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Weight management counseling experiences of first year medical students before starting medical school and their self-perceived impact on treating patients with obesity

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ABSTRACT

Physicians can play a vital role in counseling patients on overweight and obesity. This secondary analysis examined whether experiences in patient care specific to weight management before starting medical school were associated with students' intentions and confidence to provide weight management counseling (WMC) to patients who have overweight or obesity, and perceived impact as future physicians on patients' motivation to manage weight.

First-year medical students (n = 1305) in the entering class of 2020 at eight medical schools nationwide completed questions relating to their prior experiences in patient care and WMC using the 5As. Also assessed were their intentions to treat patients with overweight or obesity, and confidence in counseling patients to help manage their weight. Over half the students (58.3%) who completed the survey had prior experience in patient care and nearly half (47.4%) began medical school with prior WMC experiences. Prior experiences correlated positively with higher confidence in performing WMC and students' intentions to treat patients with overweight or obesity. Given the relatively high rates of exposure to some type of weight management or lifestyle counseling among students before enrolling in medical school, the curriculum could build on established student interest and experience by offering treatment strategies including counseling for patients with overweight and obesity. By making prior experiences advantageous for admission, medical schools could gravitate towards admitting students who have brief but valuable insights about weight management in health care, thus increasing the possibility of filling important gaps.

1. Introduction

Obesity, defined as body mass index (BMI) ≥ 30 kg/m^2, has reached epidemic proportions in the United States (US). More than two-thirds of US adults have overweight or obesity (Prevalence of obesity among adults and youth: United States, 2020; www.cdc.gov, 0000; Overweight and Obesity, 0000); placing them at increased risk for diabetes, cardiovascular disease, cancer, all-cause mortality and now COVID-19 (Overweight and Obesity, 0000; Stokes A. Using maximum weight to redefine body mass index categories in studies of the mortality risks of obesity. Stokes, 2014; Stokes and Preston, 2016; Kass et al., 2020; Ryan et al., 2020; Ward et al., 2019; Yu et al., 2017). It is predicted that by 2030 half the US population will have obesity, with nearly 1 in 4 adults projected to have severe obesity (BMI $\geq$ 40 kg/m^2) (Kitahara et al., 2014) A *meta*-analysis of data pooled from 20 studies found that adults with severe obesity had an increased risk of dying at an early age from many different causes (Di Angelantonio et al., 2016). National surveys demonstrate that only 20–40% of patients with obesity receive any type of weight management counseling (WMC) from their physician (McAlpine and Wilson, 2007; Scott et al., 2004) even when many of these visits provide an opportunity for clinicians to intervene and make appropriate recommendations for patients. There is strong evidence that physicians

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can help patients manage their weight (Jackson et al., 2005). One strategy that has been tested is using the 5 As framework: "Asking about weight and lifestyle (diet and exercise) history", "Advising dietary, exercise and weight-related changes", "Assessing readiness to make lifestyle changes to achieve weight loss using the Stages of Change questions", "Assisting in setting goals and providing or referring to a comprehensive lifestyle intervention", and "Arranging ongoing follow-up and support, monitoring BMI at least annually." The U.S. Preventive Services Task Force (USPSTF) recommends screening all adults for obesity (LeBlanc et al., 2018; Fitzpatrick et al., 2016) and clinicians offer or refer adults with a BMI of 30 kg/m^2 or higher to intensive, multicomponent behavioral interventions (O'Connor et al., 2020; Kraschnewski et al., 2013). An inherent hurdle to this recommendation is that physicians typically lack adequate education in WMC (Kraschnewski et al., 2013; Smith et al., 2015; Ahmed et al., 2016; Vitolins et al., 2012; Butsch et al., 2020) and report low self-efficacy (Block et al., 2003; Forman-Hoffman et al., 2006; Kristeller and Hoerr, 1997; Davis et al., 2008; Adams, 0000) or low confidence in their ability to help patients address weight-related concerns. This lack of training results in missed opportunities to engage patients in discussions about their weight, diet, and physical activity ultimately leaving them at greater risk for weight-related morbidity and mortality. Medical school curricula and training provide the foundation for influencing physicians' future behavior; yet in many medical schools, very little time is devoted to developing WMC skills (Ockene et al., 2021; Kushner et al., 2014). The Association of American Medical Colleges and the Obesity Medicine Education Collaborative address this deficit by recommending that WMC be strongly emphasized within the medical school curriculum (Kushner et al., 2019; Ockene et al., 2021; Association AAMC, 2007). These organizations have developed curriculum guidelines that provide competencies and learning objectives related to the biologic, population health, and clinical training aspects of WMC.

The objective of the current secondary analysis was to examine whether prior experiences in patient care specific to weight management counseling is associated with students' intentions to provide WMC to patients who have overweight or obesity, their confidence in treating these patients, and their perceived impact as future physicians on patients' motivation to make weight-related changes. We designed our study keeping in mind current learning theories especially for medical educators. Research has shown that earlier experiences can enhance an individual's attitudes, skillset, and knowledge and that prior experiences affect people's behavior going forward (Torre et al., 2006). The nature of prior experiences may influence students' abilities to serve as technically skillful clinicians, to relate to and work with a diverse group of patients, and to appreciate the role physicians play in social and behavioral medicine (Xiao et al., 2015).

2. Materials and methods

2.1. Study participants

MSWeight (Medical Students learning Weight management counseling skills) is a multi-modal educational intervention (MME) guided by Social Cognitive Theory (Bandura, 1977) (Gagne's Conditions of Learning (Gagne, 1985) and Socio-Ecological Theory (Stokols, 1996). Participants were first-year medical students from eight U.S. medical schools participating in the study (N = 1305), a group randomized controlled trial designed to compare the impact of a multi-modal WMC curriculum to traditional medical school education, on student's WMC skills (Ockene et al., 2018). Schools were private (N = 4) or public (N = 4), from geographically diverse regions across the U.S. (e.g. Northeast, South, Northwest, Midwest) and met the following criteria at the time of recruitment:

1) an enrollment of $\geq$ 90 matriculating first year students; 2) $\leq$ 4 h of WMC training over 3 years of medical school; 3) include a Family Medicine or out-patient Internal Medicine clerkship; and 4) willing and able to offer a WMC Objective Structured Clinical Examination (OSCE) for students following the completion of a core clerkship, the Family or out-patient Internal Medicine Clerkship rotation, or as part of a cumulative OSCE (Ockene et al., 2018, 2016; Mazor et al., 2015). The University of Massachusetts Medical School Institutional Review Board (IRB) as well as the IRBs at the eight schools approved the study. The University of Massachusetts Medical School served as the coordinating center for the study.

2.2. Data collection and measures

First year students in the entering class of 2020 at each medical school completed a baseline survey that included items to assess prior experiences with counseling before attending medical school and their attitudes and perceived impact on patients' motivation to modify diet and physical activity. The survey was self-administered online or on paper, according to the school's usual practice. It took no longer than 10 min for students to complete the survey. Online surveys were administered through RedCap (Research Electronic Data Capture tool) and paper survey responses were entered into a RedCap database by the coordinating center (www.project-redcap.org, 0000).

2.3. Prior WMC experiences of first year medical students

Prior experiences of medical students related to WMC were assessed using 10 yes/no items. Students were asked whether they had experience in patient care (e.g. working in nursing, dental health, social work, EMT, or similar professions) before starting medical school, as well as experience carrying out each of the 5As counseling steps with patients who have overweight or obesity as described earlier. Students were also asked whether they had training in health-related counseling (e.g. tobacco, weight management counseling), how to treat patients with obesity, how to help people manage their diet or physical activity, and whether they had ever tried to counsel a close family member or friend about their weight. The number of 'yes' responses was summed to create a prior experiences in WMC score (range 0–10) where higher scores reflect greater experience with WMC before entering medical school.

2.4. Intention to use the 5As in WMC patients with overweight or obesity

Intention to use the 5As was assessed using 5 questions scored on a 4-point Likert scale (strongly disagree (1), disagree (2), agree (3), and strongly agree (4)). Thinking about their work as future physicians, students were asked about their intentions to perform the following activities routinely: "Ask about weight and lifestyle (diet and exercise) history", "Advise about dietary, exercise and weight-related changes", "Assess readiness to make lifestyle changes to achieve weight loss using the Stages of Change framework" (Prochaska and DiClemente, 1983), "Assist in setting goals and provide or refer to a comprehensive lifestyle intervention", and "Arrange ongoing follow-up and support". A summary score was created by summing the items (range 5–20) ($\alpha = 0.89$) where higher scores indicate greater intention to routinely use the 5As framework to deliver WMC.

2.5. Perceived impact on patients' motivation to change diet and/or physical activity

Thinking of their future practice as a physician, students were asked a single question about how much impact they expected to have on their patient's motivation to change diet or physical activity. Student responses were reported on a 5-point Likert scale (not much, little, somewhat, much, and a great deal).

2.6. Confidence in providing WMC to patients with overweight or obesity

Students were asked a single question, "I feel confident in providing

weight management counseling for my overweight and obese patients." Response options were on a 4-point Likert scale ranging from 'Strongly disagree' to 'Strongly agree'.

3. Covariates

3.1. Attitudes about WMC

Students were asked 8 questions about attitudes towards WMC training and the role of the physician in providing this counseling, with responses recorded on a 5-point Likert scale (strongly disagree, disagree, neutral, agree, strongly agree). A five item measure, importance of physician delivered WMC, was used for this analysis (α = 0.78). Items included: "It is important for all physicians to have training in weight management counseling to help patients who are overweight and obese", "Counseling for weight management should not only be handled by nutritionists and psychologists, but also by the patient's physician", "Learning to talk to patients about their weight is relevant to my future practice as a physician", "I need more training to provide weight management counseling" and "Weight management counseling by a physician can be effective in helping patients manage their weight." Higher scores reflect more favorable attitudes toward WMC.

3.2. Gender

Gender information was collected in a free text field and students wrote in their self-identified gender. The majority of respondents answered 'male' or 'female'. Other responses included 'Non-Binary' and 'somewhere in the middle'.

3.3. Weight bias

The survey included all items from the Nutrition, Exercise, and Weight Management (NEW) Attitudes Scale anti-fat subscale (Ip et al., 2013) with the exception of one item ("I believe if I eat a healthy diet it would make me an effective role model") because it has a neutral weight (zero). The resulting scale is based on responses to sixteen items (α = 0.78). As suggested by the original author, the scale was scored using Thurston weighting scale (Edwards and Kenney, 1946) with a possible range of scores from −80 to + 80. Higher scores reflect more favorable attitudes toward individuals with obesity.

4. Statistical analyses

Participant demographics were described using proportions for categorical variables and means with standard deviations (SD) for continuous measures. Prior experience with WMC was described using the percentage of those reporting 'yes' to each item. Mixed effects linear regression models estimated the association of individual prior WMC experience items, and the summed score as a continuous predictor, with intentions to treat patients with overweight and obesity. Parallel models estimated the association of prior WMC experience with perceived impact. Models contained a random effect for school to account for within-school correlation and were adjusted for attitudes about WMC, gender and weight bias. The impact and confidence items were used as single items in regression models. For descriptive purposes, number of prior experiences were grouped (0; 1–3; 4 or more) based on the observed distribution of that variable and perceived impact, intentions to treat patients with overweight or obesity, and confidence were summarized within those categories, and between group p-values were obtained from mixed-effects linear regression models that included a random effect for school. All analyses were conducted using Stata 14.2 (StataCorp LP, College Station, TX).

5. Results

A total of 1224 first year medical students completed the baseline survey. After excluding students who were missing information about perceived impact on patients' motivation to change diet and/or physical activity, prior experiences with weight management counseling before medical school, perceived intentions to treat patients who have overweight or obesity, confidence in providing WMC for their patients with overweight or obesity (n = 18), or potential confounders (n = 6), our final analytic sample included 1200 first year students.

Characteristics of first-year medical students are summarized in Table 1. Most of the participants were white (71%), 5.4% identified as being Hispanic, and 49.3% female. The average age was 23.9 years (SD = 2.8). On average, students had limited prior experience with counseling patients in weight management (mean = 2.1 experiences out of a maximum possible 10, SD = 2.1), strong intentions to use the 5As approach to counsel patients in weight management (mean = 16.0 out of a maximum possible 20, SD = 2.3) and positive attitudes towards physician-delivered WMC for overweight/obesity (mean = 3.5 out of a maximum possible 4; SD = 0.4). Perceived impact on patients' motivation to change diet and/or physical activity was modest (mean = 3.5 out of a maximum possible 5; SD = 0.8), as was students' confidence in performing WMC with patients who had overweight or obesity (mean = 2.2 out of a maximum possible 4; SD = 0.7).

Table 2 presents the proportion of students with prior experience in various aspects of patient care including informal or patient-care settings. Overall, 58.3% of students reported having prior patient care

Table 1
Characteristics of the Study Sample (N = 1200).

List Variables	N (%)
Gender	
Female	606 (50.5%)
Age Mean (SD)	23.9 (2.8)
Race	
White/Caucasian	839 (71.1%)
Black/African American	67 (5.7%)
Asian	191 (16.2%)
Other	83 (7.0%)
Ethnicity	
Hispanic origin	63 (5.4%)
Perceived impact on patients' motivation to change diet and/or physical activity, Mean (SD)[a]	3.5 (0.8) Range 1 – 5
Confidence in performing WMC for overweight and obese patients, Mean (SD)[b]	2.2 (0.7) Range 1–4
Prior Experiences Score, Mean (SD)[c]	2.1 (2.1) Range 0 – 10
Perceived Intentions Score. Mean (SD)[d]	16.0 (2.3) Range 5 – 20
Attitudes Towards WMC[e]	3.5 (0.4) Range 1–4

a. Student responses to a single question were reported on a 5-point Likert scale (not much = 1, little = 2, somewhat = 3, much = 4, and a great deal = 5).
b. Response options were on a 4-point Likert scale ranging from Strongly disagree = 1, disagree = 2, Agree = 3, Strongly agree-4.
c. The number of 'yes' responses to 10 questions was summed to create a prior experiences in WMC score
d. The perceived intention score was derived based on sum of responses to 5 questions scored on a 4-point Likert scale (strongly disagree (1), disagree (2), agree (3), and strongly agree (4)).
e. The attitudes toward WMC score was derived from the sum of responses to 8 questions about attitudes towards WMC training and the role of the physician in providing this counseling, each based on a 5-point Likert scale (strongly disagree = 1, disagree = 2, neutral-3, agree = 4, strongly agree = 5).

Table 2
Distribution of Prior Experiences in Patient Care with Weight Management Counseling.

Type of Experience in Patient Care with Weight Management Counseling	Percentage of Respondents Answering 'Yes' to each type of Experience in Patient Care with Weight Management Counseling	
	All respondents N = 1200	Those respondents reporting at least one WMC experience N = 963
Experience in patient care before starting medical school	58.3%	72.6%
Counseling a close family member/ friend about their weight	47.4%	59.0%
Asking about weight and lifestyle	27.4%	34.2%
Advising dietary, exercise and weight-related changes	18.7%	23.3%
Assisting in setting goals and providing or referring to a lifestyle intervention	14.3%	17.8%
Training on how to help people manage their diet or physical activity	14.0%	17.4%
Health-related counseling	10.8%	13.5%
Assessing readiness to make lifestyle changes to achieve weight loss	8.1%	10.1%
Arranging ongoing follow-up and support, monitoring BMI	6.8%	8.4%
Training on how to treat obesity	6.5%	8.1%

related experiences, 47.4% had counseled a close family member or friend about their weight, and more than one quarter (27.4%) had experience in asking about weight and lifestyle. Few had experience assessing a person's readiness to make lifestyle changes (8.1%), arranging ongoing follow-up and support (6.8%) or training regarding how to treat obesity (6.5%). The types of experiences reported were similar among those who had any prior experience with weight management or lifestyle counseling. Of the 1200 students included in this analysis, 963 (80.3%) reported having at least 1 wt management or lifestyle counseling experience before medical school. Of those, 72.6% reported having experience with patient care, 59% reported experience counseling a close family member or friend about their weight, and 34.2% reported asking patients about weight and lifestyle. Few had experience assessing readiness to make lifestyle changes to achieve weight loss (10.1%), arranging ongoing follow-up support (8.4%) and training on how to treat obesity (8.1%).

Table 3 presents the association of total number of prior WMC experiences with intentions to treat patients who have overweight or obesity, perceived impact as future physicians on a patient's motivation to change their diet and physical activity, and their confidence in performing weight management counseling for their patients who had overweight or obesity. Greater experience with WMC before medical school was highly correlated with greater intentions to treat patients who have overweight or obesity ($\beta = 0.14$; SE = 0.03; $p < 0.001$). That is, for each additional prior experience (range 0–10), intention to use 5As for WMC increased by 0.14 points (range 5–20). More prior experience with WMC was highly correlated with greater perceived impact as a future physician on a patient's motivation to manage their weight ($\beta = 0.05$; SE = 0.01; $p < 0.001$). For each additional prior experience, perceived impact increased by 0.05 points on the 1–5 scale. More experience with WMC before medical school also was associated with higher confidence in WMC with their patients who had overweight or obesity ($\beta = 0.06$; SE = 0.01; $p < 0.001$).

The mean perceived intentions, perceived impact and confidence scores grouped by the number of prior experiences (0, 1–3, 4 or more) and shown in Table 4, indicate that as the number of prior experiences increases, intention to use 5As for WMC patients with overweight/ obesity, perception of impact as a physician and confidence in performing WMC also increases. Those with 1–3 prior experiences (n = 735) had a higher intention to use 5As for WMC patients with overweight or obesity score compared to the 237 students with 0 prior experiences, (mean = 15.9 (2.2) vs. 15.7 (2.1)). Students with 4 or more experiences (n = 228) had the highest intention to use 5As for WMC score (mean = 16.7 (2.4)) and a significantly higher mean perceived intention score than those with 0 prior experiences ($p < 0.001$).

A similar pattern was observed for the relationship between the number of prior experiences and the perceived impact score. Those with 1–3 prior experiences had a higher perceived impact score than those with 0 prior experience (mean = 3.4 (0.8) vs. 3.3 (0.8)). Those with 4 or more prior experiences had the highest perceived impact (mean = 3.7 (0.8)). The difference in mean perceived impact scores between those with 4 or more and 0 prior experiences was statistically significant ($p < 0.001$).

The relationship between the number of prior experiences and confidence showed a similar pattern. Those with 1–3 prior experiences had a higher mean confidence score than those with 0 prior experiences (mean = 2.2 (0.7) vs. 2.1 (0.7), $p = 0.03$) and those with 4 or more prior experiences had the highest mean confidence score (mean = 2.4 (0.8)).

Table 4
1st year Medical Student Mean Intentions, Perceived Impact and Confidence Scores by Number of Weight Management Counseling Experiences Before Entering Medical School.

Number of Prior Weight Management Counseling Experiences	Number of Students (%)	Intentions Score Mean (SD)	Perceived Impact Score Mean (SD)	Confidence Score Mean (SD)
0	237 (19.8%)	15.7 (2.1) Range: 8–20	3.3 (0.8) Range: 1–5	2.1 (0.7) Range: 1–4
1–3	735 (61.3%)	15.9 (2.2) Range: 5–20	3.4 (0.8) Range: 1–5	2.2 (0.7) Range: 1–4
4 or More	228 (19.0%)	16.7 (2.4) Range: 10–20	3.7 (0.8) Range: 2–5	2.4 (0.8) Range: 1–4

Table 3
Association of 1st Year Medical Students' Prior Weight Management Counseling (WMC) Experiences with Intentions to Treat Patients with Overweight or Obesity, Perceived Impact of WMC, and Confidence in Delivering WMC.

Prior WMC Experiences	Intentions to Treat Patients with Overweight or Obesity		Perceived Impact of WMC		Confidence in Delivering WMC	
	Unadjusted Coefficient (SE)	Adjusted Coefficient (SE)	Unadjusted Coefficient (SE)	Adjusted Coefficient (SE)	Unadjusted Coefficient (SE)	Adjusted Coefficient (SE)
Prior WMC Experiences Score (Range 0–10)	0.19 (0.03) †	0.14 (0.03) †	0.06 (0.01) †	0.05 (0.01) †	0.07 (0.01) †	0.06 (0.01) †

* Models Adjusted for Attitudes About WMC, gender and weight bias
† $p < 0.05$

The difference in mean confidence scores between those with 4 or more and 0 prior experiences was statistically significant as well ($p < 0.001$).

6. Discussion

In this survey of first year medical students from 8 geographically dispersed schools, 80.3% (963/1200) of students had one or more experiences in some type of weight management or lifestyle counseling before starting medical school. In the comment box provided in the survey for students to write in additional information, students inserted an array of experiences, some in more traditional patient-care settings and others indicated informal interactions with friends and family members.

Compared to students with no prior experience, those with 1 or more experiences had modestly higher intention to use 5As for WMC patients with overweight or obesity, as well as a perception that they would have greater impact as a physician on their patients' motivation to modify diet and/or physical activity. Our analysis indicates that, as the number of prior WMC experiences a student had increases, intention to use 5As for WMC patients who have overweight or obesity increases as does the perception that they would have a greater impact on their patient's motivation to manage weight. In our earlier study (Ockene et al., 2016) investigating the effect of tobacco counseling experiences of first year medical students before entering medical school, students with prior tobacco counseling experiences, and particularly those with more experiences, reported greater tobacco counseling self-efficacy. Similarly, in this analysis, more experience with WMC before medical school is positively correlated with higher perceived physician impact on a patient's ability to manage their weight. All prior experience items were significantly correlated with perceived physician impact except for "Training on how to treat obesity". These findings are in-line with other studies on preparedness of medical students to treat patients with obesity (Ockene et al., 2021)

The study team has successfully used the 5As model previously in several other similar studies because the 5As framework provides an efficient way for the busy clinician to counsel patients in brief encounters. Our current findings suggest that before entering medical school, first year medical students (both those with and without prior experiences in WMC) have had few experiences in using the 5As to help people adhere to weight management. Those who have used the 5As framework, report that they are more likely to ask about weight and lifestyle but less likely to arrange follow-up and support or assess readiness to make lifestyle changes in patients. Given that training regarding how to treat obesity was the least frequently endorsed item, it is important to include WMC skill building early in medical school as part of patient counseling and interviewing skills training so that students can learn to routinely incorporate these practices into their patient encounters. Adapting and tailoring the medical school curriculum to build on students' early experiences might be one way to advance their knowledge, skills, and confidence during preclinical and clinical years. It is also possible that knowledge of the effectiveness of each of the 5As components could help to better guide students in their ability to build on their prior experiences and provide clinically appropriate recommendations for patients with overweight or obesity.

7. Strengths and limitations

To the best of our knowledge, this is the first study to examine students' weight management counseling experiences before entering medical school and to investigate whether prior experiences were associated with perceived intentions and impact as future physicians to treat patients with overweight or obesity. Demographic characteristics of this sample were comparable to those of first-year medical students nationally (aamc, 0000) thus increasing potential generalizability to medical students across the U.S.

There are some limitations to be noted. We did not obtain detailed information on the venue for students' prior WMC experiences. It is possible that students may consider their provision of WMC to family or friends to be a clinical counseling experience. Future studies should assess students' prior WMC experiences by asking details about the setting, duration, types, and quality of their experiences, whether they received systematic training on WMC and whether they had direct contact with patients with overweight or obesity. Notably, we measured intentions, and not actual practice and skill. While intentions can be a good marker of future practice, more objective measurements of skill and the relationship between prior experiences and skill must be measured. We also do not know which came first: factors related to the students' motivations or confidence level that encouraged them to seek counseling experiences before attending medical school or whether these experiences and others contributed to their interest to pursue medical studies. It is also important to remember that students who are naturally vigilant to weight-related concerns may report acting on that vigilance in the past and intending to do so in the future, even if their vigilance predated the experiences in question.

8. Future directions

Further qualitative studies would be valuable to compare students with and without prior experiences and the depth of the experience to understand how it may impact student intentions. The practice of medicine attracts students who want to have both a behavioral and social impact and this desire coupled with motivational and skill-based teaching can be harnessed to improve medical education (Buja, 2019).

Students applying to medical school with prior experiences that include being part of a health-care team or observing patient-physician interactions have a firsthand awareness of medical training and practice. Prior experiences would help a student develop a realistic understanding of the skills, attitudes and values needed in patient care. It may also help them in the admissions process. Multiple mini interviews which ask students about behavioral and social aspects and patient challenges have been adopted by many medical schools in the admissions process (Langer et al., 2020).

Given the relatively high rates of prior exposure to some type of weight management or lifestyle counseling, medical schools could build on established student interest and experience by offering practical training in counseling and treatment strategies specifically for patients with overweight and obesity.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

Prevalence of obesity among adults and youth: United States, 2017-2018 NCHS Data Brief No: 360 February 2020.
https://www.cdc.gov 〉 nchs 〉 data 〉 databriefs accessed 4/23/20.
Overweight and Obesity Statistics https://www.niddk.nih.gov/health-information/health-statistics/overweight-obesity.

Stokes A. Using maximum weight to redefine body mass index categories in studies of the mortality risks of obesity. Popul Health Metr. 2014 Mar 17;12(1):6. PMID: 24636105; PMCID: PMC3985598.
Stokes, A., Preston, S.H., 2016. Revealing the burden of obesity using weight histories. Proc Natl Acad Sci USA 113 (3), 572–577.
Kass DA, Duggal P, Cingolani O. Obesity could shift severe COVID-19 disease to younger ages. Lancet. 2020 May 16;395(10236):1544-1545. Epub 2020 May 4. PMID: 32380044; PMCID: PMC7196905.
Ryan DH, Ravussin E, Heymsfield S. COVID 19 and the Patient with Obesity - The Editors Speak Out. Obesity (Silver Spring, Md). 2020;28(5):847-847.
Ward, Z.J., Bleich, S.N., Cradock, A.L., Barrett, J.L., Giles, C.M., Flax, C., Long, M.W., Gortmaker, S.L., 2019. Projected U.S. State-Level Prevalence of Adult Obesity and Severe Obesity. N Engl J Med. 381 (25), 2440–2450.
Yu, E., Ley, S.H., Manson, J.E., Willett, W., Satija, A., Hu, F.B., Stokes, A., 2017. Weight history and all-cause and cause-specific mortality in three prospective cohort studies. Ann Intern Med. 166 (9), 613. https://doi.org/10.7326/M16-1390.
Kitahara CM, Flint AJ, Berrington de Gonzalez A, et al. Association between Class III Obesity (BMI of 40–59 kg/m) and Mortality: A Pooled Analysis of 20 Prospective Studies. PLOS Medicine. July 8, 2014.
Di Angelantonio, E., Bhupathiraju, S.N., Wormser, D., Gao, P., Kaptoge, S., de Gonzalez, A.B., Cairns, B.J., Huxley, R., Jackson, C.L., Joshy, G., Lewington, S., Manson, J.E., Murphy, N., Patel, A.V., Samet, J.M., Woodward, M., Zheng, W., Zhou, M., Bansal, N., Barricarte, A., Carter, B., Cerhan, J.R., Collins, R., Smith, G.D., Fang, X., Franco, O.H., Green, J., Halsey, J., Hildebrand, J.S., Jung, K.J., Korda, R.J., McLerran, D.F., Moore, S.C., O'Keeffe, L.M., Paige, E., Ramond, A., Reeves, G.K., Rolland, B., Sacerdote, C., Sattar, N., Sofianopoulou, E., Stevens, J., Thun, M., Ueshima, H., Yang, L., Yun, Y.D., Willeit, P., Banks, E., Beral, V., Chen, Z., Gapstur, S. M., Gunter, M.J., Hartge, P., Jee, S.H., Lam, T.-H., Peto, R., Potter, J.D., Willett, W. C., Thompson, S.G., Danesh, J., Hu, F.B., 2016. Body-mass index and all-cause mortality: individual-participant-data meta-analysis of 239 prospective studies in four continents. Lancet. 388 (10046), 776–786.
Scott, J.G., Cohen, D., DiCicco-Bloom, B., Orzano, A.J., Gregory, P., Flocke, S.A., Maxwell, L., Crabtree, B., 2004. Speaking of weight: how patients and primary care clinicians initiate weight loss counseling. Prev Med. 38 (6), 819–827.
McAlpine, D.D., Wilson, A.R., 2007. Trends in obesity-related counseling in primary care. Med Care. 45, 322–329.
Jackson, J.E., Doescher, M.P., Saver, B.G., Hart, L.G., 2005. Trends in professional advice to lose weight among obese adults, 1994 to 2000. J Gen Intern Med. 20 (9), 814–818.
LeBlanc, E.S., Patnode, C.D., Webber, E.M., Redmond, N., Rushkin, M., O'Connor, E.A., 2018 Sep 18. Behavioral and Pharmacotherapy Weight Loss Interventions to Prevent Obesity-Related Morbidity and Mortality in Adults: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. JAMA. 320 (11), 1172–1191. https://doi.org/10.1001/jama.2018.7777. PMID: 30326501.
Fitzpatrick SL, Wischenka D, Appelhans BM, et al; Society of Behavioral Medicine. An Evidence-based Guide for Obesity Treatment in Primary Care. Am J Med. 2016 Jan; 129(1):115.e1-7. PMID: 26239092; PMCID: PMC5988348.
O'Connor, E.A., Evans, C.V., Rushkin, M.C., Redmond, N., Lin, J.S., 2020. Behavioral Counseling to Promote a Healthy Diet and Physical Activity for Cardiovascular Disease Prevention in Adults With Cardiovascular Risk Factors: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. JAMA. 324 (20), 2076–2094.
Kraschnewski JL, Sciamanna CN, Pollak KI, Stuckey HL, Sherwood NE. The epidemiology of weight counseling for adults in the United States: a case of positive deviance. Int J Obes (Lond). 2013 May;37(5):751-3. PMID: 22777541; PMCID: PMC4429525.
Smith S, Seeholzer EL, Gullett H, et al. Primary Care Residents' Knowledge, Attitudes, Self-Efficacy, and Perceived Professional Norms Regarding Obesity, Nutrition, and Physical Activity Counseling. J Grad Med Educ. 2015 Sep;7(3):388-94. PMID: 26457144; PMCID: PMC4597949.
Ahmed NU, Delgado M, Saxena A. Trends and disparities in the prevalence of physicians' counseling on diet and nutrition among the U.S. adult population, 2000–2011. Preventive Medicine. 2016;89:70–75.
Vitolins, M.Z., Crandall, S., Miller, D., Ip, E., Marion, G., Spangler, J.G., 2012. Obesity Educational Interventions in U.S. Medical Schools: A systematic Review and Identified Gaps. Teaching and Learning in Medicine: An. International Journal. 24 (3), 267–272.
Butsch, W.S., Kushner, R.F., Alford, S., Smolarz, B.G., 2020. Low priority of obesity education leads to lack of medical students' preparedness to effectively treat patients with obesity: results from the U.S. medical school obesity education curriculum benchmark study. BMC Med Educ 20 (1). https://doi.org/10.1186/s12909-020-1925-z.
Block, J.P., DeSalvo, K.B., Fisher, W.P., 2003. Are physicians equipped to address the obesity epidemic? Knowledge and attitudes of internal medicine residents. Prev Med. 36 (6), 669–675.
Forman-Hoffman, V., Little, A., Wahls, T., 2006. Barriers to obesity management: a pilot study of primary care clinicians. BMC Fam Pract. 7, 35.
Kristeller, J.L., Hoerr, R.A., 1997. Physician attitudes toward managing obesity: differences among six specialty groups. Prev Med. 26 (4), 542–549.
Davis, N.J., Shishodia, H., Taqui, B., Dumfeh, C., Wylie-Rosett, J., 2008. Resident physician attitudes and competence about obesity treatment: need for improved education. Med Educ Online. 13 (1), 4475. https://doi.org/10.3402/meo.v13i.4475.
Adams KM, MPH, Kohlmeier M, Zeisel SH. Nutrition Education in U.S. Medical Schools: Latest Update of a National Survey. Academic Medicine, Vol. 85, No. 9 / September 201.
Kushner RF, Van Horn L, Rock CL, et al. Nutrition education in medical school: a time of opportunity. Am J Clin Nutr. 2014 May;99(5 Suppl):1167S-73S.
Ockene JK, Ashe K, Peterson KS, Fitzgibbon M, Buscemi J, Dulin A. Society of Behavioral Medicine Call to Action: Include obesity/overweight management education in health professional curricula and provide coverage for behavior-based treatments of obesity/overweight most commonly provided by psychologists, dieticians, counselors, and other health care professionals and include such providers on all multidisciplinary teams treating patients who have overweight or obesity. Transl Behav Med. 2020 Apr 3: PMID: 32242625.
Association of American Medical Colleges (AAMC) Report VIII Contemporary Issues in Medicine: The Prevention and Treatment of Overweight and Obesity; Medical School Objectives Project. Washington, DC: Association of American Medical Colleges (AAMC); 2007. Aug, Report No.: VIII. Report VIII Contemporary Issues in Medicine.
Kushner, R.F., Horn, D.B., Butsch, W.S., Brown, J.D., Duncan, K., Fugate, C.S., Gorney, C., Grunvald, E.L., Igel, L.I., Pasarica, M., Pennings, N., Soleymani, T., Velazquez, A., 2019. Development of Obesity Competencies for Medical Education: A Report from the Obesity Medicine Education Collaborative. Obesity (Silver Spring). 27 (7), 1063–1067. https://doi.org/10.1002/oby.2019.27.issue-710.1002/oby.22471.
Torre, D.M., Daley, B.J., Sebastian, J.L., Elnicki, D.M., 2006. Overview of current learning theories for medical educators. Am. J. Med. 119 (10), 903–907. https://doi.org/10.1016/j.amjmed.2006.06.037.
Xiao RS, Hayes RB, Waring ME, et al. Tobacco counseling experience prior to starting medical school, tobacco treatment self-efficacy and knowledge among first-year medical students in the United States. Prev Med. 2015 Apr;73:119-24. doi: 10.1016/j.ypmed.2015.02.003. Epub 2015 Feb 7. PMID: 25666737; PMCID: PMC4378235.
Bandura, A., 1977. Social Learning Theory. Prentice-Hall, Englewood Cliffs, NJ.
Gagne RM. The conditions of learning. 4. New York: Holt, Rinehart & Winston; 1985.
Stokols, D., 1996. Translating social ecological theory into guidelines for community health promotion. Am J Health Promot. 10 (4), 282–298.
Ockene JK, Ashe KM, Hayes RB, et al. Design and rationale of the medical students learning weight management counseling skills (MSWeight) group randomized controlled trial. Contemp Clin Trials. 2018 Jan;64:58-66. doi: 10.1016/j.cct.2017.11.006. Epub 2017 Nov 9. PMID: 29128651; PMCID: PMC5745008.
Ockene, J.K., Hayes, R.B., Churchill, L.C., Crawford, S.L., Jolicoeur, D.G., Murray, D.M., Shoben, A.B., David, S.P., Ferguson, K.J., Huggett, K.N., Adams, M., Okuliar, C.A., Gross, R.L., Bass, P.F., Greenberg, R.B., Leone, F.T., Okuyemi, K.S., Rudy, D.W., Waugh, J.B., Geller, A.C., 2016. Teaching Medical Students to Help Patients Quit Smoking: Outcomes of a 10-School Randomized Controlled Trial. J Gen Intern Med. 31 (2), 172–181.
Mazor, K.M., Jolicoeur, D., Hayes, R.B., Geller, A.C., Churchill, L., Ockene, J.K., 2015. Assessing Medical Students' Tobacco Dependence Treatment Skills Using a Detailed Behavioral Checklist. Teach Learn Med. 27 (3), 292–298. PMID: 26158331.
https://www.project-redcap.org/.
Prochaska, J.O., DiClemente, C.C., 1983. Stages and processes of self-change of smoking: toward an integrative model of change. J Consult Clin Psychol. 51 (3), 390–395. https://doi.org/10.1037//0022-006x.51.3.390. PMID: 6863699.
Ip, E.H., Marshall, S., Vitolins, M., et al., 2013 Feb. Measuring medical student attitudes and beliefs regarding patients who are obese. Acad Med. 88 (2), 282–289. https://doi.org/10.1097/ACM.0b013e31827c028d. Erratum. In: Acad Med. 2018 May; 93 (5):793. PMID: 23269296; PMCID: PMC3826984.
Edwards, A.L., Kenney, K.C., 1946. A comparison of the Thurstone and Likert techniques of attitude scale construction. Journal of Applied Psychology 30 (1), 72–83. https://doi.org/10.1037/h0062418.
https://www.aamc.org/data-reports/students-residents/interactive-data/2020-facts-enrollment-graduates-and-md-phd-data.
Buja, M. Medical education today: all that glitters is not gold. BMC Med Educ. 2019; 19: 110. Published online 2019 Apr 16.
Langer T, Ruiz C, Tsai P, et al. Transition to multiple mini interview (MMI) interviewing for medical school admissions. Perspect Med Educ. 2020 Aug;9(4):229-235. PMID: 32833134; PMCID: PMC7459053.