Do Physician Assistant Training Programs Adequately Prepare PAs to Address Nutritional Issues in Clinical Practice?

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Purpose The purpose of this study was to determine physician assistants' (PAs') current level of confidence to engage in nutrition-related tasks and their satisfaction with the nutrition education they received in PA school.

Methods To achieve this goal, a mixed-methods approach that consisted of 3 data collection phases (qualitative online discussions, quantitative survey, and qualitative interviews) was used to explore and measure PAs' perceptions of the education they received in PA school and through other sources and how confident they felt addressing nutrition-related issues in clinical practice.

Results While 80% of PAs endorse the idea that PAs should be more involved in providing nutritional care to patients, the majority reported basic or no knowledge of the nutritional implications of chronic conditions (69%), inflammatory bowel disease (69%), nutritional needs over the lifespan (67%), and food allergies and intolerances (64%). Barriers to patient care included knowledge-related challenges when selecting lab tests based on patient profile (46%) and identifying needs based on various gastrointestinal diseases (67%) and when using diagnostic data to identify deficiencies (74%). Overall, 59% of PAs reported being slightly or very dissatisfied with the nutrition-related content in the curricula used to formally train PAs.

Conclusions The primary goal of every PA program is to prepare its graduates to be competent to enter clinical practice. Regarding nutrition, these data indicate that programs are failing to do so. PAs lack the confidence and ability to provide optimal nutritional care, which is staggering considering that nutrition is the first line of treatment in the prevention and management of numerous chronic diseases.

INTRODUCTION

Nutrition is a foundation of human health and is linked to the prevention and management of multiple diseases and chronic conditions including cardiovascular disease, type 2 diabetes, and many others.[1-4] Given the central role that nutrition plays in human health, one would expect the topic to receive extensive coverage during the training of PAs (physician associates/physician assistants) and other medical providers. Since 1985, the National Academy of Science has recommended that medical students receive 25 hours of classroom instruction related to nutrition.[5,6] Yet recent surveys have demonstrated that 71% of allopathic medical schools[7] and 85% of osteopathic schools[8] fail to meet this benchmark. Furthermore, cardiologists reported that while they believed they should be able to provide nutritional information to patients, few felt they had received enough training in medical school, residency, or fellowship to prepare them to do so.[9]

While nutrition is not specifically mentioned in the Accreditation Review Commission on Education for the Physician Assistant (ARC-PA) Fifth Edition Standards,[10] the National Commission on Certification of Physician Assistants (NCCPA) blueprint for the Physician Assistant National Certification Exam and the Physician Assistant National Recertification Exam groups nutrition with gastrointestinal disorders as a broad topic without specific subtopic guidance, and together they comprise 9% of the test.[11] Although, questions with nutrition-related content may be found in other parts of the exam such as the cardiovascular and endocrine sections.

Despite the lack of a requirement, a decades-old survey of PA programs conducted in 2000 found that while 94% of schools self-reported they were offering nutrition as part of the curriculum, the mean number of contact hours devoted to nutrition was 18.[12] There are no current data available regarding contact hours or content of nutrition taught in PA school; however, recent data indicate that PAs express a similar dissatisfaction with their training in nutrition as their physician colleagues. In a recent survey of PA graduates working in Nebraska, 83% indicated they "often" encounter nutrition issues/problems with their patients; yet only 27% felt "very comfortable" addressing these issues.[13] Another survey of PA students from 3 classes at a midwestern program found that over 50% were not satisfied with the nutrition knowledge they had acquired.[14] The purpose of this study was to determine PAs' current level of confidence to engage in nutrition-related tasks and their satisfaction with the nutrition education they received in PA school. While recent publications have assessed regional samples, our sample was a national one.

METHODS

Research Approach

A mixed-methods approach that consisted of 3 data collection phases (qualitative online discussions, quantitative survey, and

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qualitative interviews) was used to identify and measure PAs' perceptions of how the instruction they received in PA school and through other sources had prepared them to address nutritional issues in patient care with consideration of their specialty area.

In phase 1, a review of literature identified previous research on the roles of PAs, or their current level of knowledge, skills, and confidence, when it comes to providing nutrition care. These results were reviewed by a panel of experts. Additionally, a moderated Q&A with experts, referred to as an "Ask-Me Session," was organized to collect qualitative data via the American Academy of PAs (AAPA) Huddle online community ("Huddle") for AAPA members. In phase 2, an online survey was deployed to a random sample of PAs from AAPA's master file to quantify the challenges and experiences outlined in phase 1. In phase 3, those who completed the online survey and met specific inclusion criteria were invited to participate in a 30- to 45-minute semi-structured interview to discuss caring for patients who may benefit from nutrition care.

Recruitment and Sampling

Phase 1

Huddle users who visited the site and those who receive regular notifications about upcoming "Ask-Me" sessions were informed of the nutrition discussion in the weeks before it took place. Once the discussion closed, participants in this session were contacted and provided with an informed consent agreement to allow for their contributions to be part of this study. This post hoc approach was done to minimize the impact of data collection on a regular Huddle activity.

Phase 2

A total of 7580 PAs were randomly selected from among all eligible PAs in the AAPA master file. PAs were considered eligible if they were located in the United States (US), had not opted out of emails from AAPA, and had not been selected for a random sample-based survey from AAPA in the past 6 months. Those with aol.com email address were excluded because of delivery issues. Prospective participants received an email invitation to complete a screening questionnaire to determine their final eligibility for the study; they had to be a PA in the US who spends 50% or more of their time providing care to patients. Eligible participants completed an informed consent agreement before proceeding to the 20-minute quantitative survey.

Phase 3

At the conclusion of phase 2, respondents were offered an opportunity to participate in phase 3, a telephone interview conducted by experienced facilitators (including coauthors MP and SP). Interested survey participants were selected using a maximum variation purposive sampling approach, to ensure that multiple perspectives were included in the interview phase and to increase the trustworthiness of the findings.[15] To that end, participants from different subspecialties were recruited with attention given to gender, years of practice, US Census regions, and practice setting. A sample size of 25 interviews was determined, based on experience from other studies, to ensure minimal requirements for data saturation, a point where no new themes emerge from interview data. See Table 1 for demographic details.

Data Collection and Analysis

Phase 1

Two experts (coauthors EM and CW) responded to open-ended questions from AAPA members during the "Ask-Me" session that took place February 10-26, 2019. Text-based question and response data from participants were downloaded and analyzed using NVivo (QSR International).[16] Along with findings from the literature review and subject matter expert consultation, qualitative data were analyzed for both descriptive and informative purposes and contributed to the development of the survey (phase 2) and interview guide (phase 3).

Phase 2

Data were collected between March 22 and May 16, 2019, after which data were cleaned to remove incomplete, duplicate, or otherwise ineligible responses. PAs from 57 specialty areas were regrouped into 4 main categories for subgroup comparison and analysis purposes: (1) primary care and prevention (PC&P), (2) acute illnesses (AI), (3) surgery and medical procedures (S&MP), and (4) chronic diseases (CD) (see online Appendix: Categorization of Specialties into 4 groups for details, Supplemental Digital Content 1, http://links.lww.com/PAEA/A24). Quantitative data were analysed using SPSS statistical analysis software (IBM Corp.) and included descriptive statistics and cross-tabulations.[17] The data presented from phase 2 are primarily descriptive in nature.

Phase 3

In-depth semi-structured interviews of 30- to 45-minutes in length were conducted between March 29 and April 24, 2019. Open-ended questions were used to encourage unbiased, in-depth responses. Core topic areas related to nutrition care covered in the interview guide included professional role, main clinical challenges, patient communication, interpersonal collaboration, and educational needs of PAs.

Audio recordings of interviews were transcribed, then analyzed using a coding framework developed using NVivo software. The coding framework was deductive in nature and was based on the core topic areas of the interview guide.[18] In addition, this process integrated themes that emerged from interview data, based on their relevance, significance, volume, and strength.

Final Analysis and Triangulation

Data collected from multiple sources, using both qualitative and quantitative methodologies were then triangulated to provide more trustworthy results and allow for an in-depth understanding of the outcomes of interest.[19] These findings were then contextualized by the expert panel including coauthors EM and CW based on their clinical expertise.[20] This article presents findings organized by the themes that arose from the final analysis and triangulation.

RESULTS

Twenty PAs from the moderated "Ask-Me" Q&A session agreed for their data to be used in the study; 25 participants took part in

Table 1. Characteristics of Study Participants

	Quantitative Surveys (n = 353) n (%)	Qualitative Interviews (n = 25) n (%)
Primary specialty		
Primary care & prevention	142 (40)	4 (16)
Acute illnesses	41 (12)	5 (20)
Surgeries & medical procedures	82 (23)	11 (44)
Chronic diseases	88 (24)	5 (20)
Years of practice		
Less than 5	91 (26)	10 (40)
5-15 years	156 (44)	9 (36)
More than 15 years	106 (30)	6 (24)
Practice location		
Urban	126 (36	10 (40)
Suburban	166 (47)	14 (56)
Rural	61 (17)	1 (4)
Primary setting		
Outpatient clinic or physician's office	215 (61)	10 (40)
Hospital	98 (28)	11 (44)
Urgent care center	19 (5)	1 (4)
Other	19 (5)	3 (12)
Primary employer		
Hospital (including academic medical center)	126 (36)	11 (44)
Physician practice: Single specialty group	86 (24)	5 (20)
Physician practice: Multispecialty group	52 (15)	3 (12)
Other	89 (25)	6 (24)

semi-structured interviews; and the online survey was fully (n = 213) or partially (n = 140) completed by 353 PAs (Table 1). Consequently, questions located later in the survey had fewer responses. Invitations to participate in the survey were sent to 7580 PAs; 353 completed the informed consent and proceeded to the survey for a response rate of 4.7%. Thirty-four participants were removed from the sample because they (a) did not meet eligibility requirements (20), (b) did not consent (12), or (c) quit before the first survey question (2). An additional 217 participants had to be excluded from the present analyses due to a technical error in the survey programming that resulted in informed consent not being obtained.

Training and Education Within Nutrition

Overall, 59% of PAs reported being slightly or very dissatisfied with the nutrition-related content in the curricula currently used to formally train PAs (Table 2). Those in AI reported greater satisfaction with the amount of training received as a PA to provide nutrition education to patients than those in other specialty areas (25% vs 15% total, $p < 0.001$). The importance of improving educational offerings was expressed by PAs during interviews and discussed with the expert panel during the "Ask-Me" session.

"I don't think I had any dedicated exams on nutrition when I was a PA student. It was very different, the way it was incorporated into a medical education. And it was very, I would say, insufficient."

– PA, PC&P

"I certainly think that nutrition should be incorporated into a discussion of whatever clinical condition you are studying, but I also think that nutrition should be a standalone subject. It's probably one of the most, if not the most, important things that we do to our bodies, for our bodies, day in and day out—what we put into it."

– PA, PC&P

Challenges posed by the quality, variety, and amount of nutrition education available to PAs in both continuing education and formal curricula were reported to be a prominent barrier to the provision of optimal patient care. Nearly half of PAs were dissatisfied with the amount (49%) and quality (47%) of continuing nutrition education available (Table 2). Furthermore, 68% of PAs had not attended any nutrition-related CME events. Though PAs indicated that programs at scientific conferences are their primary source of information on nutrition, qualitative data suggest that there are limited offerings for PAs on nutrition at those conferences.

"When you go to conferences, I don't hear a lot of talk about nutrition. It always seems less scientific or less important.... People are really starting to pay attention to how nutrition fits into our treatment, but it seems like it's behind."

– PA, CD

Current and Desired Role of PAs in Nutrition Care

When asked to indicate their level of agreement with the statement, "I suspect there is more I should be doing in the care of patients with nutritional issues," 72% of PAs agreed or strongly agreed (Table 2). Qualitative data also suggest that

Table 2. PAs' Level of Agreement and Satisfaction with Nutrition-Related Activities*

	Percent Agreement					
	Total	Not Relevant	Included in Rating	Agree or Strongly Agree	Neither Agree nor Disagree	Disagree or Strongly Disagree
	n	n	n	%	%	%
I suspect there is more I should be doing in the care of patients with nutritional issues.	220	4	216	72	19	8
Nurses should be more involved in the education of patients with nutritional issues.	220	2	218	70	22	8
PAs should be more involved in the education of patients with nutritional issues.	220	3	217	80	17	4
PAs should place greater emphasis on the relationship between nutrition and mental health.	220	5	215	76	22	2
	Percent Satisfied					
	Total	Not Relevant	Included in Rating	Very Satisfied or Satisfied	Neither Satisfied nor Dissatisfied	Dissatisfied or Very Dissatisfied
	n	n	n	%	%	
Nutrition-related content included in the curricula used to currently train PAs	222	17	205	7	34	59
Amount of training I personally received as a PA to provide nutrition education to my patients	222	6	216	15	15	69
Amount of continuing education on nutrition that is available to PAs	222	6	216	10	41	49
Quality of continuing education on nutrition that is available to PAs	222	6	216	10	43	47
My ability to refer patients to evidence-based resources	222	11	211	42	20	38

*Difference between years of practice subgroups was assessed. Only one of the 5 satisfaction items showed a significant difference by years of practice (*The nutrition-related content included in the curricula used to currently train PAs*); 1-10 years = 65% very or slightly dissatisfied vs. 21+ years = 49% very or slightly dissatisfied; $p = 0.033$). No difference by years of practice was found for any of the agreement items presented.

PA, physician assistant/associate.

PAs would like to take a greater role in nutrition care but face barriers due to a lack of confidence in their ability to provide sound nutrition management plans.

"When people are coming in wanting a more concrete nutrition plan, I don't know if I feel very well equipped to do that. And so, I would love to have more of a role in doing that."

– PA, PC&P

Challenges and Barriers to Providing Nutrition Care in Clinical Settings

PAs reported skill-related challenges when identifying a patient's nutritional needs, specifically when selecting lab tests based on patient profile (46%), when identifying needs based on various gastrointestinal diseases (67%), and when using diagnostic data to identify deficiencies (74%).

Knowledge and Confidence to Provide Nutritional Recommendations

Participants reported no or only basic knowledge related to providing nutritional recommendations in several clinical situations. The areas where the greatest percentage of PAs expressed having no or basic knowledge were inflammatory bowel disease (75%), reducing systemic chronic inflammation (70%), nutrition based on stage in life (67%), and allergies/food intolerances (64%). The areas where fewer PAs believed their knowledge to be suboptimal were bone health and vitamin D (34%), diabetes (29%), and sodium consumption for hypertension (28%) (Figure 1).

PAs varied in their confidence in their own abilities, with their confidence highest in identifying unhealthy dietary patterns and lifestyle (65% mean confidence level) and nutritional deficiencies (47%), and lowest in evaluating daily caloric intake (36%),

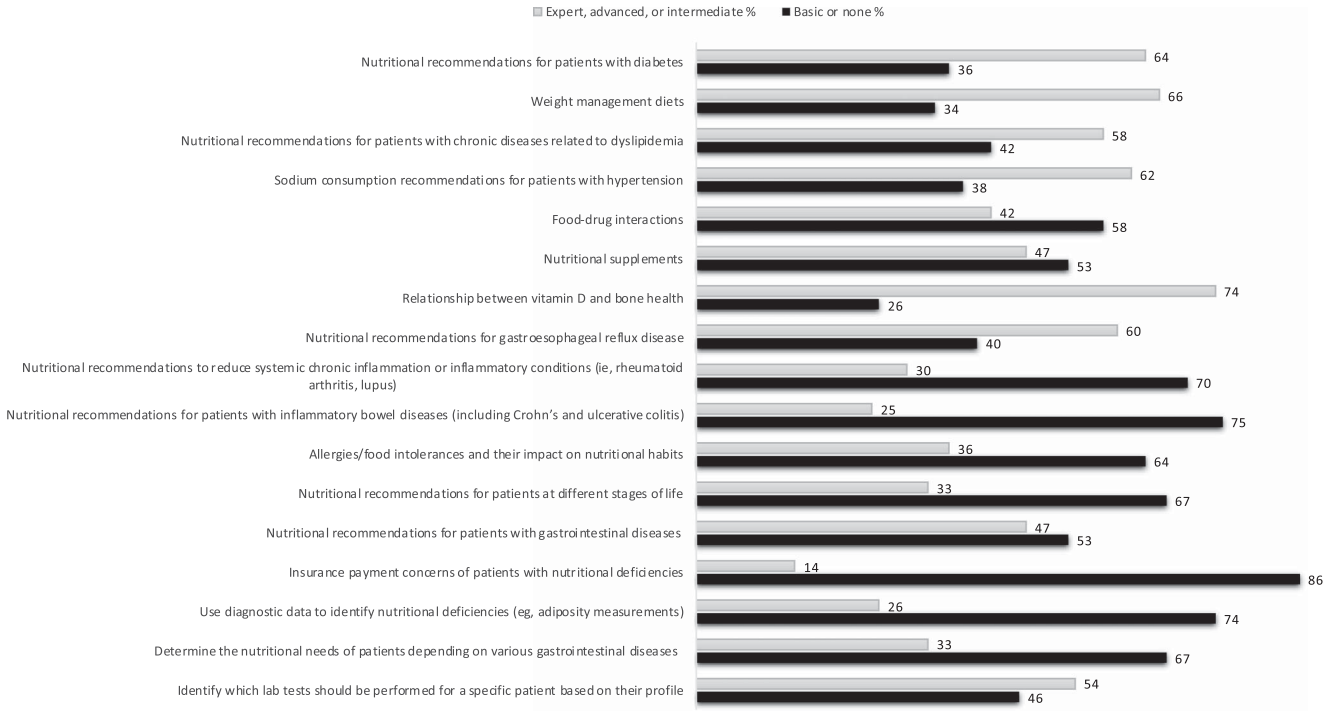

Figure 1. PAs' knowledge and skills in nutrition-related topics.

establishing a dietary plan for chronic disease prevention (41%), and eliciting a comprehensive diet history (44%) (Table 3). A lack of evidence and the volume and variety of over-the-counter supplements available were among the causalities of this challenge.

"A lot of these supplements, they do have an effect. I just don't know how they interact or the side effects or any of that kind of thing. If I don't know that information, I'm not going to give it to the patient. I can't guarantee its safety."

– PA, PC&P

Skills and Confidence to Educate Patients on Nutrition

A majority of participants agreed or strongly agreed that nurses (70%) and PAs (80%) should be more involved in the education of patients with nutritional issues. Dissatisfaction with their ability to refer patients to evidence-based resources was observed (38%) (Table 2). Overall, PAs lacked confidence in educating the patient on nutrition-related topics (mean: 53.25, SD: 30.47) (Table 3).

Table 3. PAs' Confidence Engaging in Nutrition-Related Tasks*

Nutrition-Related Task	Total n	Not Relevant to Role (n)	Confidence Ratings (n)	Mean 95% CI
Eliciting a comprehensive diet history from the patient	252	8	244	44
Recommending nutritional supplements	252	5	247	45
Establishing a dietary plan for chronic disease prevention	252	9	243	41
Evaluating the patient's daily caloric intake in relation to their activity levels	252	6	246	36
Educating the patient on nutrition topics	252	3	249	53
Identifying nutritional deficiencies	252	6	246	47
Determining if the patient's current diet is appropriate for them (in relation to factors like age, existing conditions, etc.)	252	5	247	47
Promoting realistic patient expectations of weight management (ie, maintenance, loss, gain)	252	3	249	54
Identifying unhealthy dietary patterns and lifestyle	252	2	250	65
Offering psychological support, when appropriate, to patients with nutritional issues	252	7	245	50

*Difference between years of practice subgroups was assessed. Only one of the 10 confidence items showed a significant difference by years of practice (*Determining if the patient's current diet is appropriate for them, in relation to factors like age, existing conditions, etc*; Mean ± SD Less than 1 year = 27 ± 31; 1-10 years 43 ± 32; 11-20 years 51 ± 32; 21 + years 52 ± 34; $p = 0.040$).

PA, physician associate/assistant.

"I have so many patients coming in who have questions about how their food intake might be related to their symptoms.... I don't have the background or knowledge to talk to them about those things. I just go, "Well, I'm not aware of anything. If you want to try a special diet, you can try it. I don't really have any guidance for it."

– PA, PC&P

Resources, Skills, and Confidence to Motivate Patients to Make a Behavior Change

PAs' confidence in providing psychological support to patients with nutritional issues and in promoting realistic patient expectations was: mean: 50.28, SD: 32.56 and mean: 53.73, SD: 33.28, respectively. Seventy-six percent of PAs agreed with the statement, "PAs should place greater emphasis on the relationship between nutrition and mental health." This corresponds with the difficulties reported in counseling patients with chronic diseases or mental health issues during interviews with PAs.

"Those with mental health issues, they're really focusing so much on their mental health, which is extremely exhausting to try to counsel a patient on their mental health. I can't say that I really spend a lot of time on diet with those who have depression or anxiety, for the most part."

– PA, PC&P

DISCUSSION

The data confirm that practicing PAs are dissatisfied with the nutrition education that was provided in their formal training as a PA student as well as with what is provided for continuing education. This is similar to the dissatisfaction reported by physicians.[4] Furthermore, graduates within the past 10 years have demonstrated significantly greater dissatisfaction than PAs with 21+ years of experience. It should be noted that PAs in the AI group expressed greater satisfaction; due to their positions in emergency medicine, critical care, urgent care, and wound care, any nutritional issues they experience with their patients are likely to be more focused. Decades ago, the National Academy of Sciences took steps to improve nutrition education for physicians by recommending 25 hours of nutrition education in medical school; conversely, there has not been a formal call to improve nutrition education in PA programs. Although the ARC-PA does not specifically include nutrition in their curricular standards, to be truly compliant with existing standards, nutrition education must be provided to students.[5]

Like data provided 7 years ago by Hanson et al,[13] practicing PAs acknowledge they should be providing better care to patients with nutritional issues but lack the confidence to identify their patients' needs.[21] Our data indicate that PAs have a knowledge deficit in providing nutrition recommendations for commonly encountered chronic diseases such as diabetes, hypertension, dyslipidemia, and GERD, conditions for which focusing on nutrition is a first line of treatment.[1-4] These diseases are listed in the NCCPA blueprint and are taught by programs in compliance with ARC-PA Standard B2.03: "The curriculum must include instruction in clinical medicine covering all organ systems." Yet, practicing PAs continue to lack confidence in some of the care they provide.[12] PAs felt most comfortable promoting realistic expectations of weight management and identifying unhealthy lifestyle habits, but PAs lacked confidence in estimating caloric intake, establishing a diet plan for chronic disease prevention, and educating patients about nutrition-related topics. These 3 areas require formal education and relate to ARC-PA Standard B2.15a: "The curriculum must include instruction in concepts of public health as they relate to the role of the practicing PA and disease prevention," as well as Standard B2.07e: "The curriculum must include instruction in patient evaluation, diagnosis, and management across all age groups and from initial presentation through ongoing follow-up, including: patient management including acute and chronic care plans."[11] Lastly, ARC-PA mandates via Standard B2.13 that programs must provide instruction to prepare students to search, interpret, and evaluate the medical literature; nevertheless, PAs in clinical practice are struggling when attempting to refer patients to evidenced-based resources.[5] Most of the confidence items in our survey had a high standard deviation, indicating a high degree of variation among PAs in their confidence in addressing these issues. We could hypothesize that this variation in confidence translates into differences in the care received by patients.

Medical students have indicated that their nutrition education was inadequate due to nutrition not deemed to be a priority and lacking qualified faculty to teach the subject[1] Likely, these are the same barriers encountered in PA education, in addition to time constraints. However, while ARC-PA has not specifically listed nutrition as a curricular standard, inclusion is necessary to be truly compliant with the current standards as well as the NCCPA blueprint. While adding a stand-alone nutrition course will increase credits and cost for the student, incorporating nutrition into existing didactic courses as well as throughout clerkships could prevent an additional cost. Nevertheless, most likely there will be a deficit in faculty who are competent to teach nutrition. With that in mind, the Nutrition in Medicine (NIM) project was established to provide a core nutrition curriculum for medical students free of charge. A survey published in 2015 indicated that a third of responding medical schools (44/121) were actively using this online curriculum, and an additional 18 made it available to students as a resource.[7] Due to the success of NIM, a similar program was created for practicing physicians as well. Initiating a comparable program for PA students would eliminate the barrier of finding qualified faculty and allow for flexible integration into existing didactic and clinical curriculum. Furthermore, to encourage practicing PAs to participate in nutrition continuing education programs, NCCPA should consider recognizing credits approved by the Commission on Dietetic Registration (CDR) and its providers towards Category 1 certification maintenance. It should be noted that PAs may claim CDR credits as Category 2 credits within the NCCPA system. Furthermore, specifically including nutrition in ARC-PA Standards' verbiage would move PA programs to address it in their curriculum.

Limitations

A programming error resulted in the elimination of 217 participants from the final analysis of survey data, in addition to the 12 who declined to participate. A potential for self-

selection bias is a limitation in this study, as Huddle discussion data came only from members active in this online forum.

This study is based on self-reported data, which may involve biases on the part of the participant; however, this limitation was mitigated by a design (mixed-methods) that used findings from numerous sources and perspectives. Though these methods, and the use of triangulation and purposive sampling techniques, likely minimized the limitations mentioned above, as well as those associated with this study's sample size, findings are not sufficiently generalizable to inform education without also considering additional variables such as audience, local context and clinical setting, and the learning needs of the individual PA.

CONCLUSION

The primary goal of every PA program is to prepare its graduates to be competent to enter clinical practice. In regard to nutrition, these data indicate that programs are failing to meet this goal. Nutrition is the first line of treatment in the prevention and management of numerous chronic diseases and can no longer be deprioritized or ignored. While not specifically mentioned in the ARC-PA Standards, its inclusion is implied if programs interpret each standard holistically. Self-directed learning is recognized by the PA profession as an essential competency domain; however, in order to be self-directed in this area as a practicing PA, a foundation in nutrition must be provided by PA programs, and opportunities for continuing education must be offered at our national conferences and through other channels.

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REFERENCES

1. Bowen KJ, Sullivan VK, Kris-Etherton PM, et al. Nutrition and cardiovascular disease – an update. *Curr Atheroscler Rep*. 2018; 20(8). doi: 10.1007/s11883-018-0704-3.
2. Micha R, Shulkin ML, Peñalvo JL, et al. Etiologic effects and optimal intakes of foods and nutrients for risk of cardiovascular diseases and diabetes: systematic reviews and meta-analyses from the Nutrition and Chronic Diseases Expert Group (NutriCoDE). *PLoS ONE*. 2017; 12:e0175149.
3. Evert AB, Dennison M, Garner CD, et al. Nutrition therapy for adults with diabetes or prediabetes: a consensus report. *Diabetes Care*. 2019;42:731-754.
4. Sethi S, Richter JE. Diet and gastroesophageal reflux disease: role in pathogenesis and management. *Curr Opin Gatstroenterol*. 2017;33: 107-111.
5. National Research Council (US) Committee on Nutrition in Medical Education. *Executive Summary. Nutrition Education in U.S. Medical Schools*. Washington, DC: National Academies Press; 1985.
6. Academy of Nutrition and Dietetics. Position of the academy of nutrition and dietetics: interprofessional education in nutrition as an essential component of medical education. *J Acad Nutr Diet*. 2017; 117:1104-1113.
7. Adams KM, Butsch WS, Kohlmeier M. The state of nutrition education at US medical schools. *J Biomed Educ*. 2015;2015:1-7.
8. Briggs-Early K, Adams KM, Kohlmeier M. Analysis of nutrition education in osteopathic medical schools. *J Biomed Educ*. 2015;2015:1-6.
9. Devries S, Agatston A, Aggarwal M, et al. A deficiency of nutrition education and practice in cardiology. *Am J Med*. 2017;130:1298-1305.
10. Accreditation Review Commission on Education for the Physician Assistant, Inc. *Accreditation Standards for Physician Assistant Education*, 5th ed. ARC-PA; 2019: http://www.arc-pa.org/wp-content/uploads/2019/09/Standards-5th-Ed-Sept-2019-fnl.pdf. Accessed January 28, 2020.
11. National Council for the Certification of Physician Assistants. Content blueprint for PANCE. Effective; 2019. https://www.nccpa.net/pance-content-blueprint. Accessed January 28, 2020.
12. Sullivan SY. Nutrition education in physician assistant programs: a national survey. *J Physician Assist Educ*. 2000;11(1):18-24.
13. Hanson CK, Woscyna G, Jensen SK, et al. Demographics and nutrition-related patient care encounters: a survey of physician assistants in Nebraska. *J Physician Assist Educ*. 2013;24:6-13.
14. Favia M, Moore A, Kelly P, et al. What do physician assistant students know about nutrition? A survey of attitudes, self-perceived proficiency, and knowledge during three stages of physician assistant education. *J Physician Assist Educ*. 2016;27(3):131-135.
15. Palinkas LA, Horwitz SM, Green CA, et al. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Adm Pol Ment Health*. 2015;42:533-544.
16. NVivo, version 12; 2018. QSR International Pty Ltd; Doncaster, Australia.
17. IBM SPSS 25.0 software. IBM Corporation; Armonk, New York.
18. Brod M, Tesler LE, Christensen TL. Qualitative research and content validity: developing best practices based on science and experience. *Qual Life Res*. 2009;18(9):1263-1278.
19. Turner SF, Cardinal LB, Burton RM. Research design for mixed methods: a triangulation-based framework and roadmap. *Organizational Res Methods*. 2017;20:243-267.
20. Carter N, Bryant-Lukosius D, DiCenso A, Blythe J, et al. The use of triangulation in qualitative research. *Oncol Nurs Forum*. 2014;41(5): 545-547.
21. Hartley M. Lifestyle modification as first line of treatment for chronic disease. *J Diabetes Metab Disord Control*. 2014;1(2):35-39.
22. Mogre V, Stevens FCJ, Aryee PA, Amalba A, Scherpbier A. Why nutrition education is inadequate in the medical curriculum: a qualitative study of students' perspectives on barriers and strategies. *BMC Med Education*. 2018. doi: 10.1186/s12909-018-1130-5.