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WEB PAPER

The impact of lifestyle medicine continuing education on provider knowledge, attitudes, and counseling behaviors

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Abstract

Background: There is a need for effective continuing medical education (CME) programs to increase healthcare providers' knowledge and skills in lifestyle medicine so that healthcare providers are better equipped to assist patients in adopting and maintaining healthier lifestyle behaviors.

Aims: To evaluate the impact of five live face-to-face CME programs in lifestyle medicine on providers' barriers, knowledge, confidence, and professional counseling behaviors.

Methods: 200 participants completed researcher-generated surveys before and 90 days after each CME program. Paired *t*-tests measured significant changes for all outcome variables, and regression analyses assessed predictors of these changes.

Results: Barriers that were targeted during the programs, i.e. lack of knowledge/skills, lack of materials, and perceived poor patient compliance showed highly significant improvement. Participants also reported significant changes in knowledge, confidence, and counseling behaviors in the areas of exercise and stress management. Some improvements occurred in areas that the CME programs did not target as much, i.e. nutrition, smoking, and weight management. The greatest predictor of change was the baseline level of scores. Those participants who could most benefit from change did show the largest improvements.

Conclusions: Live CME programs can be effective in educating healthcare providers about topics within the rapidly expanding field of lifestyle medicine.

Introduction

Lifestyle medicine has evolved during the past decade to help address the current epidemic of chronic diseases, which could be prevented or optimally managed if individuals adopted and maintained healthier lifestyles (Dysinger & Carls 2010). This rapidly expanding field is an adjunct to standard medical practices. Lifestyle medicine consists of evidenced-based interventions to assist patients in adopting and maintaining lifestyle behaviors. It is based upon numerous studies that have demonstrated that healthy lifestyles can help prevent or manage obesity (Williams et al. 2008), cardiovascular disease (Ainsworth & Gabriel 2009), type 2 diabetes (Knowler et al. 2002; American Diabetes Association 2007), and hypertension (Bond Brill 2011) as well as other diseases (Dysinger & Carls 2010). Lifestyle Medicine focuses on exercise, nutrition, smoking, and stress management among other behaviors. Lifestyle medicine also supports patient-centered care, and aims to make patients more knowledgeable and motivated as well as more competent in managing their own health (Egger et al. 2008). When physicians and other health care providers incorporate lifestyle medicine into their practices, patient outcomes have improved (Orchard et al. 2005; Dod et al. 2010; Sweet & Fortier 2010; Cox et al. 2011; Morrison et al. 2012).

There has been growing support from practitioners, researchers, and organizations during the past decade to

Practice points

- Physicians and other providers need to develop more competencies in lifestyle medicine.
- It is possible to build lifestyle medicine competencies through live face-to-face CME trainings.
- CME in lifestyle medicine can result in a reduction of barriers to practice and an increase in knowledge, skills, and implementation.

integrate lifestyle medicine into healthcare practice and training (Jacobson et al. 2005; Terre 2007; Williams et al. 2007; Pettee & Ainsworth 2009; Fisher et al. 2011). In 2004 the American College of Lifestyle Medicine (ACLM) was established as a national medical specialty society for clinicians who utilize lifestyle interventions (www.lifestylemedicine.org). The ACLM has been instrumental in establishing standards for lifestyle medicine practice and in fostering education and research. In 2010 physician competencies in lifestyle medicine were published in JAMA (Lianov & Johnson 2010). Further, other health professions, e.g. nursing, pharmacy, physical therapy, and psychology, are also incorporating lifestyle counseling interventions into their practices (Johnson 2007; Prevost 2007; Burton et al. 2010).

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However, while lifestyle medicine can produce positive patient outcomes, physicians and other providers often fail to use such interventions (Tsui et al. 2004; Buffart et al. 2009; Balls et al. 2010; Howe et al. 2010). In 2010, only about one-third of adults who had seen a physician or other health professional in the past year reported that the provider advised them to begin or continue to exercise (Barnes & Schoenborn 2012). Do et al. (2011) report similar findings for arthritis, noting that physicians' physical activity and weight loss counseling practices did not reach Healthy People 2010 objectives for patients with that condition. Patients have also reported that physicians often do not address their particular needs and interests when they do prescribe lifestyle changes (Beran et al. 2008). Further, Easter and Beach (2004) observed that physicians did not respond empathetically to almost 70% of the opportunities to do so when interviewing oncology patients.

Primary barriers to lifestyle counseling are the lack of time (Foster et al. 2003) and low confidence for changing patient behaviors along with perceived poor patient compliance (Tsui et al. 2004; Howe & others 2010; Drexel et al. 2011). Physicians also report that they have limited training in how to effectively deliver lifestyle counseling (Lobelo et al. 2009; Balls et al. 2010; Howe et al. 2010) with resultant inadequate knowledge and skills (Huang et al. 2004).

After physicians receive educational training in lifestyle medicine, they have reported an increase in counseling (Beno et al. 2005) and empathy (Fernández-Olano et al. 2008), and there are improved patient outcomes (Pelto et al. 2004). Previous research has also indicated that live face-to-face continuing medical education (CME) formats, as compared with other print and web-based delivery systems, are often preferred (Stancic et al. 2003) and have equal or greater impact on physician behaviors (Marinopoulos et al. 2007). However, there are few studies of live CME programs related to lifestyle medicine, and these vary in objectives, methodology, and impact (Pelto et al. 2004; Hinchman et al. 2005; Perrin et al. 2008; Sargeant et al. 2008; Doyle et al. 2011; Drexel et al. 2011). These educational training programs ranged in length, from one hour (Perrin et al. 2008) to 20 hours of training (Pelto et al. 2004). They also targeted various specific outcomes, i.e. hypertension management (Drexel et al. 2011), childhood obesity management (Hinchman et al. 2005; Perrin et al. 2008), nutrition counseling (Pelto et al. 2004), and patient-centered counseling and communication skills (Sargeant et al. 2008; Doyle et al. 2011). All these programs, except for Doyle's (2011) seven-hour communications skills training with nurses, reported performance improvements in clinical practice (up to six months post training). Some studies also found increase in provider knowledge, skills (Drexel et al. 2011), and confidence (Perrin et al. 2008; Doyle et al. 2011). Overall, these investigations show that live CME interventions can succeed in building provider skills in specific areas related to lifestyle medicine. However, these studies varied in length, content, and setting; and they aimed to improve specific clinical skills. No study to date has examined the impact of live CME programs that address overall physician competencies in lifestyle medicine (Lianov & Johnson 2010).

Our primary goal in this study was to assess the impact of two types of live face-to-face CME programs that aimed to alter participants' thinking and behavior in the direction of greater comfort with the use of lifestyle medicine. We investigated changes 90 days after the programs and hypothesized that participants would report (a) a lessening of barriers to their practice of lifestyle medicine, (b) becoming more knowledgeable and confident in various domains of lifestyle medicine, and (c) using more lifestyle interventions in their practices. We also sought to learn what factors might have made a difference in the outcomes of these programs. Specifically, we looked at the impact of participants' professions (physician versus non-physician), program type (one day versus 2.5 days), and participants' pre-program scores. We predicted that the longer 2.5-day programs would result in greater significant changes. We did not predict whether there would be significant changes on the basis of profession and pre-program scores, but rather we simply explored whether these variables did impact results. The study was approved by the Massachusetts College of Pharmacy and Health Sciences Institutional Review Board.

Methods

Setting and participants

Five CME programs in lifestyle medicine were conducted in Boston, Massachusetts, between June 2009 and June 2011. The programs were sponsored by Harvard Medical School, Departments of Continuing Education and Physical Medicine & Rehabilitation in cooperation with the Institute of Lifestyle Medicine. The educational objectives of these programs were to increase knowledge and confidence to deliver lifestyle medicine interventions as well as related counseling behaviors, while decreasing barriers. Educational content addressed common core elements of lifestyle medicine. These included (a) the history of and rationale for lifestyle medicine, (b) the Exercise is Medicine™ initiative, and (c) lifestyle medicine competencies (Lianov & Johnson 2010). In addition, recognized experts provided lectures on nutrition, exercise prescription, behavioral counseling, and stress management. All programs also included provider health, e.g. sample chair exercises and mindfulness practice; however, the extent to which this topic was covered varied depending on the program length and type.

These educational programs also aligned with current CME trends and recommendations. First, Davis and Davis (2010), in their review of CME programs, highlighted the value of needs assessments; therefore the programs did target previously established provider needs, i.e. barriers to lifestyle counseling, which include low confidence. Thus, all programs included a session on patient-centered communication delivered by a health coach. Second, as Kahn et al. (2007) note in their AMA Continuing Medical Education report, there should be an increased focus in CME outcomes on performance improvement (PI). Thus, in addition to building knowledge, skills, and attitude change, the programs included emphasis on providers' professional practices and there was a post-training assessment of their professional behaviors. Third, as interactive modes of CME training in contrast to a more traditional didactic

delivery style have been particularly efficacious (Davis & Davis 2010; Drexel et al. 2011), one program format included optional highly interactive components.

Attendees at these programs were physicians and other health care professionals who responded to flyers, email, and website announcements. Thus, this was a self-selected population with no restrictions to enrollment. As they were self-selected, we assume that the attendees were already interested in the topic of lifestyle medicine.

All attendees were asked to voluntarily complete a survey tool developed by the interprofessional research team. Approximately 32% of attendees at the programs completed both baseline and 90-day follow-up surveys, and these respondents were our study participants ($N=200$). Participants were 77% female, with an average age of 47 years. Almost half of the participants were physicians (49%), while nurses (11%) were second most represented professional group. Table 1 provides a description of participants by program format and profession (physician/non-physician).

CME program formats

A one-day program, “Lifestyle Medicine: Tools for Promoting Healthy Change,” comprised three of the five programs in our study. One hundred and four (52%) study participants attended this type of program. In addition to the basic didactic sessions described above, the “Lifestyle Medicine” program provided lectures and discussion sessions on various applications of lifestyle medicine, e.g. management of a lifestyle medicine practice, shared medical appointments, and inter-professional collaborations. Lifestyle medicine was also discussed as it is applied to pain management, smoking, and sleep. These last three topics were included only one time each, so not all participants at the Lifestyle Medicine program heard these lectures. Overall, this program provided a more general education in lifestyle medicine.

A two-and-a-half-day program, “Active Doctors, Active Patients, The Science and Experience of Exercise” was conducted twice during our study. Ninety-six (48%) study participants attended this type of program. In addition to the basic modules described above, “Active Doctors” provided more intense learning and focus on exercise. There were didactic sessions on exercise science, exercise intensity, exercise and the brain, stretching and strengthening, and sports injuries. Also, physician health was emphasized in this program and optional interactive exercise sessions were included to support personal engagement. Activities included: Pilates, spinning, resistance training, boxing, and cardio

conditioning at a nearby health club. Additional optional sessions addressed how to effectively prescribe exercise and counsel patients in various special populations, e.g. older adults, children, patients with diabetes, and those with physical disabilities.

Outcome measures

We developed a self-report survey instrument to assess changes in specific barriers, knowledge, confidence, and practices, based on previous research and recommended competencies. We collected baseline data prior to each CME program, using either paper or an on-line questionnaire. We assessed post-program outcomes on-line 90-days later through email requests.

The survey included four categories of outcome variables. Cronbach's alpha demonstrated good to high internal reliability of all categories:

- Strength of five typical *barriers* to lifestyle counseling; $\alpha = 0.64$
- *Knowledge* about five areas of lifestyle medicine, i.e. exercise, weight management, smoking, nutrition, and stress management; $\alpha = 0.72$
- Level of *confidence* in addressing each of the same five areas; $\alpha = 0.84$
- Use of 11 specific *practices* with patients; $\alpha = 0.76$

Self-reported barriers, knowledge, and the level of confidence were all measured on 1–10 (not at all/very true) scales. For the various practices, each participant indicated whether they use each lifestyle medicine approach with patients. Therefore, this category was a dichotomous (yes/no) measure.

Data analysis

Once data were collected, all identifying information (names and email addresses) was removed resulting in a completely anonymous data-set. Microsoft Excel and SPSS 11.5 were used to analyze the data. We assessed the significance of change in dependent variables with repeated-measure paired *t*-tests. In our calculations of mean pre-post differences for each item, we did not include participants who had already achieved ‘perfect’ scores before they came to a program. (For example, a score of 10 on “Knowledge of weight” indicated that the participant felt they already knew all there was to know about weight.) We removed such participants in the corresponding paired comparisons because there was no room for improvement. We dealt with missing data on any particular item or category by using pairwise deletion. Note that this procedure contributed to increased variability in the number of participants for the various items (Table 2) because there were more initially ‘perfect’ participants for some items than for others. There was also a second reason for variation in the number of participants in different items: some items were asked in more programs and so garnered more responses.

In addition to assessing the degree and strength of change in these items and categories, we also assessed the impact of several independent variables upon them. We used stepwise

Table 1. Number of participants by profession and program format.

	Physician	Non-physician	Unknown	Total
Lifestyle medicine	34	61	9	104
Active doctors	64	22	10	96
Total	98	83	19	200

regression analyses to determine to what extent changes were predicted by (a) program format (Active Doctors/Lifestyle Medicine), (b) participant profession (physician/non-physician), and/or (c) baseline value of each variable.

Results

Barriers, knowledge, and confidence

We found a clear improvement on the perception of barriers to lifestyle medicine practices, with a significant mean decrease of 1.3 points on a 10-point scale, ($t(165)=9.04$, $p=0.000$). Specifically, those barriers that were targeted in the CME programs, i.e. lack of knowledge/skills, lack of materials, and perceived poor patient compliance, showed highly significant improvement ($p=0.000$). Conversely, those barriers which were not addressed in the programs, i.e. limited time available and lack of incentives, did not significantly change.

Providers' overall self-reported knowledge increased by 1.1 points on a 10-point scale. As with the barriers, mentioned above, this change was highly significant ($t(139)=-8.00$, $p=0.000$). The high level of significance held up for all topic areas with the exception of smoking, which improved but advanced relatively less than other areas of knowledge (Mean change = 0.5 ± 2.0 , $p=0.033$). Less improvement in smoking was not surprising given that just one Lifestyle Medicine program included this topic.

Similarly, providers' overall confidence also increased by 1.1 points, again highly significant ($t(126)=-6.83$, $p=0.000$). The biggest and most significant increases in confidence were

indicated for discussing exercise, stress management, and nutrition. There were no significant changes in confidence for discussing weight management ($p=0.210$) and smoking ($p=0.061$).

Approaches to lifestyle medicine

Table 3 shows the number of providers who reported practicing specific lifestyle-medicine approaches before and after the programs. The number of providers who coached or discussed how to change lifestyle behaviors significantly increased (131–157, $p=0.000$). Significantly more providers also reported that they prescribed exercise, discussed stress management, and provided handouts or written materials to patients post-program. Conversely, there was a significant decrease in the number of providers who reported that they referred patients to specialists in general, nutritionists/dieticians and support groups (Figure 1).

Table 4 summarizes the significant changes in important lifestyle counseling topic areas. We see the most consistent and notable improvements in the areas of exercise and stress management. For exercise, provider 'knowledge and confidence' refers to the general topic of as a whole, while 'number of providers' specifically refers to those who have begun to write an 'exercise prescription'. A prescription contains specific instructions for the patient about the type, length of time, frequency, and intensity level of exercise in which he should engage. Knowledge of weight management, smoking, and nutrition all improved, but the sense of more knowledge in these particular areas did not consistently translate to increases in confidence or provider behaviors.

Table 2. Providers' overall reported changes 90 days after educational programs.

Categories/items	<i>n</i>	Pre-program Mean (SD)	Post-program mean (SD)	Change Mean (SD)	<i>p</i> -Value (paired <i>t</i> -tests)
Perceived barriers ('Lack of...'): 1 = No barrier; 10 = High barrier Low scores are more desirable	166	5.4 (1.7)	4.1 (1.8)	-1.3 (1.1)	0.000
Limited time	148	6.1 (2.2)	5.8 (2.8)	-0.3 (2.5)	0.132
Lack of incentives	113	5.5 (2.4)	5.3 (3.0)	-0.2 (3.1)	0.508
Lack of knowledge/skills	132	4.8 (2.0)	3.0 (1.8)	-1.7 (2.1)	0.000
Lack of materials	140	5.3 (2.1)	3.8 (2.4)	-1.5 (2.8)	0.000
Perceived poor compliance	146	5.2 (2.2)	4.1 (2.4)	-1.1 (2.5)	0.000
Self-reported knowledge about: 1 = Not knowledgeable; 10 = Very knowledgeable High scores are more desirable	140	6.8 (1.4)	7.9 (1.2)	1.1 (1.6)	0.000
Exercise	132	6.8 (1.7)	8.0 (1.3)	1.2 (1.7)	0.000
Weight management	89	6.9 (1.7)	7.8 (1.5)	0.9 (1.4)	0.000
Smoking	85	7.0 (1.9)	7.4 (1.8)	0.5 (2.0)	0.033
Nutrition	88	6.7 (1.7)	7.4 (1.7)	0.7 (1.4)	0.000
Stress management	89	6.5 (1.8)	7.3 (1.6)	0.8 (1.5)	0.000
Confidence in discussing: 1 = Not confident; 10 = Very confident High scores are more desirable	127	7.2 (1.9)	8.3 (1.3)	1.1 (1.9)	0.000
Exercise	95	7.2 (1.6)	8.5 (1.3)	1.3 (1.7)	0.000
Weight management	56	7.5 (1.3)	8.1 (1.6)	0.6 (1.7)	0.130
Smoking	57	7.0 (1.8)	7.5 (2.2)	0.5 (2.0)	0.061
Nutrition	66	6.8 (1.6)	7.5 (1.9)	0.7 (1.9)	0.006
Stress management	71	6.6 (1.9)	7.9 (1.8)	1.2 (1.9)	0.000

Note: In the Knowledge and Confidence categories, the number (*n*) of respondents for the Exercise measures is larger than for the other measures, as the Exercise measure was included in more program surveys.

Impact of conference type, profession, and pre-program level

Results of the stepwise regression analyses (Table 5) indicate the relative influence of three independent variables: (a) conference type, (b) profession, and (c) baseline (pre-program) score – on barriers, knowledge, and confidence.

- (a) The 'Active Doctors' program showed significantly more impact (in the desired direction) than did the 'Lifestyle Medicine' programs on five of the 15 dependent items we assessed.

Table 3. Change 90 days after educational programs in number of providers who reported using specific practices (N = 200).

Approaches	Pre-program (n)	Post-program (n)	Change (n)	p-value
Coach/discuss how to change lifestyle	131	157	26	0.000***
Prescribe exercise	87	111	24	0.005**
Advise patient to "lose some weight"	112	111	-1	1.000
Advise diet	21	18	-3	0.549
Discuss stress management	98	117	19	0.002**
Provide handouts or written materials	81	99	18	0.021*
Refer to specialist	55	31	-24	0.001**
Refer to nutritionist/dietician	114	99	-15	0.037*
Refer to support group (e.g. Wt Watchers)	94	80	-14	0.045*
Refer to health club	54	62	8	0.332
Refer to health or wellness coach	32	34	2	0.850

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

- (b) Profession (physician versus non-physician) predicted changes for three of the 15 items. Physicians showed more increase than did non-physicians in knowledge about weight management, and confidence in discussing smoking and stress management.
- (c) Baseline score was the strongest and most pervasive predictor of change. Participants with the 'worst' pre-program scores tended to change the most. For example, those who perceived high barriers for themselves in terms of lifestyle counseling were the ones who showed the greatest change toward perceiving low barriers. Those who believed themselves least knowledgeable or confident showed the greatest change toward more knowledge or confidence.

Discussion

We assessed the efficacy of live CME programs to improve physicians' and other health care providers' self-reported knowledge, confidence, and counseling strategies for lifestyle medicine. Overall, it appears that this is an effective format. Our results are consistent with previous research that has demonstrated the efficacy of live single CME training programs (Perrin et al. 2008; Sargeant et al. 2008; Doyle et al. 2011); though to our knowledge, this is the first time that there has been an evaluation of teaching a range of lifestyle medicine topics and counseling strategies. This is important because an integrated approach to these topics historically has not been part of mainstream medical education. Also, the participants chose to both attend the CME activity and to complete the pre- and post- activity surveys. The changes that were demonstrated support this CME format of voluntary participation.

Our analyses suggest improvements in all major areas. These included gains in self-reported knowledge, confidence and practice styles, as well as less impact of barriers. There was

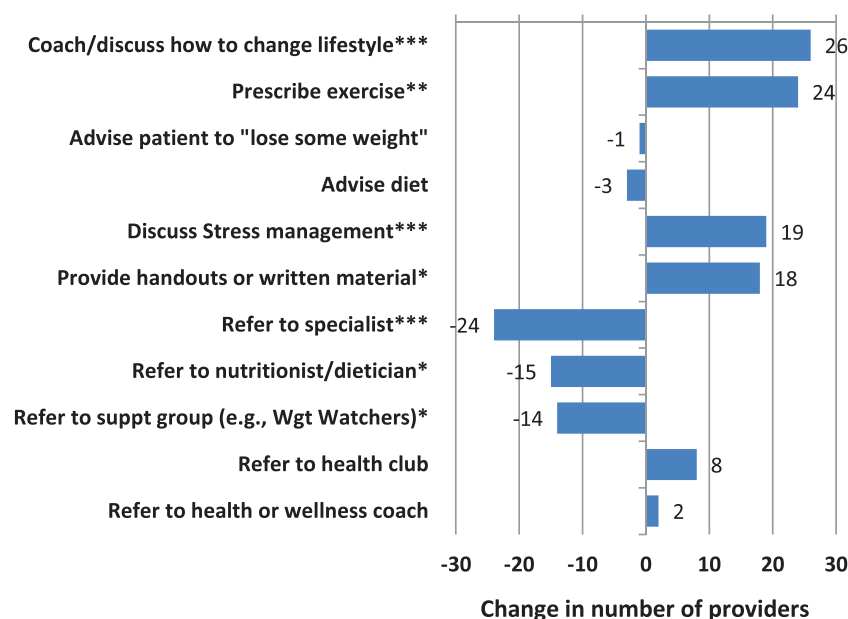


Figure 1. Change after CME educational programs in the number of providers using a variety of practices. Some changes are significant: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

also a significant increase in the number of providers who approached lifestyle medicine topics within their practices compared to a significant decrease in the number of providers who referred patients to outside specialists. This may be due to an increase in their own confidence to offer services to patients within their own practice.

One interesting finding was in regard to weight management. Given the current obesity epidemic, this is a topic that nearly all health care providers are confronted with on a regular basis (Simkin-Silverman et al. 2008). While providers indicated that they believed they became much more knowledgeable about weight management after the educational programs, there were no significant changes in their confidence to discuss this with patients or in their prevalence of

weight management counseling. Weight management is a particularly complex and challenging area. Successful counseling requires sensitively addressing multiple factors (e.g., exercise, diet, stress). The programs spent a significant amount of time teaching about factors related to weight management separately, but offered very little comprehensive information about how to use them together with the specific intent of dealing with weight management. This perhaps should be given more attention in future lifestyle medicine training programs. We suspect that providers would benefit from this, as Perrin et al. (2008) demonstrated increases in confidence and counseling frequency when they specifically addressed childhood obesity in their training program with pediatricians.

The results indicate that these programs had the greatest impact on those participants who had the most to gain. This finding supports presenting CME trainings in lifestyle medicine to providers who may not be very familiar with or confident about these competencies and practices. This also supports the efficacy of more widespread continuing education to practitioners newly facing the need to promote healthier behaviors as they work within evolving Accountable Care Organizations or Patient Centered Medical Homes.

We also found that the “Active Doctors” program had a greater effect than the “Lifestyle Medicine” program on removing the lack of knowledge as a barrier, and increasing knowledge and confidence related to exercise and weight management. This program was longer and it did focus more on exercise, so we assume that these may account for the greater gains in these areas. We cannot state if and how the optional interactive exercise sessions in the “Active Doctors” program impacted results, though we believe that the

Table 4. Significant increases 90 days after educational programs in provider knowledge and confidence, and the number of providers who address these topics.

	Provider knowledge	Provider confidence	Number of providers
Exercise	***	***	**
Weight management	***	ns	ns
Smoking	*	ns	Not asked
Nutrition	***	**	ns
Stress management	***	***	**

Notes: Number of providers data are extracted from Approaches results (Table 4 and Figure 1).

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5. Significant impact of program type, profession, and baseline scores on outcomes.

Outcomes	Program type (β)	MD/non-MD (β)	Baseline score (β)	Adj. R^2
<i>Perceived barriers ('Lack of...'):</i>			–0.50***	0.247
Time			–0.30***	0.085
Compensation/incentives			–0.43***	0.178
Knowledge	0.19**		–0.60***	0.392
Materials			–0.55***	0.295
Patient compliance			–0.48***	0.225
<i>Self-reported knowledge about:</i>	0.14*		–0.69***	0.499
Exercise	0.15*		–0.67***	0.497
Weight	0.19*	–0.25**	–0.46***	0.313
Smoking			–0.56***	0.309
Nutrition			–0.43***	0.179
Stress			–0.54***	0.287
<i>Confidence in discussing:</i>	0.16**		–0.77***	0.623
Exercise	0.24**		–0.64***	0.512
Weight	0.47		–0.44***	0.409
Smoking		–0.28*	–0.35***	0.162
Nutrition			–0.40**	0.149
Stress		–0.26**	–0.52***	0.361

Notes: Positive and negative beta scores:

- Conference type: Positive beta indicates that ‘Active Doctor’ (2-day) attendees changed more than ‘Lifestyle Medicine’ (1-day) attendees.
- MD/non-MD: Negative beta indicates that physicians changed more than non-physicians.
- Baseline score: Negative beta indicates that attendees with lower pre-program scores showed greater change than did attendees with higher pre-program scores.

Adjusted R^2 scores indicate percent of variance for each outcome measure that is cumulatively explained by these three independent variables.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. All empty cells have non-significant betas.

experience of practicing the skills, in addition to the didactic components, was a strength of the course. Finally, both physicians and non-physician professionals benefited equally from the programs, with minor exceptions. This lends support to expanding CME programs in lifestyle medicine to all healthcare providers.

The faculty in these CME programs generally encouraged participants to consider their individual settings and to plan how they might realistically incorporate what they learned into their clinical practices. However, we recommend that future program developers and researchers place more emphasis on this component. It would be worthwhile to investigate the impact of providing specific examples of how to systematically incorporate procedural changes to accommodate lifestyle medicine (e.g. chart stickers, patient self-report forms).

There are limitations in the current study. First, we did not employ a control group (i.e. similar professionals who did not attend our courses). As a result, we do not know to what degree the positive changes we observed reflected self-selection and extant interest in lifestyle approaches on the part of participants. Second, we used self-report surveys, so this study could have biases inherent in this kind of research. We did not, for example, independently verify that knowledge had increased or that exercise was being prescribed more often. Future studies should strive to collect and assess actual practice data. Also, data collection should include breakdown by physician specialty in order to be able to determine if impact varied between primary care physicians and specialists. Finally, caution should be exercised around this study's findings given that the participants in our study were self-selected respondents. Previous research has shown that reported changes in behavior, especially positive, can be susceptible to response bias (Doyle et al. 2011). However, it is notable that we observed most changes in those areas that the CME programs targeted (barriers related to lack of knowledge, confidence, and materials) in contrast to those topics that the programs did not fully address (barriers related to time and incentives, weight management, smoking). These differences do support the validity of our findings and the impact of the CME programs.

Conclusions

Our results support live face-to-face CME training as an effective means to educate healthcare providers about topics within the rapidly expanding field of lifestyle medicine. A single program could effectively lessen barriers and increase knowledge, confidence and practices that help patients self-manage health behaviors. Future studies of lifestyle medicine CME could compare live trainings with emerging web-based educational methodologies given their growing popularity and ease in content delivery, and also further examine the efficacy of interactive formats.

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Dr. Phillips is on the Scientific Advisory Board of OnLife, a subsidiary of Tennessee Blue Cross/Blue Shield.

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