Title: Leveraging a Podcast Series for Nutrition Education in Medical Curriculum

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Author names:

1. John Vellek
2. Jessica Rosen
3. Gillian Hecht
4. Francesco Ciuffo
5. Rachel Thommen
6. Kristina H. Petersen

Degrees and Affiliations:

1. MD. 2024 graduate, New York Medical College, Valhalla, New York, USA
2. MD, MS. 2024 graduate, New York Medical College, Valhalla, New York, USA
3. MD, MS. 2024 graduate, New York Medical College, Valhalla, New York, USA
4. BS. Fourth-year medical student, New York Medical College, Valhalla, New York, USA
5. MD. 2024 graduate, New York Medical College, Valhalla, New York, USA
6. PhD. Associate Professor, Department of Biochemistry and Molecular Biology, New York Medical College, Valhalla, New York, USA

ORCID (Open Researcher and Contributor Identifier):

https://orcid.org/0000-0002-3988-3248

https://orcid.org/0000-0002-4538-7267

https://orcid.org/0009-0002-1816-6992

https://orcid.org/0000-0002-2945-8117

https://orcid.org/0000-0002-3286-4466

https://orcid.org/0000-0002-1944-6972

About the author: John Vellek is a Class of 2024 graduate at New York Medical College pursuing a career in radiology. He is also a recipient of the Dean's Award for Research in 2022 at New York Medical College.

Corresponding author email: jvellek@student.nymc.edu

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ABSTRACT.

Background: Malnutrition is a worldwide problem. Despite the paradoxical global prevalence of both an obese and underfed population, physicians have historically fallen short in their efforts to combat this epidemic. Unfortunately, medical education has only recently prioritized nutrition curriculum, and its incorporation has been slow. The Culinary Medicine Interest Group (CMIG) at New York Medical College (NYMC) aims to expand access to nutrition education in medical school.
Methods: The CMIG podcast was conceived as an adjunct to the preclinical curriculum. Podcasts were distributed via the NYMC learning-management system in parallel with pre-clinical curriculum and made widely available via Spotify, YouTube, and Google Podcasts. A pre-podcast survey was conducted to establish a baseline of nutrition knowledge in the NYMC student population, and a post-podcast survey was also distributed.
Results: During 2022-2023, twelve episodes covering various nutrition-related subspecialty topics were released. We received 76 pre-podcast survey responses which made the need for nutrition curriculum clear: 37% reported no experience with nutrition, less than half took coursework that covered nutrition, 59% were uncomfortable discussing eating disorders, and only 21.5% reported feeling comfortable discussing diet in relation to menopause. Post-podcast survey responses could not be analyzed due to low participation.
Conclusion: Limited survey responses hinder conclusions about the podcast's potential impact; we believe this is related to the lack of value conferred upon content beyond the scope of mandated material. Nevertheless, baseline data support the need for more nutrition curriculum; we present a novel approach to expanding access to nutrition curriculum in medical education.

Key Words: nutrition; culinary medicine; medical education; podcast education; survey analysis

INTRODUCTION.

Malnutrition is a worldwide problem that presents in many forms. In the US, there has been a drastic increase in obesity over recent decades, with the percentage of adults considered to be in the obese range rising above 40% nationwide in 2021.[1] Globally, obesity continues to rise; shockingly, the number of obese adults doubled between 2000 and 2010.[2,3] This dramatic rise in obesity is closely related to people consuming nutrient-poor, energy-dense foods that are often less expensive and more easily obtained than their nutritious counterparts.[4,5] As such, many people in the obese population worldwide are also deficient in a variety of micronutrients, further compounding their health risks. Alongside the growing number of people who are obese, in stark contrast, there remains a global problem of an underfed population, particularly in developing countries, who experience malnutrition at alarming rates.[2] Despite global malnutrition, physicians have historically lacked the education to address these issues.[6,7]

Some of the blame for physicians' failure to tackle this issue has been placed on physician burnout and the overwhelming pressure to combat the sequelae of poor nutrition. However, research has highlighted that nutrition education at the medical school level remains underdeveloped despite the Association of American Medical Colleges declaring the importance of nutrition in medical education.[6,7,8] In recent years, nutrition has been taught as a specific set of pathologies related to micronutrient deficiencies rather than a concept intimately related to general wellness.[7] Only 25% of medical schools in the US have a formal nutrition education built into their curriculum.[7] Furthermore, an analysis of physician education in nutrition in the US has shown that most of their nutrition training is acquired independently rather than as part of their formal education.[7] The Culinary Medicine Interest Group (CMIG) at New York Medical College (NYMC) was founded in 2020 by first-year medical students to expand nutrition education in medical school's preclinical and clinical years.

There has been a dramatic increase in the popularity of podcasts over the last several years.[9] While many are based on leisure, the interest in educational podcasts has also increased.[10,11] Notably, the distribution of these podcasts within the field of medicine has been inconsistent, often with variable topics covered depending on subspecialty.[10] Within medical podcasts, content surrounding nutrition and nutrition education is uncommon and often gleaned from individuals outside of the medical field.[7,10,11,12] Incorporating new material within the medical school curriculum is daunting, as curricular programs are well-established and have limited opportunities for expansion without sacrificing content elsewhere. As such, the CMIG sought to pursue its mission of increasing preclinical and clinical nutrition education at the medical school level by releasing a podcast series detailing the clinical experiences of various physicians and their use of nutrition and diet education, thereby creating a self-directed resource to bridge the gap in nutrition education for future and current physicians and clinicians. This study seeks to explore the utility of an adjunct nutrition curriculum provided as a voluntary podcast in enhancing student understanding of nutrition in medicine.

METHODS

We initially conceived the CMIG podcast as an adjunct to the preclinical curriculum, modeling a systems-based approach. We chose to deliver our curriculum as a podcast series given the increasing popularity of podcasts among the public, ease of access through streaming applications, and most notably as a result of the virtual asynchronous learning model used during the COVID-19 pandemic when this project was created. Our initial plan was to record two episodes per system covered within a course; each episode was approximately 15 to 20 minutes. We recruited NYMC faculty to be interviewed via email including the CMIG's mission statement. We notified faculty via email or verbally that the podcast would be distributed virtually on public platforms with a target audience of students at NYMC. Upon their agreement to participate, we provided faculty participants with a list of questions that would be covered during the podcast recording. The CMIG executive board composed and tailored questions to each faculty member's expertise and/or desired discussion topics.

We recorded twelve podcast episodes during two academic years beginning in the fall of 2020 and ending in the spring of 2022. Podcast guests specialized in areas coinciding with the systems-based approach utilized in preclinical curriculum, including general medicine/primary care, pediatrics, neurology/neuroscience, nephrology, pulmonology, women's health, endocrinology, gastroenterology, and cardiology. Before recording, we briefed interviewees once again on the podcast and its distribution plan. Faculty were then asked questions per the pre-written document with subsequent follow-up questions as appropriate. The target conversation length was approximately 15 to 20 minutes. We recorded podcast episodes using the Zoom video conferencing platform. After recording, audio files from Zoom were edited with Final Cut Pro.

We initially distributed podcast episodes using the learning management system for NYMC as an adjunct to the first-year medical school physiology curriculum for the Class of 2025. Subsequently, we uploaded episodes to YouTube, Spotify, and Google Podcasts. Episodes were released on the 15th and 30th of every month, starting in September 2022 and concluding in March 2023 (excluding December 2022). We advertised episode releases via an email to the entire NYMC student body. Faculty interviewees were notified via email upon release of their respective episodes. We have not monetized episodes or used funds to create, market, or distribute the podcast.

A pre-podcast survey was emailed to NYMC students via Qualtrics on 8/30/2022. Students receiving the survey included those studying for an MD, PhD, Masters, and other health professional programs, including dental, physical therapy, and speech-language pathology students. The survey was made available to over 1900 students in various health-related fields, including more than 800 studying for a MD.

We derived our survey from the pre-module survey used in the Nutrition and Culinary Medicine Area of Concentration at NYMC and recorded responses to establish a broad baseline of nutrition knowledge within the target population.[13] The survey asked respondents to provide consent so we could incorporate their answers for academic research; it remained open until the release of the podcast's first episode on 9/16/2022. The original plans included reevaluation with a post-podcast survey, which included the same questions as

the pre-podcast survey, plus a section about listenership. However, we received limited responses to the pre-podcast survey and very few responses to the post-podcast survey.

Survey responses were studied in aggregate to preserve confidentiality of individual responses. Student emails were the only identifying data recorded, which were used to contact students to request consent for use of their responses. This study was deemed exempt by the NYMC Institutional Review Board.

RESULTS.

We received 76 complete responses to the pre-podcast survey with permission to analyze data. We also received some partial additional responses. The respondents were predominantly female-identifying (68.4%), with the remainder identifying as male. The majority of respondents were in their third year of medical school at the time of their response (40.8%), followed by second year (30.3%), with first and fourth year garnering lower response rates (18.4% and 7.9%, respectively). Most respondents reported occasional podcast listenership in their free time, with 25.0% responding with 1-2 listens per month and 23.7% responding with listening to podcasts a few times per month. Complete demographic data can be found in Table 1.

We recorded baseline nutrition education in the target audience by querying their feelings about discussing nutrition in various clinical settings through our pre-podcast survey (Appendix B). Complete data for these questions can be found in Tables 2A-2C. The vast majority of students reported limited nutrition experience prior to taking the survey: 43.7% reported taking some high school or college nutrition courses, while 36.8% reported having no prior nutrition experiences whatsoever. We asked respondents to first rate their level of comfort in discussing the treatment of various disease states using diet with patients that they would hear throughout the podcast series. Respondents reported the greatest level of comfort in the discussion of hypertension, with 58.8% responding that they felt "somewhat comfortable" or " extremely comfortable." Respondents also reported high levels of comfort in discussing food allergies and vitamin deficiencies, with 55.2% and 51.8% responding as "somewhat comfortable" or " extremely comfortable" for each subject, respectively.

Students reported the greatest level of discomfort in relation to the discussion of eating disorders, with 58.9% responding that they felt " somewhat uncomfortable" or "extremely uncomfortable." When asked about comfort discussing specific physiological changes and their relation to diet, respondents reported an overall lower level of comfort. For the relationship between menopause and diet, only 21.5% of respondents reported feeling "somewhat comfortable" or "extremely comfortable" discussing with patients. We saw similarly low levels of comfort to questions about other physiological changes, including breastfeeding and trauma, with 21.5% and 29.1% of students responding "somewhat comfortable" or "extremely comfortable" for each topic, respectively. Respondents had the highest level of comfort discussing being overweight and obese with patients, with 64.5% feeling "somewhat comfortable" or "extremely comfortable." Students reported greater levels of comfort discussing common nutritional concepts with patients compared to the previous questions. Students reported high levels of comfort, particularly when discussing alcohol with patients, with 81.5% responding "somewhat comfortable" or "extremely comfortable." We also saw high comfort levels when discussing hydration status at 84.2% for the same categories. Notably, over 60% felt "somewhat comfortable" or "extremely comfortable" discussing macronutrients, cholesterol, body-mass index (BMI), and vitamins/minerals. Students were less confident in their ability to discuss hip-to-waist ratio, with only 50.0% feeling "somewhat comfortable" or "extremely comfortable."

We recorded listenership to each podcast episode individually and separately by streaming platform as of 11/27/2023 (Table 3). The most popular episode of the podcast was "Plant-Based Diets and Reflux

Disorders," with 140 plays on YouTube and 27 on Spotify. The second most popular was "Eosinophilic Esophagitis," with 16 plays on YouTube, seven on Spotify, and four on Google Podcasts. Listenership declined following the release of these two episodes, the first two in the series. YouTube garnered the highest overall views across all episodes, followed by Spotify and Google Podcasts. A list of titles and links to the twelve podcast episodes can be found in Table 4.

Our post-podcast survey was distributed in a manner similar to the pre-podcast survey over a period of several weeks. We received 7 complete responses to the post-podcast survey, and unfortunately could not perform any meaningful analysis given this low response rate.

DISCUSSION.

To our knowledge, this work details the first use of a podcast series to enhance nutrition education in a medical school curriculum. The literature has shown that physicians have historically fallen short in their efforts to understand nutrition. Additionally, medicial education tends to view nutrition as a myriad of specific deficiencies rather than as a fundamental component of overall well-being.[6,7,8] Respondents from the NYMC medical school class had minimal experience in nutrition prior to medical education, with nearly half reporting having only taken a few classes, and almost 40% reporting no previous exposure to nutrition education. Given the low response rates, we must interpret these data with some caution while also admitting that they likely represent overestimates, as students with an interest in nutrition were more likely to answer our survey.

Data collected from the pre-survey clearly depict a need for expanded nutrition education. Students reported less comfort and even discomfort when asked about discussing pathologies and treatment plans involving diet. This was particularly evident in our results surrounding eating disorders, where nearly 60% of respondents were uncomfortable, as well as menopause, where only 21.5% were comfortable. This underscores the need for our work to continue, considering that eating disorders have become increasingly pervasive worldwide alongside the expansion of social media and menopause is a physiologic change impacting half of patients across all subspecialties. Regardless of specialization, all physicians need to be ready to talk about diet and nutrition, and our data show that the current generation of new physicians does not feel prepared. Our students reported the greatest degree of comfort in discussing macronutrients, micronutrients, and hydration, which may be in large part due to the presence of this material on board examinations. Unfortunately, extremely limited responses to the post-podcast survey precluded any analysis of the impact of our podcast on students' knowledge and attitudes.

Listenership to the podcast series was inconsistent. Initial results were promising, with high levels of play recorded for the first episode. However, listenership quickly dropped off and stabilized to around 10 listens per episode across streaming platforms, bringing into question the strength of the series' retention with its audience. Although our podcast introduced valuable content to the medical school community, we believe its efficacy was limited by the strained schedule associated with medical education. This may have led to a hesitancy among listeners to spend time on "extra" content exams don't cover. [6,7,8] Research has shown that medical education has historically failed to incorporate meaningful nutrition education into the curriculum despite the importance placed on it by the AAMC. [6,7,8] We hypothesize that listenership would increase if medical school exams and licensing exams confer more value on nutritional content by mandating its inclusion and testing students on it. Additionally, inclusion of the podcast series, or at least its contents, into the standard curriculum would likely have led to greater listenership. As a wholly separate resource, listenership was most likely driven by pre-existing interest in nutrition.

Unfortunately, our survey analysis was limited due to the low response rate. Of the over 1900 health science students, including over 800 medical students, given access to the surveys, only 76 fully completed the pre-podcast survey with consent to participate in research, a response rate of less than 5%. One of the reasons for this may have been the length of the survey. Additionally, we had minimal participation in the post-podcast

survey, with less than 10 complete responses. As such, we cannot currently ascertain the impact of our podcast on NYMC nutrition education, although we believe this is due to our resource being provided outside of the normal curriculum as a voluntary learning tool. However, we are hopeful that we can continue to expand access to important nutritional education through continued expansion of listenership amongst other medical school populations so we may analyze survey data as the podcast series expands. We also hope to see the incorporation of nutritional education content into the mandated preclinical curriculum, which would confer value upon it as "testable" rather than as a wholly separate, optional, and implicitly less critical body of knowledge. We recommend that those who wish to replicate our work incorporate all components, including survey distribution, directly into the existing curriculum at their institution. The incorporation into mandated curriculum would confer value upon these concepts. Furthermore, students would be more likely to both listen to the material as well as complete pre- and post-surveys to better understand the benefit of these resources.

Despite the limited data available, we believe this work models an innovation in nutritional medical education. The aims of our work were twofold: to present an alternative method of delivery of medical education content through asynchronous podcast episodes and to highlight nutrition as an essential and underdeveloped area of healthcare education. The production of this podcast series has made subspecialty-specific content available to future clinicians and emphasized the role of nutrition across various aspects of medicine. As we continue to distribute this podcast, we hope this work may spark conversations about the need to continue to prioritize, enhance, innovate, and mandate nutrition education in medical school.

SUMMARY - ACCELERATING TRANSLATION

Leveraging a Podcast Series for Nutrition Education in Medical Curriculum

This work seeks to address the gap in medical education regarding nutrition. By creating a podcast series involving physicians and their use of nutrition in the day-to-day of their subspecialty, we exposed students to the value of understanding nutrition regardless of what type of doctor they aspire to become. Our survey data also demonstrate that the average medical student does not feel prepared to discuss nutrition with their patients across a spectrum of common topics that come up in treatment and preventative care. However, we are currently unable to determine its efficacy in preparing students for this role, as post-podcast survey responses were extremely limited. Given this result, we can reasonably conclude that the delivery of this material as a voluntary resource was not conducive to student learning. As such, we believe that this work demonstrates the need for expansion of nutrition education in medical school as well as the need to examine further methods for bridging that gap.

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FIGURES AND TABLES.

Table 1: Select demographic data of podcast respondents in the pre-podcast survey (N=76)

Gender Identity	Man			Woman		
	31.6%			68.4%		
Previous Nutrition Experience	Some high school or college courses		Undergraduate minor or major		Other program	None
	43.7%		3.5%		16.1%	36.8%
Year in Medical School	First		Second		Third	Fourth
	18.4%		30.3%		40.8%	7.9%
Podcast Use	Never	Rarely (1-2 times a month or less)	Sometimes (more than 2 times a month but not weekly)	Often (1-2 times a week)	Very often (3-4 times a week)	All the time (nearly every day or daily)
	13.6%	25.0%	23.7%	17.1%	10.5%	10.5%

Table 2A: Survey Data for question 2.2 in the pre-podcast survey (N=85)

What is your level of comfort in discussing how to treat/manage following conditions using diet with patients?	Extremely uncomfortable	Somewhat uncomfortable	Neither comfortable nor uncomfortable	Somewhat comfortable	Extremely comfortable
Type II Diabetes mellitus	9.41%	17.65%	20.00%	43.53%	9.41%
Hypercholesterolemia	9.41%	12.94%	31.76%	43.53%	2.35%
Cardiovascular disease	10.59%	9.41%	35.29%	37.65%	7.06%
Hypertension	9.41%	8.24%	23.53%	54.12%	4.71%
Epilepsy	27.06%	44.71%	21.18%	5.88%	1.18%
Osteoporosis	22.35%	28.24%	30.59%	18.82%	0.00%
Eating disorders	23.53%	35.29%	24.71%	16.47%	0.00%
Food allergy and sensitivity	12.94%	8.24%	23.53%	47.06%	8.24%
Asthma	23.53%	25.88%	30.59%	18.82%	1.18%
Vitamin and mineral deficiencies	10.59%	11.76%	25.88%	48.24%	3.53%
Inflammatory disorders of the gastrointestinal system (IBS, Crohn's disease, Celiac Disease)	14.12%	28.24%	27.06%	22.35%	8.24%
Reflux Disorders	8.24%	21.18%	22.35%	41.18%	7.06%

Table 2B: Survey data for question 2.3 in the pre-podcast survey (N=79)

What is your level of comfort in discussing how to treat/manage following physiological changes using diet with patients?	Extremely uncomfortable	Somewhat uncomfortable	Neither comfortable nor uncomfortable	Somewhat comfortable	Extremely comfortable
Glycemic Index	10.13%	26.58%	26.58%	30.38%	6.33%
Trauma and recovery	16.46%	29.11%	32.91%	20.25%	1.27%
Overweight/obesity	8.86%	10.13%	16.46%	53.16%	11.39%
Preconception nutrition	15.19%	25.32%	25.32%	29.11%	5.06%
Gestational nutrition	15.19%	22.78%	26.58%	34.18%	1.27%
Postnatal nutrition and breastfeeding	15.19%	26.58%	29.11%	25.32%	3.80%
Menopause	18.99%	30.38%	29.11%	21.52%	0.00%
Renal health	17.72%	31.65%	26.58%	21.52%	2.53%

Table 2C: Survey data for question 2.4 in the pre-podcast survey (N=76)

What is your level of comfort in discussing the following nutritional concepts and their impact on health with your patients?	Extremely uncomfortable	Somewhat uncomfortable	Neither comfortable nor uncomfortable	Somewhat comfortable	Extremely comfortable
Macronutrients (carbohydrates, proteins, fats)	5.26%	11.84%	17.11%	47.37%	18.42%
Fat profiles in specific foods and oils	7.89%	15.79%	21.05%	43.42%	11.84%
Cholesterol	7.89%	7.89%	15.79%	55.26%	13.16%
BMI	5.26%	15.79%	13.16%	51.32%	14.47%
Hip-to-waist ratio	5.26%	21.05%	23.68%	35.53%	14.47%
Alcohol	3.95%	11.84%	2.63%	60.53%	21.05%
Vitamins and minerals	6.58%	10.53%	18.42%	52.63%	11.84%
Antioxidants	7.89%	18.42%	26.32%	40.79%	6.58%
Hydration	3.95%	2.63%	9.21%	52.63%	31.58%
Plant-based diets	7.89%	17.11%	23.68%	42.11%	9.21%

Table 3: Podcast aggregate viewership data from release to 11/27/2023.

Episode	Number of Plays as of 11/27/2023		
	YouTube	Spotify	Google Podcasts
Plant-Based Diet and Reflux Disorders	140	27	0
Eosinophilic Esophagitis	16	7	4
Adolescents, Allergies, and Eating Disorders	14	1	7
Pediatric Obesity	4	2	10
Fad Diets and Cardiovascular Disease	5	6	7
Hypertension	4	5	2
Allergy and Pulmonology	8	2	3
Renal Health	2	2	2
Obesity and Endocrine	5	3	0
Menopause	2	1	2
Breastfeeding	17	2	2
Neurodegeneration	7	5	2

Table 4: Podcast Episode Links

Episode	Link - YouTube
Plant-Based Diet and Reflux Disorders	https://youtu.be/WnZpQsUnPTQ
Eosinophilic Esophagitis	https://youtu.be/JIFl97Lj-cs
Adolescents, Allergies, and Eating Disorders	https://youtu.be/LPfwIYbBJ-8
Pediatric Obesity	https://youtu.be/_2b4gceW_bQ
Fad Diets and Cardiovascular Disease	https://youtu.be/57opolHs6fs
Hypertension	https://youtu.be/PXYBtyDpyD8
Allergy and Pulmonology	https://youtu.be/GPQrcyvFyaQ
Renal Health	https://youtu.be/N3ZTqzUY7B8
Obesity and Endocrine	https://youtu.be/YJpoySj2KBQ
Menopause	https://youtu.be/1Z7zs046dkE
Breastfeeding	https://youtu.be/ftCuhlqpDnU
Neurodegeneration	https://youtu.be/EXxG4_rWhrg