⟨http://scalingupnutrition.org/sun-countries/ghana/⟩. Accessed 23 September 2016.
10. Bhutta ZA, Das JK, Rizvi, A, et al. Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost?. *Lancet* 2013;382(9890):452–477.
11. American Dietetic Association. Nutrition and you: Trends 2008. Report of Results. Chicago, American Dietetic Association; 2008.
12. American Dietetic Association. Nutrition and you: Trends 2011. Report of Results. Chicago, American Dietetic Association; 2011.
13. Abramson S, Stein J, Schaufele M, Frates E, Rogan S. Personal exercise habits and counseling practices of primary care physicians: a national survey. *Clin J Sport Med* 2000;10(1):40–48.
14. Keyserling TC, Ammerman AS, Davis C, Mok MC, Garrett J, Simpson Jr R. A randomized controlled trial of a physician-directed treatment program for low-income patients with high blood cholesterol: the Southeast Cholesterol Project. *Arch Fam Med* 1997;6(2):135.
15. Ockene JK, Ockene IS, Quirk, ME, et al. Physician training for patient-centered nutrition counseling in a lipid intervention trial. *Prev Med* 1995;24(6):563–570.
16. Ockene IS, Hebert JR, Ockene, JK, et al. Effect of physician-delivered nutrition counseling training and an office-support program on saturated fat intake, weight, and serum lipid measurements in a hyperlipidemic population: worcester Area Trial for Counseling in Hyperlipidemia (WATCH). *Arch Intern Med* 1999;159(7):725–731.
17. Ball L, Johnson C, Desbrow B, Leveritt M. General practitioners can offer effective nutrition care to patients with lifestyle related chronic disease. *J Prim Health Care* 2013;5(1):59–69.
18. Mowe M, Bosaeus I, Rasmussen HH, Kondrup J, Unosson M, Irtun Ø. Nutritional routines and attitudes among doctors and nurses in Scandinavia: a questionnaire based survey. *Clin Nutr* 2006;25(3):524–532.
19. Collier R. Canadian medical students want more nutrition instruction. *Can Med Assoc J* 2009;181(3–4):133–134.

20. Temple NJ. Survey of nutrition knowledge of Canadian physicians. *J Am Coll Nutr* 1999;18(1):26–29.
21. Weinsier RL, Boker JR, Morgan, SL, et al. Cross-sectional study of nutrition knowledge and attitudes of medical students at three points in their medical training at 11 southeastern medical schools. *Am J Clin Nutr* 1988;48(1):1–6.
22. Kolasa K. Developments and challenges in family practice nutrition education for residents and practicing physicians: an overview of the North American experience. *Eur J Clin Nutr* 1999;53:S89–S96.
23. Leslie FC, Thomas S. Symposium 9: Competent to care. Are all doctors competent in nutrition? In: *Proceedings of the Nutrition Society*. 68(3); 2009:296.
24. Adams KM, Kohlmeier M, Zeisel SH. Nutrition education in US medical schools: latest update of a national survey. *Acad Med* 2010;85(9):1537–1542.
25. Glanz K. Review of nutritional attitudes and counseling practices of primary care physicians. *Am J Clin Nutr* 1997;65(6): 2016S–2019S.
26. Cimino JA. Why can't we educate doctors to practice preventive medicine?. *Prev Med* 1996;25(1):63–65.
27. Soltesz KS, Price JH, Johnson LW, Tellijohann SK. Family physicians' views of the preventive services task force recommendations regarding nutritional counseling. *Arch Fam Med* 1995;4(7):589.
28. Kushner RF. Barriers to providing nutrition counseling by physicians: a survey of primary care practitioners. *Prev Med* 1995;24(6):546–552.
29. Weinsier RL, Boker JR, Feldman EB, Read MS, Brooks CM. Nutrition knowledge of senior medical students: a collaborative study of southeastern medical schools. *Am J Clin Nutr* 1986;43 (6):959–968.
30. Spencer EH, Frank E, Elon LK, Hertzberg VS, Serdula MK, Galuska DA. Predictors of nutrition counseling behaviors and attitudes in US medical students. *Am J Clin Nutr* 2006;84(3): 655–662.
31. Vetter ML, Herring SJ, Sood M, Shah NR, Kalet AL. What do resident physicians know about nutrition? An evaluation of attitudes, self-perceived proficiency and knowledge. *J Am Coll Nutr* 2008;27(2):287–298.
32. Sodjinou R, Bosu WK, Fanou, N, et al. Nutrition training in medical and other health professional schools in West Africa: the need to improve current approaches and enhance training effectiveness. *Glob Health Action* 2014:7.
33. Oyewole O, Atinmo T. Nutrition education in medical training: the need to reconsider the sacrosanctity of medical education in Nigeria. *Afr J Med Med Sci* 2008;37(3):219–224.
34. Dare L, Buch E. The future of health care in Africa. *Br Med J* 2005;331(7507):1–2.
35. Willis-Shattuck M, Bidwell P, Thomas S, Wyness L, Blaauw D, Ditlopo P. Motivation and retention of health workers in developing countries: a systematic review. *BMC Health Serv Res* 2008;8(1):247.
36. Mogre V, Amalba A, Saaka M, Kyei-Aboagye K. Medical students' achievement on the Bachelor of Medicine, Bachelor of Surgery/Chirurgery (MBChB) part I and II licensing examination: a comparison of students in problem-based learning community-based education and service and conventional curricula in Ghana. *J Educ Eval Health* 2014;11:10.
37. Walsh CO, Ziniel SI, Delichatsios HK, Ludwig DS. Nutrition attitudes and knowledge in medical students after completion of an integrated nutrition curriculum compared to a dedicated nutrition curriculum: a quasi-experimental study. *BMC Med Educ* 2011:11.
38. Mihalynuk TV, Coombs JB, Rosenfeld ME, Scott CS, Knopp RH. Survey correlations: proficiency and adequacy of nutrition training of medical students. *J Am Coll Nutr* 2008;27(1):59–64.
39. Walker WA. Advances in nutrition education for medical students – overview. *Am J Clin Nutr* 2000;72(3):865S–867S.
40. Gramlich LM, Olstad DL, Nasser, R, et al. Medical students' perceptions of nutrition education in Canadian universities. *Appl Physiol Nutr Metab* 2010;35(3):336–343.
41. Hyska J, Mersini E, Mone, I, et al. Assessment of knowledge, attitudes and practices about public health nutrition among students of the University of Medicine in Tirana, Albania. *South East Eur J Public Health* 2014;1.
42. DiMaria-Ghalili RA, Edwards M, Friedman, G, et al. Capacity building in nutrition science: revisiting the curricula for medical professionals. *Ann N Y Acad Sci* 2013;1306(1):21–40.
43. Hardman WE, Miller BL, Shah DT, Nowson C. Student perceptions of nutrition education at marshall university Joan C. Edwards School of Medicine: a resource challenged institution. *J Biomed Educ* 2015:2015.
44. Eaton CB, McBride PE, Gans KA, Underbakke GL. Teaching nutrition skills to primary care practitioners. *J Nutr* 2003;133(2): 563S–566S.
45. Jay M, Gillespie C, Ark, T, et al. Do internists, pediatricians, and psychiatrists feel competent in obesity care?. *J Gen Intern Med* 2008;23(7):1066–1070.
46. Mihalynuk TV, Scott CS, Coombs JB. Self-reported nutrition proficiency is positively correlated with the perceived quality of nutrition training of family physicians in Washington State. *Am J Clin Nutr* 2003;77(5):1330–1336.
47. Mihalynuk TV, Knopp RH, Scott CS, Coombs JB. Physician informational needs in providing nutritional guidance to patients. *Fam Med* 2004;36(10):722–726.
48. Crowley J, Ball L, Han DY, Arroll B, Leveritt M, Wall C. New Zealand medical students have positive attitudes and moderate confidence in providing nutrition care: a cross-sectional survey. *J Biomed Educ* 2014.
49. Adams KM, Kohlmeier M, Powell M, Zeisel SH. Nutrition in medicine: nutrition education for medical students and residents. *Nutr Clin Pract* 2010;25(5):471–480.
50. Devries S, Dalen JE, Eisenberg, DM, et al. A deficiency of nutrition education in medical training. *Am J Med* 2014;127(9): 804–806.
51. Eisenberg DM, Burgess JD. Nutrition education in an era of global obesity and diabetes: thinking outside the box. *Acad Med* 2015.
52. Eisenberg DM, Miller AM, McManus K, Burgess J, Bernstein AM. Enhancing medical education to address obesity: “see one. Taste one. Cook one. Teach one”. *JAMA Intern Med* 2013;173 (6):470–472.
53. Touger-Decker R. Nutrition education of medical and dental students: innovation through curriculum integration. *Am J Clin Nutr* 2004;79(2):198–203.
54. Wong V, Millen BE, Geller AC, Rogers AE, Maury J, Prout MN. What's in store for medical students? Awareness and

utilization of expert nutrition guidelines among medical school preceptors. *Prev Med* 2004;39(4):753–759.
55. Intersociety Professional Nutrition Education Consortium. Bringing physician nutrition specialists into the mainstream: rationale for the Intersociety Professional Nutrition Education Consortium. *Am J Clin Nutr* 1998;68(4):894–898.

Victor Mogre is a lecturer at the Department of Health Professions Education and Innovative Learning, School of Medicine and Health Sciences, University for Development Studies, Ghana.

Fred Stevens is professor at the Department of Educational Development and Research, School of Health Professions Education, Faculty of Health, Medicine and Life Sciences, Maastricht University, The Netherlands.

Paul A. Aryee is a senior lecturer at the Department of Community Nutrition, School of Allied Health Sciences, University for Development Studies, Ghana.

Albert J.J.A Scherpbier is professor at the Department of Educational Development and Research, School of Health Professions Education, Faculty of Health, Medicine and Life Sciences, Maastricht University, The Netherlands.