Original Publication

OPEN ACCESS

Obesity, Diet, and Exercise Education for the Primary Care Clerkship Using an Articulate Storyline 2 e-Learning Module

Robert Wilechansky, MD*, Marissa Burgermaster, PhD, Deborah Jones, MD, MPH, David Seres, MD, ScM

*Corresponding author: rmwilechansky@gmail.com

Citation: Wilechansky RM, Burgermaster M, Jones DP, Seres DS. Obesity, diet, and exercise education for the primary care clerkship using an Articulate Storyline 2 e-learning module. *MedEdPORTAL*. 2016;12:10497. https://doi.org/10.15766/mep_2374-8265.10497

Copyright: © 2016 Wilechansky et al. This is an open-access publication distributed under the terms of the Creative Commons Attribution-NonCommercial-Share Alike license.

Abstract

Introduction: Despite high obesity rates nationwide, many medical schools provide insufficient nutrition education. It has been difficult to deliver nutrition education in the Columbia University College of Physicians and Surgeons primary care clerkship given its numerous clinical sites offering varied expertise. We supplemented the clerkship curriculum with an interactive e-learning module designed to provide medical students with knowledge and skills in nutrition and weight management, as well as an understanding of registered dietitians' role. The module was created using Articulate Storyline 2 software and emphasizes active learning and simulated clinical decision-making. **Methods:** Learning objectives and a curriculum were developed based on a literature review, a student focus group, and the guidance of a multidisciplinary committee. The module integrates narrated content with interactive exercises and utilizes multiple teaching styles. Participants were third-year medical students in the primary care clerkship during January-May 2016 ($n = 64$). Students completed a web-based evaluation survey after the module. **Results:** Ninety-two percent of students completed the module in 2 hours or less. Ninety-seven percent agreed that the module was easy to navigate, and 93% agreed that it contributed to their understanding of the topic. Qualitatively, students generally responded positively to the module's active learning component and its use of multiple teaching styles. **Discussion:** This web-based interactive learning module is an accessible tool that allows educators to simultaneously deliver information and target clinical reasoning skills. Active learning facilitates students' engagement with the content. This module is easily adaptable for other learners, including physicians and patients, and other areas of the curriculum.

Keywords

Counseling, E-Learning, Nutrition, Obesity, Diet, Exercise, Module, Weight, Articulate, Storyline

Appendices

- A. Obesity, Diet, and Exercise Management and Counseling Module folder
- B. Post Major Clinical Year Survey
- C. Nutrition Curriculum Focus Group Questions and Topics
- D. e-Learning Module Curriculum Outline
- E. End of Module Survey

All appendices are peer reviewed as integral parts of the Original Publication.

Educational Objectives

After completing this web-based module, learners will be able to:

1. Describe the causes and health implications of obesity, as well as barriers to weight loss.
2. Identify patients who would benefit from referral to a registered dietitian.
3. Describe components of a healthful diet.
4. Describe current weight-loss guidelines and exercise guidelines.
5. Evaluate patients for obesity on physical exam.
6. Apply motivational interviewing techniques in clinical scenarios.

Introduction

Dietary choices, high body mass index, and physical inactivity were among the leading risk factors for disability and premature death in the US from 1999 to 2010.¹ A lifestyle that includes healthy eating and active living may mitigate these risks and contribute to the prevention of noncommunicable disease. Health care professionals—especially primary care physicians—have an important role in supporting

patients in attaining and maintaining a healthy weight. In the US, high rates of obesity and its associated comorbid illnesses prompt many patients to seek lifestyle counseling from physicians. A number of student and professional groups, including the Association of American Medical Colleges and the National Heart, Lung, and Blood Institute, which funded the Nutrition Academic Award Program,^{2,3} have called for improved nutrition education for medical students. In particular, longitudinal curricular integration and interprofessional education have been recommended for reforming current nutrition curricula in US medical schools.⁴ However, most medical schools fall short of minimum nutrition education recommendations, in part due to the fact that many institutions lack a dedicated nutrition course.⁵ Moreover, many physicians report that they feel unprepared to address weight management and would favor additional training in this area.⁶

Curricula designed to teach obesity, nutrition, and healthy lifestyle principles to medical students have been published on MedEdPORTAL. A notable example is the NEW Lifestyle (nutrition, exercise, and weight management) curriculum developed at the Wake Forest School of Medicine, which uses PowerPoint to deliver eight short modules, each with a pre- and postquiz.⁷ This curriculum provides a broad overview of obesity epidemiology, health effects, social bias, counseling, and treatment. A number of other curricula present team-based learning activities covering similar content, emphasizing interprofessional education in lifestyle management,⁸ obesity diagnosis and treatment planning,⁹ and personalized, evidence-based weight-loss recommendations.¹⁰ Of note, a survey of obesity and lifestyle education curricula on MedEdPORTAL did not reveal any that use interactive web-based delivery methods, such as HTML5. There are a number of advantages of this type of learning modality, including ease of access and flexibility. In addition, interactive web-based curricula may promote self-directed learning and enable medical educators to incorporate multiple instructional methods within a single entity.¹¹

At Columbia University College of Physicians and Surgeons (P&S), nutrition curricular reform is currently in progress. The Nutrition and Healthy Lifestyle Curriculum Steering Committee (NHLC)—a multidisciplinary group of physicians, registered dietitians, and medical students—seeks to integrate clinical nutrition education into all 4 years of the medical school curriculum. A postmajor clinical year (post-MCY) survey conducted in 2014 on behalf of the NHLC found that a majority (79%) of P&S students believed that nutrition education during clinical clerkships was insufficient, while a majority (78%) of students responded that they did not feel prepared to provide nutrition-related patient care.¹² Delivering nutrition education in the P&S primary care clerkship is challenging because of the large number of clinical practice sites offering varied clinical experiences and a range of nutrition expertise. We addressed this by introducing an e-learning module created using Articulate Storyline 2 software into the primary care clerkship curriculum. By using an interactive e-learning approach, we were able to provide medical students in a geographically dispersed primary care clerkship with practical knowledge and counseling skills related to obesity, diet, and exercise, as well as an understanding of nutrition professionals' role in healthy lifestyle management. Our web-based, e-learning module is free and publicly available.

Methods

The post-MCY survey (Appendix B) was sent electronically to third-year P&S medical students ($n = 102$) in December 2014 to assess needs for nutrition education in the P&S curriculum. Surveys were sent via Qualtrics (2014-2016 versions), a web-based software for survey distribution and data collection. Following this, in March 2015, fourth-year P&S medical students were recruited for a focus group conducted to discuss the logistics of delivering nutrition education at P&S (Appendix C). We felt that fourth-year students were best positioned to offer comprehensive insight after having completed the entire P&S curriculum.

The focus group consisted of five participants (three male, two female) who were recruited via email. The focus-group discussion included existing nutrition and healthy lifestyle curriculum components in each year of the medical school curriculum, as well as suggestions for curricular improvements and additions. Participants' responses were audio-recorded, transcribed, and thematically coded. Focus-group participants all reported that they did not feel confident to counsel a patient on nutrition. All participants

responded positively to the nutrition e-learning module proposal for the primary care clerkship. Students were also in favor of standardized interprofessional education opportunities with nutrition professionals. In terms of overall content, students expressed the most desire to learn the basic components of healthy living regimens, including for themselves as young people as well as for people with common chronic illnesses. Students were also interested in learning about the most reliable resources for nutrition information, including notable studies, journals, and textbooks.

A search of MedEdPORTAL using the terms *articulate storyline*, *obesity*, *nutrition*, *diet*, *exercise*, *physical activity*, and *module* did not reveal any published curricula on these topics created using Articulate Storyline 2 software or HTML5 as a published format.

The results of the needs assessment informed the decision to create a standardized educational intervention—an electronic learning module—to teach basic concepts in nutrition and healthy lifestyle management. Given the relevance of these topics to the outpatient setting, the primary care clerkship was determined to be the ideal placement for this intervention. Learning objectives were subsequently drafted in order to reflect the key teaching aims of this project. Drawing from major guidelines as well as the advice of the NHLCC, a curriculum was then developed for the e-learning module (Appendix D). In lieu of a cursory overview of the vast amount of content related to the subject matter, the curriculum instead provides a practical framework that physician trainees can use to conceptualize patient management and counseling related to obesity, diet, and exercise. The curriculum was divided into two parts: (1) history and assessment and (2) management and counseling of overweight and obese patients. Topics covered in Part 1 include obesity statistics, classification, risk factors, health implications, and physical exam assessment and are designed to emphasize why obesity and lifestyle management should be important to physicians in primary care settings. Topics covered in Part 2 include basic principles of weight management, role of registered dietitians in obesity management, dieting and healthy food choices, exercise recommendations, and motivational interviewing strategies and are designed to aid physician trainees as they learn how to support their patients in dietary and exercise self-management.

Articulate Storyline 2 software was used to create the e-learning module entitled *Obesity, Diet, and Exercise: Management and Counseling Strategies for Medical Students and House Staff* (Appendix A). Funding used to purchase a student license for this software program was provided by the Scholarly Projects Program at P&S. The Articulate Storyline 2 platform was chosen due to its relatively simple user interface as well as its capability to support a variety of interactive exercises, including multiple-choice questions, drag-and-drop, matching, and branched decision-making scenarios. The software also has built-in animated characters, which were used to simulate human interactions and expressions. Among the multiple publication formats that Storyline 2 offers, we chose to use HTML5 for its accessibility on most devices. The module is specifically designed to be interactive and to appeal to multiple learning styles by using narration, reading, diagrams, case scenarios, and quizzes. Slides contain a mixture of narrated lecture-style content with animations as well as interactive exercises in order to accommodate varying learner preferences. To increase student engagement, the teaching method varies throughout the module. The module content adheres to a general pattern: Topics are introduced via lecture-style narration or reading via a clickable figure, followed by a related interactive exercise and/or a related testing component (e.g., multiple-choice question). In addition, a medical case scenario is introduced at the start of Part 1 and is used throughout the module to illustrate clinical teaching points. Hyperlinks to additional web-based information are inserted throughout the module to encourage in-depth reading about related topics. We designed the module to be completed in 60-90 minutes so that the assignment would be a manageable addition to the dense primary care clerkship curriculum. Users are able to complete it in more than one session without losing their place.

The module was published and hosted online at CourseWorks@Columbia, a web-based forum in which students and instructors can communicate and share materials. It was made available to Columbia medical students in the primary care clerkship as of January 2016. Currently, the source files for the e-learning module continue to be hosted on CourseWorks. The module is publicly available to any person with the hyperlink. In addition, all of the source files for the module have been included in order to enable editing

for noncommercial purposes. A licensed copy of Articulate Storyline 2 software is required in order to edit the module.

We used Qualtrics to create a web-based survey embedded within the module, entitled End of Module Survey (Appendix E). The survey is used to evaluate students' perceptions regarding the duration of the module and their experience while working through it. It contains multiple-choice, matrix-table, and free-response (text-entry) question types. We used Qualtrics (2016 version) for both data compilation and analysis.

Results

A large majority of students completed the e-learning module in less than an hour or in 1-2 hours (39% and 53%, respectively; $n = 64$), as depicted in Table 1. Table 2 presents students' evaluation of their experience working through the module. The majority of students either strongly agreed or agreed that the module was easy to navigate (72% and 25%, respectively; $n = 64$). A large majority of students also either strongly agreed or agreed that the module content contributed to their understanding of obesity, diet, and exercise management and counseling (55% and 38%, respectively; $n = 64$). In addition, 91% of students reported that they did not skip slides during the module.

Table 1. e-Learning Module Duration as Reported by Students ($n = 64$) on End of Module Survey

Approximately How Long Did It Take You to Complete the Module?	Percentage of Respondents
Less than an hour	39
1-2 hours	53
2-3 hours	8
More than 3 hours	0

Table 2. e-Learning Module Experience as Reported by Students ($n = 64$) in the End of Module Survey

How Would You Rate Your Experience While Using the Module?	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
It was easy to navigate the module.	72.0	25.0	0	1.5	1.5
The content of the module contributed to my understanding of obesity, diet, and exercise management and counseling.	55.0	38.0	3.0	3.0	1.0

The End of Module Survey also allowed students to provide written comments. Student respondents generally suggested that the module was informative and engaging, even when initial expectations were negative. Several students also provided constructive comments for improving the module, including technical suggestions related to audio quality and efficiency of sorting exercises, as well as specific suggestions for additional content.

Positive Comments

- "The module was very organized, interactive, and informative. I especially appreciated the extra resources provided (e.g., how to talk to patients about weight loss), the information about diet and exercise, and the guidelines for consulting with a nutritionist."
- "The module was engaging and interactive, and I enjoyed working through it. It included a lot of graphics and only essential pieces of text. The font size is also large enough to be easily readable."
- "Thank you, this was very clear and helped solidify the jumble of info in my fund of knowledge."
- "I was resistant to it at first, but it ended up being straightforward, interesting, and informative. I really liked how clear and organized it was. I also really liked the images & narration to stimulate all parts of the brain, not just reading."
- "Very much enjoy the use of concise videos and intermittent questioning. Great module!"
- "I think it's fantastic that there are questions throughout the model to help assess your understanding of the content. It really helped me keep engaged with the content. I hope that in the future all primary care modules can be designed with interactive questions."
- "The module was 1) informative 2) well-organized and 3) effective. Thank you!"
- "Very clear and engaging!"

- “Initially I had my reservations, but I think this was informative and helpful. I feel that it has contributed to my understanding in a meaningful way and I do feel more comfortable counseling patients now.”
- “Interactive component (clicking on tabs for more information, answering questions) was very helpful in keeping me engaged. Very important topic and very helpful to be learning at the beginning of the primary care rotation.”
- “It was a great module! I appreciate that the narrative was at a fast pace and that I could choose to read the narrative as well.”

Suggestions for Improvement

- “I think that the module was really good at providing a basic framework for understanding weight management in the primary care setting. Awesome slides and graphics and great links to additional resources! Also, not too long and not too short. Job well done! Two areas for improvement: 1. A little more info on the genetic contributors to obesity, including racial disparities in obesity and how metabolic rates (e.g., hypothyroidism) contribute to obesity. 2. Slow down a bit in speech—a little slower and clearer would be helpful but overall great job.”
- “The audio narration needs to be a little clearer and slower. The voice of the speaker is a little muffled. Also, more info on how to counsel patients about exercise would be useful!”
- “The ‘sort exercises into categories module’ was difficult to complete since you had to get all of them right before you could move forward, and it was difficult to see which activities you put in each category. Perhaps 1) changing the interface to be able to see what activities were in each category and 2) providing a pop-up box to refer to the chart when needed (instead of after submitting your answer) would be easier. Overall, great module, loved the active learning!”
- “The only exercise that was somewhat frustrating was the drag and drop of types of exercise. Making it somehow easier to swap around the types of exercise would make this go much faster! It just took multiple tries, and the classification is a bit nit-picky. I also thought making the audio stop if you weren’t looking at the video was very clever. Extremely well done and relevant to the current rotation!”
- “Overly basic info.”
- “I think it’s excellent basic information, but I feel as though most people taking it have some basic familiarity with the material. It would be nice to have a wider range so if you’re familiar with the basics, you can still learn plenty.”
- “I didn’t like the slides that had you click on what you thought the answer choices were and then it would only say, ‘correct’ if you get the exact combination correct. Then, it never gave the answer.”

We revised the module based on feedback provided by students on the End of Module Survey. Specifically, multiple audio narration tracks were re-recorded in order to improve clarity, and the exercise-sorting drag-and-drop activity was revised to permit the user to view a reference chart at all times and to view correct answers after the first attempt. Information about weight-loss drugs and comprehensive lifestyle interventions was added.

Discussion

The need for augmented education in nutrition and weight management in US medical schools has been thoroughly demonstrated in the literature. The accessible e-learning module presented here provides medical students with a framework for approaching this important topic by employing active learning strategies through new media. In addition, the module has successfully delivered a standardized educational experience in a geographically dispersed primary care clerkship.

End of Module Survey responses indicated an overall positive student response. Students largely reported that the module was easy to use and that it contributed to their overall understanding of the topics. Importantly, the time required for students to complete the module was approximately 2 hours or less, as we intended. From the students’ perspective, the module was effective in terms of accessibility and

content delivery; the module successfully helped them to organize and structure their thinking about nutrition and weight management.

We delivered instruction on each topic using multiple teaching methods to accommodate various learning styles. The students' qualitative feedback revealed a strong positive opinion with regard to active learning and incorporating multiple teaching methods into a single module. A majority of students reported that these features kept them engaged and made for a more enjoyable experience. From these findings, it is reasonable to conclude that Articulate Storyline 2 and HTML5 are useful platforms for delivering interactive web-based medical education. We may also conclude that employing a combination of teaching methods in a single, web-based entity is an effective way to promote student engagement.

There are several limitations to the module and its evaluation. The module is meant to provide a broad foundation for the topic and, as a result, does not explore all of its content in an in-depth manner. With more time and resources, it may be advantageous to create smaller, focused modules on certain subtopics designed to complement the larger module. In addition, sample size is currently limited by the rate at which students complete the primary care clerkship. A larger sample size would help to further confirm that this active learning method is an effective standardized educational tool for the primary care clerkship. In addition, a follow-up survey postgraduation could be useful for investigating whether students have been able to apply knowledge from the module during residency.

The generalizability of this web-based teaching method should be tested across different medical clerkships and levels of training. Moreover, this particular e-learning module on healthy lifestyle management may be easily adapted or expanded to target physicians of all levels as well as patients and the general public. In the future, coupling the e-learning module with a real-world interprofessional clinical experience, such as interviewing patients with a registered dietitian, would allow medical students to translate their learning directly into clinical practice. It would also be useful to measure the module's effect on student learning and knowledge retention. One potential mechanism might be to incorporate tracking and reporting programs within the module itself, in the form of a sharable content object reference model. Another possible method would be to use pre- and posttests for the clerkship that would compare student performance before and after module implementation. Similar methods might be used to test the module's effect on metrics such as anti-obesity bias and student confidence in performing relevant clinical tasks.

By incorporating an interactive, web-based, e-learning module—Obesity, Diet, and Exercise: Management and Counseling Strategies for Medical Students and House Staff—we were able to include more nutrition and healthy lifestyle education within the P&S primary care clerkship despite challenges including time and clinical site variability. Students completed the module efficiently and were satisfied with the content, reporting that the module contributed to their understanding of obesity, diet, and exercise management and counseling.

Robert Wilechansky, MD: Recent Graduate, Columbia University College of Physicians and Surgeons

Marissa Burgermaster, PhD: Postdoctoral Research Fellow, Institute of Human Nutrition, Columbia University Medical Center

Deborah Jones, MD, MPH: Associate Professor of Medicine, Columbia University Medical Center; Director of the Primary Care Clerkship, Columbia University College of Physicians and Surgeons

David Seres, MD, ScM: Director of Medical Nutrition, Institute of Human Nutrition, Columbia University Medical Center; Associate Professor of Medicine, Institute of Human Nutrition, Columbia University Medical Center

Acknowledgments

Ashley Kingon, MS, Educational Technologist II at Columbia Center for New Media Teaching and Learning.

Mary DiGiorgi, PhD, MPH, assistant professor of human nutrition in surgery, Institute of Human Nutrition, Columbia University Medical Center.

Anita Softness, MD, assistant primary care clerkship director at Columbia University College of Physicians and Surgeons.

Jonathan Amiel, MD, associate dean for curricular affairs, Columbia University College of Physicians and Surgeons.

Members of the Columbia University Nutrition and Healthy Lifestyle Curriculum Steering Committee, in particular, Wahida Karmally, DrPH, RD, CDE, CLS, and Jane Bogart, PhD.

Members of Columbia University Center for Education Research and Evaluation, in particular, Boyd Richards, PhD, Aubrie Swan Sein, PhD, EdM, and Samuel Quiah, MS.

Student participants at Columbia University College of Physicians and Surgeons.

Disclosures

None to report.

Funding/Support

None to report.

Ethical Approval

This publication contains data obtained from human subjects and received ethical approval.

References

1. US Burden of Disease Collaborators. The state of US health, 1990-2010: burden of diseases, injuries, and risk factors. *JAMA*. 2013;310(6):591-606. <http://dx.doi.org/10.1001/jama.2013.13805>
2. Report of the American Medical Student Association's Nutrition Curriculum Project. Essentials of nutrition education in medical schools: a national consensus. *Am J Clin Nutr*. 1997;65(5):1559-1561.
3. Pearson TA, Stone EJ, Grundy SM, McBride PE, Van Horn L, Tobin BW; for NAA Collaborative Group. Translation of nutritional sciences into medical education: the Nutrition Academic Award Program. *Am J Clin Nutr*. 2001;74(2):164-170.
4. Kushner RF, Van Horn L, Rock CL, et al. Nutrition education in medical school: a time of opportunity. *Am J Clin Nutr*. 2014;99(5)(suppl):1167S-1173S. <http://dx.doi.org/10.3945/ajcn.113.073510>
5. Adams KM, Kohlmeier M, Zeisel SH. Nutrition education in U.S. medical schools: latest update of a national survey. *Acad Med*. 2010;85(9):1537-1542. <http://dx.doi.org/10.1097/ACM.0b013e3181eab71b>
6. Bleich SN, Bennett WL, Gudzone KA, Cooper LA. National survey of US primary care physicians' perspectives about causes of obesity and solutions to improve care. *BMJ Open*. 2012;2(6):e001871. <http://dx.doi.org/10.1136/bmjopen-2012-001871>
7. Miller D, Crandall S, Davis S, et al. NEW Lifestyle: a downloadable teaching and learning program for nutrition, exercise, and weight management. *MedEdPORTAL Publications*. 2012;8:9256. http://dx.doi.org/10.15766/mep_2374-8265.9256
8. Bishop S, Stewart K, Dixon D, Sicut B, Wolver S. Interprofessional education team-based learning series: obesity module. *MedEdPORTAL Publications*. 2015;11:10125. http://dx.doi.org/10.15766/mep_2374-8265.10125
9. Strano-Paul L, Lane S. Diagnosis and treatment of obesity: a TBL exercise for third-year medical students. *MedEdPORTAL Publications*. 2015;11:10010. http://dx.doi.org/10.15766/mep_2374-8265.10010
10. Pascarica M, Harris DM, Simms-Cendan J, Gorman AL. Collaborative learning activity utilizing evidence-based medicine to improve medical student learning of the lifestyle management of obesity. *MedEdPORTAL Publications*. 2016;12:10426. http://dx.doi.org/10.15766/mep_2374-8265.10426
11. Lewis KO, Cidon MJ, Seto TL, Chen H, Mahan JD. Leveraging e-learning in medical education. *Curr Probl Pediatr Adolesc Health Care*. 2014;44(6):150-163. <http://dx.doi.org/10.1016/j.cppeds.2014.01.004>
12. Columbia University Center for Education Research and Evaluation. [Unpublished raw data]. 2014.

Received: June 16, 2016 | Accepted: October 11, 2016 | Published: November 10, 2016