

RESEARCH ARTICLE

Coaching, Health, and Movement Program (CHAMPS) Taught by Medical Students: A Didactic Curriculum and Program Analysis

Julia C. Ronecker[†], DO¹; Joseph Liu[†], BA, OMS IV²; Ramon E. Newman, MD³; Anne M. VanGarsse, MD⁴

¹Cincinnati Children's Hospital Medical Center, Cincinnati, OH

²Kansas City University of Medicine and Biosciences, Kansas City, MO

³Kansas City University of Medicine and Biosciences, Kansas City, MO

⁴California Health Sciences University, Clovis, CA

[†] Both authors contributed equally to this publication.

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ABSTRACT:

Purpose: The prevalence of pediatric obesity is increasing in the United States. While physicians are in a unique position to address pediatric obesity, nutrition education and counseling is insufficiently addressed in medical school curriculums. To fill this gap, one Midwest medical school piloted CHAMPS (Coaching, Health, and Movement Program with Students), a program where medical students learn about pediatric obesity and nutrition and coach families toward healthier lifestyle goals.

Method: This study evaluated the effectiveness of a 7-hour didactic curriculum and looked at changes in medical student knowledge, bias, and mentorship skills. The cohort included 35 first- and second-year medical students who completed a pre-test and two post-tests—one post-test after the didactic training and one after the 6-8 week coaching program with a family.

Results: After both the didactic curriculum and coaching sessions, medical students demonstrated statistically significant improvement in knowledge and mentorship skills with regards to pediatric obesity and nutrition. Medical students also reported feeling more confident answering questions and coaching families on healthy lifestyle choices. Medical student bias was unchanged after our intervention.

Conclusion: The CHAMPS program represents a promising experience for medical students and fills a gap in the traditional medical school curriculum.

INTRODUCTION

The prevalence of pediatric obesity, as defined by sex-specific BMI at or above the 95th percentile, was 18.9% or 13.7 million children between the ages of 2-19 years. Hispanics (25.8%) and African Americans (22.0%) were disproportionately affected.¹ Additionally, obesity prevalence was 18.9% among children and adolescents between 2-19 years in the lowest income group compared to 10.9% in the highest income group. Physicians are in a position to help guide patients and families toward healthier lifestyles, preventing obesity and decreasing morbidity. In 2013, several national societies issued guidelines for physicians to play a more

active role in this public health concern. Recommendations included calculating the BMI (a screening tool for obesity) at each visit, informing patients of their BMI, advising lifestyle changes aimed at lowering BMI, and having regular conversations about healthy meals and exercise at each visit.² A 2014 study of over 5,000 participants in the National Health and Nutritional Examination Survey determined that patients are more likely to engage in lifestyle changes if physicians initiate conversations about their weight and health status. A meta-analysis completed in 2013 found that increased physician counseling and discussion during a patient encounter resulted in increased weight loss and better health outcomes.²

Unfortunately, nutrition education is lacking in the traditional medical school curriculum, leaving graduating physicians with less skills to address this topic in practice. The National Academy of Science (NAS) produced the Nutrition Education in U.S. Medical Schools report in 1985. It concluded medical students need a minimum of 25 hours of nutrition instruction over four

CORRESPONDENCE:

Julia Ronecker, DO | julia.ronecker@cchmc.org

years to be adequately prepared to address patient concerns. However, students were only receiving an average of 19 hours over four years.³ One 10-year research study between 1999-2009 found that 62%-73% of medical schools were not meeting the minimum suggested hours by NAS.³ With less than twenty-five hours of required nutrition education at graduation, new resident physicians cannot expect to address nutrition concerns of patients or be competent to provide advice.

Kansas City University of Medicine and Biosciences (KCU) is one medical school located in Kansas City, Missouri hoping to address this gap in nutrition education and pediatric obesity. The school offers an innovative program called Score 1 for Health, which provides free medical screenings by supervised medical students and practitioners to low-income students at community schools. The Score 1 for Health team piloted CHAMPS in 2010 with a grant from the Health Care Foundation of Kansas City. Students under the age of 18 were identified at Score 1 health screenings or referred by physicians as having a BMI 95th percentile for age and sex and likely to benefit from a healthy lifestyle program. The pilot mentorship program was first conducted at local schools and involved group classes with a registered dietician and registered nurse. In 2015, CHAMPS was redesigned to be a partnership program between one medical student and one family; first- and second-year medical students at KCU were paired with families to mentor and discuss healthy nutrition and exercise options. In addition to facilitating wellness for family participants, the program aimed to enhance medical students' nutrition knowledge, increase preparedness with mentorship skills, and reduce negative bias.

To be a CHAMPS mentor, a 7-hour didactic training is completed prior to working with families. An example curriculum is detailed

in *Table 1*. This curriculum incorporates a variety of teaching methodologies: lecture, question-and-answer sessions, mock training sessions, and review sessions. The goal is for medical students to gain a foundation in nutrition topics and be prepared to convey this knowledge to families. The medical students guide the families using recommendations adapted from the "5-4-3-2-1 Go!" program created by the Consortium to Lower Obesity in Chicago Children (CLOCC). These were first launched as a mass-media campaign and counseling program in 2009 and later evaluated as a promising intervention in a 2011 community trial.⁴ It recommends the following daily goals for children and families: consume 5 servings of fruits and vegetables and 3 servings of low-fat dairy, drink 4 servings of water, experience at most 2 hours of screen time, and engage in at least 1 hour of physical activity (at least 3 times per week). Topics discussed in the didactic curriculum include: appropriate vocabulary, structuring and organizing sessions, facilitating the creation of a family-centered goal, barriers to effective coaching, motivational interviewing skills, relationship skills, and staying motivated. After completion of the 7-hour training session, medical students implement their skills during weekly 2-hour sessions with an assigned family for 6-8 weeks.

In this study, we sought to determine if this curriculum (created by an interdisciplinary team of medical doctors, registered dietitians, registered nurses, and program coordinators at KCU) was effective in improving medical student knowledge and mentorship skills. Knowledge about pediatric obesity and nutrition and mentorship skills to convey this knowledge were two skills to be obtained from CHAMPS curriculum. We also evaluated if intrinsic biases of medical students changed over the course of the program.

TABLE 1:

Example CHAMPS curriculum

NAME OF SESSION	DELIVERY OF SESSION (SUGGESTED)	DESCRIPTION OF SESSION	TIME OF SESSION
"Childhood Obesity: What Can We Do?"	MD/DO with specific interest in primary care	Background information about BMI, definition of obesity, history of obesity, social determinants of health, and current issues in the United States.	1 hour, Day 1
CHAMPS Background	Registered Dietician/Registered Nurse (RD/RN) or MD/DO	History of Score 1 for Health and the program, family-centered goals and treatment strategies.	1 hour, Day 1
CHAMPS Coaching Advice	Prior CHAMPS medical students who have completed the training and program	Medical students discuss their experience with CHAMPS, question and answer session.	30 minutes, Day 2
Nutrition Knowledge and Anticipatory Guidance	RD/RN/MD/DO or Med	Specific content of knowledge and anticipatory guidance that will be presented to families at sessions.	1 hour, Day 2
Nutrition Coaching and Review	RD/RN/MD/DO or Med	Considerations in coaching, finding motivation, overcoming barriers, leading a coaching session, appropriate language, reviewing knowledge and reviewing coaching strategies.	2 hour, Day 2
Mock Training Session	Medical Student, RD/MD/DO/ RN, Program Coordinator, Practice Interpreter	Medical students are paired and enter room with mock family and interpreter, example scenario occurs, medical students switch, allotted time for feedback.	1 hour, Day 3

Allocated Time for Questions and Breaks – 30 Minutes
 6-8 Week Program: After completing the 7-hour training session, 1-hour per week is spent with a family (including the referred child/children) addressing a family-centered goal.

METHODS

Survey Design

We evaluated our CHAMPS curriculum with first- and second-year medical students from Kansas City University of Medicine and Biosciences. Students were given a survey and asked to complete it three separate times: (1) before the completion of the CHAMPS 7-hour didactic session, (2) after the completion of the CHAMPS 7-hour didactic session, and (3) after the completion of the 6-8 week sessions with families. These were each titled (1) pre-test, (2) post-test #1, and (3) post-test #2, respectively.

The survey was 23 questions divided into two sections: 13 multiple-choice questions (Section 1) and 10 Likert-style questions (Section 2). Knowledge multiple-choice questions focused on definitions of pediatric obesity, common nutrition vocabulary and concepts, and components of the "5-4-3-2-1 Go!" model. Multiple-choice mentorship skill questions focused on developing family-centered goals, leading coaching sessions, having appropriate language, developing relationships with families, and answering challenging questions from families. The Likert-style questions evaluated knowledge, mentorship skills, and biases. Bias questions evaluated how medical students perceive patients and families with obesity, what factors have caused obesity, and how patient care may be affected by bias.

The survey was qualitatively validated using both face and content validity. A group of 3 students (past CHAMPS participants) and 2 faculty members were asked to evaluate for ease of use and evaluate each question for clarity and readability. Each question was also evaluated for relevance, accuracy, and breadth of knowledge. Questions that did not meet each of these criteria were either dropped (two questions) or rewritten (three questions). Another separate group of 4 CHAMPS participants and 2 faculty members evaluated the revised survey for face and content validity using the factors described above. The final instrument incorporated revisions based on both validity screens. The instrument was approved as part of the overall study plan by Kansas City University of Medicine and Biosciences IRB.

Participant Selection

First- and second-year medical students were first informed about CHAMPS through the Pediatrics Club and Score 1 for Health Organization. Participants were also emailed about the opportunity after orientation. Students filled out an application and were asked to discuss their interest in pediatrics and their goal to promote health and wellness in the community. In order to be chosen as a mentor, the medical student had to be in good academic standing with the Dean's Office and agree to the program's time commitment. A total of 35 students were chosen and agreed to participate in one of three cohorts in September 2017, December 2017, or March 2018.

Data Analysis

Section 1: Multiple Choice Questions

One-Way Repeated Measures ANOVA was completed using ANOVA: Single Factor on Excel to check for differences in the

mean multiple-choice test scores across the three-survey series. If significance was found, we utilized a Bonferroni correction in Excel to determine which pairs showed significant differences. The correction of our p-value allowed us to account for the number of pairwise comparisons ran by the Repeated Measures ANOVA. Lastly, we used t-test: Two-Sample Assuming Equal Variances in Excel to compare pre-test and post-test #1 data from excluded participants with data from included participants to account for possible non-response biases.

Section 2: Likert Scale Questions

We analyzed the data for the Likert Scale Questions of the survey using the non-parametric Friedman Test for repeated-measures in Excel. If significance was found, we utilized subsequent Wilcoxon Signed-Rank tests in R to determine which paired survey iterations showed significant differences. The dependent variables chosen for this study were Bias, Knowledge, and Mentorship Skills. A Likert-type scale was utilized to measure items associated with each variable.

RESULTS

Out of 36 students who began the study, 25 completed the three-survey series (pre-test, post-test #1, and post-test #2), resulting in a 69.44% response rate. Results from 11 students were excluded from the final data analyses due to partial completion of the three-survey series. There were 5 students who completed only pre-test, and 6 students completed only pre-test and post-test #1. Characteristics of participants are detailed in *Table 2*.

TABLE 2:

Characteristics of participants in the CHAMPS program

CHARACTERISTIC	NUMBER(S)
Gender	
<i>Male</i>	14 (56%)
<i>Female</i>	11 (44%)
Year in School	
1st	22 (88%)
2nd	3 (12%)

Multiple Choice Test Scores—Before and After Didactic Course, Family Sessions

Prior to beginning the 7-hour didactic course, participants averaged a score of 63.69% (13.96%, n = 25) on Section 1 of the pre-test. After completion of the didactic curriculum, the same participants scored an average of 82.46% (9.29%, n = 25) on Section 1 of post-test #1. After participating in the 6-8 week program with their paired families, the participants scored an average of 78.77% (11.16%, n = 25) on Section 1 of post-test #2. One-Way Repeated Measures ANOVA showed significant variation

TABLE 3:

Section 1 – Multiple-choice test scores for pre-test and post-tests

GROUP	MEAN SCORE (SD)*	MEAN % (SD)*	MEDIAN	MINIMUM	MAXIMUM
Pre-Test (n=25)	8.28 (1.81)	63.69% (13.96)	8	8	8
Post-Test #1 (n=25)	10.72 (1.21)	82.46% (9.29)	11	11	11
Post-Test #2 (n=25)	10.24 (1.45)	78.77% (11.16)	10	10	10

Total correct responses scored from 0 to 13 correct (0 – 100%). *Repeated Measures ANOVA showed significant variation amongst pre-test, post-test #1, and post-test #2 performance, $F(2, 72) = 18.27, p < 0.001$. Bonferroni correction showed difference between pre-test and post-test #1 ($p < 0.001$), as well as between pre-test and post-test #2 ($p < 0.001$).

amongst pre-test, post-test #1, and post-test #2 performance, $F(2, 72) = 18.27, p < 0.001$. Subsequent Bonferroni correction with adjusted alpha level of 0.017 revealed that the mean score for pre-test was significantly different than the mean score for post-test #1 ($p < 0.001$). It also revealed that the mean score for pre-test was significantly different than the mean score for post-test #2 ($p < 0.001$). No statistically significant difference was found between the mean scores of post-test #1 and post-test #2 ($p = 0.80$). Results for the Section 1 of surveys are presented in *Figure 1 and Table 3*.

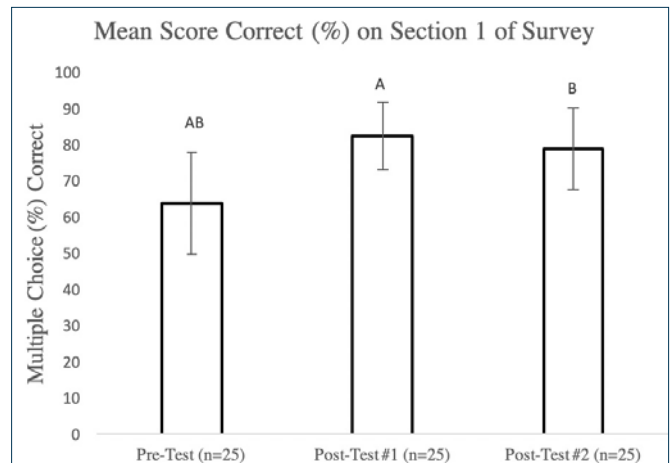
In order to account for possible non-response bias due to removing data of participants that did not fully complete the three-survey series, we conducted additional analyses to compare results of included versus excluded participants. First, we compared the mean pre-test score of participants who only completed the pre-test with the mean pre-test score of participants who completed the entire three-survey series. The independent-samples t-test comparing the two showed no significant difference in pre-test performance of Included participants (Mean = 63.69%, SD = 13.96%, $n = 25$) and pre-test performance of Excluded participants (Mean = 67.13%, SD = 13.36%, $n = 11$); $t(34) = 2.03, P = 0.50$. Next, we compared the mean post-test #1 of participants who only completed the pre-test and post-test #1 with the mean post-test #1 score of participants who completed the study. The independent-samples t-test comparing the two showed no significant difference in post-test #1 performance of Included participants (Mean = 82.46%, SD = 9.29%, $n = 25$) and post-test #1 performance of Excluded participants (Mean = 87.18%, SD = 7.94%, $n = 6$); $t(29) = 2.05, p \text{ value} = 0.26$. Comparison is shown in *Table 4 and Table 5*.

Student Agreeability Before and After Didactic Course, Family Sessions

In individual items testing for mentorship skills, non-parametric Friedman Test for Repeated-Measures showed significant variation amongst pre-test, post-test #1, and post-test #2 responses. Items with significant Friedman Test were further analyzed by Wilcoxon Signed-Rank Test, all showing differences between the pre-test and post-test #1 responses, as well as between the pre-test and

FIGURE 1:

Mean Score Correct (%) on Section 1 of Survey



Mean test scores (%) (+SD) on Section 1 of survey. Statistically significant differences between groups are noted via same letters (Bonferroni correction, $p < 0.001$).

post-test #2 responses. For whether "I feel confident answering questions about pediatric obesity," the Median score increased from a 3 (Neutral) in the pre-test to a 4 (Agree) in both post-test #1 and post-test #2; $X^2=26.42, p<0.00001$. In addition, significance for this item was also found between post-test #1 and post-test #2 responses. For whether "I feel prepared to discuss with a family the prevalence of pediatric obesity and the importance of being healthy," the Median score increased from a 3 (Neutral) in the pre-test to a 4 (Agree) in both post-test #1 and post-test #2; $X^2=25.62, p<0.00001$. For whether "I feel prepared to coach a family on healthy lifestyle choices," the Median score increased from a 3 (Neutral) in the pre-test to a 4 (Agree) and 5 (Strongly Agree) in post-test #1 and post-test #2, respectively; $X^2=32.46, p<0.00001$.

In individual items testing for knowledge, significant variation was found amongst pre-test, post-test #1, and post-test #2. Further analysis showed differences between the pre-test and post-test #1 responses, as well as between the pre-test and post-test #2

TABLE 4:

Section 1 - Multiple choice test scores, included versus excluded pre-test performance

GROUP	MEAN SCORE (SD)*	MEAN % (SD)*	MEDIAN	MINIMUM	MAXIMUM
Included Pre-Test (n=25)	8.28 (1.81)	63.69% (13.96)	8	4	12
Excluded Pre-Test (n=11)	8.73 (1.74)	67.13% (13.36)	8	6	11

Total correct responses scored from 0 to 13 correct (0 – 100%). * No significant difference between Included and Excluded pre-test performance, $t(34) = 2.03$, p value = 0.50.

responses. For whether “I understand the coaching strategy of 5-4-3-2-1 and how to set a goal with a family,” the Median score increased from a 1 (Strongly Disagree) in the pre-test to a 4 (Agree) in both post-test #1 and post-test #2; $X^2=30.62$, $p<00001$. No significant difference was shown between responses from post-test #1 to post-test #2.

In individual items testing for biases, no significant variation was found amongst pre-test, post-test #1, and post-test #2 responses. Median scores are presented in Supplemental Appendix 1, with full individual item results reported in Supplemental Appendix 2.

DISCUSSION

Given the lack of nutrition education and experiences available in United States medical schools, we sought to create a curriculum that filled this gap. We evaluated the CHAMPS curriculum based on medical student knowledge and mentorship skills before and after this intervention. With participants acting as their own controls, we can make several deductions based on the data.

Immediately following the completion of the didactic curriculum, participants demonstrated statistically significant improvement in performance on the multiple choice section of post-test #1, scoring 18.77% higher than pre-test scores. Additionally, participants continued to perform higher on the multiple choice section of post-test #2 after conclusion of the mentoring sessions with families, scoring 15.08% higher than the pre-test. It should be noted that although performance between post-test #1 and post-test #2 dropped by 3.69%, this difference was not statistically significant. This slight decrease was expected as students had been apart from the formal didactic curriculum for 6–8 weeks while mentoring their families. Furthermore, the comparable performances on both post-tests showed that knowledge and skills were neither significantly lost nor gained during the time working with families. These results show support for the applicability of our curriculum as an intervention that can solidify understanding of nutrition education over a long-term period. In addition, our survey only measured two skills (medical student knowledge and mentorship skills) gained throughout the CHAMPS experience. It is likely that medical students gained other skills and strategies that were not targeted in this survey while working with their families. To account for possible non-response bias, an additional statistical analysis was completed comparing included versus excluded participants. We were able to infer from this data that

our study would not have been significantly different if all starting participants had completed the entire three-survey series.

With the agreeability questions, student’s knowledge, mentorship skills, and biases were all evaluated. After completion of the CHAMPS curriculum, participants reported feeling more confident with their mentorship skills in answering questions about pediatric obesity and nutrition, discussing the prevalence of pediatric obesity, and coaching families on healthy lifestyles choices. Interestingly, there was also statistical improvement in feeling comfortable answering questions about pediatric obesity and nutrition between post-test #1 and post-test #2, which we attribute to the hands-on nature of working with real families during the family sessions. In regards to knowledge, students reported greater understanding of the coaching strategy of 5-4-3-2-1 and goal-setting with their families after the didactic portion. Our results from the agreeability questions show that participants’ perceptions of their mentorship skills and knowledge were improved by completion of the didactic curriculum and were maintained, or even further improved upon, throughout the 6-8 week family sessions.

One portion of this study involved evaluating medical student bias. Research has shown that physicians and medical students both hold significant bias against obese patients compared to patients below the 95th percentile for BMI.^{5,6} One study on medical student bias revealed that students showed biases in their belief, attitudes, and interactions on the basis of patient weight alone.⁶ Because biases can undermine the patient-provider relationship, delay treatment, and lessen the quality of care, we decided to see if biases changed after the CHAMPS curriculum or sessions with families. Our results indicated that there was no variation in biases between any of the surveys. The fact that bias can be present and affect obese pediatric patient care was never discussed with medical students during this study. Additionally, bias was never directly addressed during the curriculum, so a lack of bias variation is not surprising. What is important to note, however, is that students did not develop increased negative bias after completion of the curriculum.

The present study does have some limitations. First, our sample size was limited to a group of 35 students completing the CHAMPS program between 2017-2018. This limits generalizability regarding knowledge and mentorship skills gained from our intervention. However, the preliminary results are very promising. Second, only medical students from KCU were included in this initial study,

and it would be beneficial to evaluate this curriculum at other institutions.

In conclusion, the CHAMPS curriculum is an effective program to improve medical student knowledge and mentorship skills based on the results from our survey. The additional 6-8 weeks working with the families provides additional opportunities for interacting with patients, including answering questions regarding pediatric obesity. Overall, this extracurricular opportunity is one way to fill a gap in nutrition education in medical school.

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Ethical Approval: *Ethical approval has been granted for this study involving human subjects. The reviewing body was the IRB Board at Kansas City University of Medicine and Biosciences. Dates of approval were July 2017-June 2019. Reference number (via IRBNet) is [897971].*

AUTHOR DISCLOSURES:

No relevant financial affiliations

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