

Family Medicine Resident Perspectives on Curricula in Herbal Medicine

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BACKGROUND AND OBJECTIVES: Despite widespread patient use, herbal and dietary supplement education is not required in US-accredited medical schools. Thus, physicians are unprepared to address supplement use with patients. Our objectives were to assess perceived adequacy of medical education on supplements, determine resident perspectives on appropriate placement of curricula in their longitudinal medical education, and evaluate the effects of an innovative workshop on family medicine resident knowledge about supplements and intentions to address this topic with patients.

METHODS: Family medicine residents (N=65) participated in an hour-long workshop covering basic concepts about herbal and dietary supplements, including regulations, literature review techniques, and risk/benefit analysis. The participants completed pre/postworkshop surveys to assess need for increased education and evaluate efficacy of the workshop.

RESULTS: Most participants (91.9%) thought they should have received more education than provided on supplements and perceived greater need for curricula in undergraduate medical education than in graduate medical education. Only 47.6% received required education on supplements, significantly less than the 72.6% who thought this education should be required ($P<0.05$). The workshop increased the proportion of residents planning to address patients' supplement use, increased the frequency residents intend to ask about supplements, and improved resident perceptions of the efficacy of some supplements when used with physician guidance.

CONCLUSIONS: Residents perceived a lack of adequate medical education on the use of herbal and dietary supplements. Results showed a brief workshop increased resident intentions to discuss supplement use with patients. Further education on supplement use may be warranted.

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Dietary supplements, including vitamins, minerals, and herbals, are the most widely used component of complementary and alternative medicine (CAM) among US adults, surpassing chiropractic, yoga, meditation, and special diets.^{1,2} Over half of US adults report use of supplements with 18%-39% reporting

use specifically of herbals (nonvitamin, nonmineral supplements) to self-treat a wide range of conditions.¹⁻³ While vitamins and minerals often fall under the umbrella of nutrition—a subject required in 94% of US medical schools—herbal medicine does not.⁴ Given widespread patient use, medical education on

supplements, with a particular focus on herbals, warrants specific attention.

By failing to discuss supplements, physicians risk prescribing medications that adversely interact with supplements, failing to recognize patient symptoms possibly attributable to supplements, and missing opportunities to use supplements beneficially.⁵⁻⁹ While some supplements have been shown in clinical trials to be effective, others have little evidence, pose significant risks to patients, or carry risks for drug interactions.⁵⁻⁹ As providers and managers of full-spectrum patient care, these discussions are of particular importance to family physicians.

The Society of Teachers of Family Medicine has endorsed residency training in CAM since 1999.¹⁰ Consequently, the proportion of family medicine residencies (FMRs) including curricula on CAM has increased from 28% in 1995 to 44% in 2013, and 89% of CAM courses include training on supplements.¹¹⁻¹² Despite increasing graduate medical education (GME) on supplements, the proportion of patients discussing supplements with their physician has remained low. Sixty-three percent to 72% of patients using supplements in 2008, up to 80% in 2017 report that they do not discuss them with their physician.^{5,6} This is

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surprising, as CAM curricular guidelines include the “ability to inquire into patients’ use of CAM in a non-threatening, nonjudgmental manner,” yet these data suggest that current medical education on CAM does not improve discussions about supplements.¹¹

The paucity of these discussions might be partly explained by deficient undergraduate medical student education (MSE) on supplements as opposed to insufficient GME on supplements. Currently, Liaison Committee on Medical Education- (LCME) accredited medical schools are not required to include any instruction on CAM.¹³ While a large body of literature describes the implications of and suggests solutions to limited CAM exposure in MSE, few examine the need for expanded education on supplements specifically, or incorporate evidence-based analysis of therapies.^{7,8,14,15} Not only do the data warrant education specifically on supplements, medical students consistently rank supplements among the top CAM therapies they would like to learn about.^{1,2,7}

The National Academy of Medicine (formerly the Institute of Medicine) recommended as early as 2005 that health professional schools provide enough instruction on CAM to competently advise patients, though no specific guidelines were provided.¹⁶ Although GME on CAM has expanded in FMRs and improved resident knowledge in programs incorporating this training, other surveys show that only 5% of FM residents feel comfortable advising patients on CAM.^{10-12,17} Less improvement has been made at the MSE level, with consequent reports that medical students are not comfortable counseling patients about CAM.^{7,15,16} These data suggest that the US medical education system has done a poor job incorporating National Academy of Medicine recommendations.

Objectives and Hypotheses

In this study, we assessed perceived adequacy of medical education on

supplements among residents at Colorado FMRs and sampled resident perspectives on appropriate placement of supplement curricula in GME vs MSE. Due to previously reported medical student and resident discomfort advising patients about CAM, we hypothesized that residents perceive MSE and GME on supplements as inadequate; however, we hypothesized that residents would identify a greater need for supplement education in MSE, given recent GME expansion of supplement education without corresponding expansions in MSE.^{7,10-12,15-18} Based on principles from the theory of reasoned action (TRA), a well-established theory of human motivation and behavior, we hypothesized that both perceived faculty norms and resident attitudes would influence resident intentions and behavior.¹⁹ Finally, we evaluated perceived utility of an innovative workshop in improving resident knowledge about supplements and intentions to address supplements with patients, hypothesizing that our curriculum would improve confidence about supplements and increase the proportion of residents intending to address supplements with patients.

Methods

Design and Recruitment

This study was a pre/post, single-group design. Immediately before and after participating in a 1-hour workshop about supplements, 65 FM residents completed self-report surveys about (1) perceived need for MSE/GME on supplements, and (2) supplement use attitudes, norms, intentions, and past behavior (reflecting key constructs from the TRA). The postsurvey also included measures of perceived workshop utility. The study was approved by the Colorado Multiple Institutional Review Board with exempt status.

A total of 65 residents from six Colorado FMR programs were recruited to the study. Emails offering the experimental workshop were sent to FMR program directors and

the workshop was delivered at FMRs electing to participate. FM residents in participating programs who were on clinical rotations that allotted time for didactics were required to participate in the workshop, which was incorporated into their series of regular didactic sessions. Although attendance was required, participation in the research project through completion of pre/postsurveys was voluntary. Residents were given a postcard consent form preworkshop and paper surveys pre/postworkshop. Response rate among residents attending the workshop was 100%, despite the option not to participate. Eligible participants were in a Colorado FMR program and present at the didactic session.

Educational Intervention

The workshop was designed to incorporate the core competencies outlined by the Academic Consortium for Integrative Medicine and Health that apply to supplements: potential for adverse effects, research evidence for efficacy, reputable resources for information, and current regulations.²⁰ We engaged residents in the process of researching supplements with reputable sources in response to patient cases and provided guidance for counseling patients about safety, efficacy, and regulations. Residents worked in small groups of two to three, with one facilitator per session of eight to thirteen residents and evaluated two cases. Subsequent discussions referred back to the cases. This skill-oriented and case-based design is distinct in that it prompts participants to incorporate evidence-based medicine and critical thinking into discussions of supplements, something which only 8.2% of medical schools include in existing curricula.¹⁵ Curricular content is described in Table 1.

Measures

Outcomes measures are described in Table 2, selected to allow evaluation of effects of the workshop on TRA motivational constructs relevant to supplement use, and perceived need

Table 1: Dietary Supplement Workshop Core Contents, Descriptions, and Completion Time

Core Content	Description	Minutes
Introduction	Orientation, introductions, and administration of the preworkshop survey.	5
Learning objectives	(1) Demonstrate how to look up reliable information and print patient handouts on supplements, (2) Advise patients about supplement-use, and (3) Describe US quality and safety regulations on supplements. ^{20,21}	1
Case #1	Case: A patient with Hodgkin's Lymphoma asks his physician about glutathione. Group work: Residents work in groups of two to three to develop a plan to find reliable information about glutathione and advise the patient.	5
Reliable resources	One small group is called upon to present the resources they used. Instructor then reviews reliable resources, with a focus on the Natural Medicines Comprehensive Database (NMCD) ²²	5
Safety and efficacy of supplements	Discussion initiated with presentation from a small group. Instructor reviews tools available in the NMCD for safety and efficacy analysis, including pre-prepared, patient handouts. This is followed by a comparison of the prevalence of adverse reactions to pharmaceuticals ²³ with those to supplements. ²⁴	5
Analyzing individual supplements	Residents are provided with a reference handout that briefly describes uses, safety, efficacy and drug-herb interactions for: <ul style="list-style-type: none"> • Commonly used supplements²⁵ (eg, fish oil, glucosamine, <i>Echinacea</i>...) • Examples of supplement benefits (eg, fish oil, CoQ10, chondroitin...) • Examples of supplement harms (eg, bitter orange, pennyroyal, kava...) • Examples of common drug-herb interactions (eg, kava—CNS depressants, ginseng—warfarin, St John's wort—P450 metabolites...) • Examples of herbal equivalents of pharmaceuticals (eg, ma huang—<i>Ephedra</i>; foxglove—digitalis, red yeast rice—statins...) Two examples of the above supplements (glucosamine/chondroitin and kava) are chosen for more detailed discussion about evaluation of safety and efficacy.	15
Laws and regulations	Summary of take-home points from: the Dietary Supplement Health and Education Act and the Dietary Supplement and Nonprescription Drug Act.	3
Independent verification	Discussion initiated with presentation from a small group about how they would instruct patients to find a safe product. Instructor then reviews independent verification of supplements by US Pharmacopeia, Consumer Labs, the National Sanitation Foundation, and the Natural Products Association. The Natural Medicine Brand Evidence-based Rating is also reviewed.	5
Form and dosing	Review of tools available for administration and dosing in the NMCD, with an emphasis on bioavailability and variations of dosing instructions on labels of consumer products from recommended dosing in the NMCD.	3
Prevalence of patient use	Presentation of statistics on the prevalence of patient-use of natural products and the frequency of patient nondisclosure of natural product use to providers. ^{1-3,5}	3
Case #2	Residents work in groups of two to three to evaluate combination herbal products to treat the common cold. One group is called on to present their work to the class.	5
Conclusion	Summary of the learning objectives and administration of the postsurvey.	5
Total Time		60

for and utility of the workshop itself. Composite variables (averages of Likert-type scale items) were created where internal consistency (Cronbach α) among items reflecting a given construct was greater than .70. Continuous scale items were otherwise analyzed individually. In the presurvey, participants reported perceived effectiveness of supplements (two items; Cronbach α =.80—pre and post) and perceived risk of supplements (three items analyzed separately, “attitudes

towards supplement use”); residency faculty behaviors recommending supplements to patients (one item, “perceived norms for supplement use”); “past behavior” discussing supplements with patients (two Likert-type scale items, two checkbox items—coded “yes” if either box checked “yes”). We assessed perceived need for MSE/GME supplement education with items assessing interest in learning about supplements (six items, Cronbach α =.91 pre, .90 post), and by comparing

participants' actual amount (open text coded as 0 hours, 0 to 5 hours, 6 to 10 hours, more than 10 hours, or “other” for nonnumerical responses) and context (GME vs MSE, required vs elective) for previous supplement education, and perceived amount and context in which students should receive such education. We manually coded for each participant whether or not they felt they should have received more instruction than they actually received. In the postsurvey, participants repeated items

Table 2: Description of Measures

Construct	Survey	Item Wording	Response Options
Supplement Use Attitudes, Norms, Intentions, and Behaviors			
Perceived supplement effectiveness	Pre & post	<ul style="list-style-type: none"> In general, herbs and supplements can effectively treat some medical conditions. With physician guidance, herbs and supplements can effectively treat some medical conditions. 	Scale: 1–5 (strongly disagree–strongly agree)
Perceived supplement risk	Pre & post	<ul style="list-style-type: none"> Herb and supplement use leads to more adverse reactions than use of pharmaceuticals. When used with physician guidance, herbs and supplements pose more risks to patients than pharmaceuticals. When used without physician guidance, herbs and supplements pose more risks to patients than use of pharmaceuticals. 	
Past behavior/ Future intentions	Pre & post	<ul style="list-style-type: none"> When interviewing patients, I typically ask about [in the future, I plan to ask about] use of herbs and supplements. I currently recommend [In the future, I plan to recommend] herbs and supplements to patients. 	Scale: 1–5 (never–always)
		<ul style="list-style-type: none"> I have [In the future, I plan to have] a discussion with the patient about their herb/supplement use. I screen [In the future, I plan to screen] patients' herb/supplement use for potential harmful interactions with medications. 	Checkbox
Perceived faculty norms	Pre only	Faculty in my residency program recommend herbs and supplements to patients	Scale: 1–5 (never–always)
Perceived Need for and Usefulness of Supplement Education			
Interest in learning about supplements	Pre & post	How interested are you in learning about [in learning more about]: <ul style="list-style-type: none"> Important drug-herb interactions. Top herbs & supplements: most used, most toxic & most beneficial. How to look up accurate information about herbs and supplements. How to instruct patients to shop for and use herbs and supplements safely. Laws, regulations and quality standards for herbs and supplements. How to use herbs and supplements to treat patients in primary care. 	Scale: 1–5 (very disinterested–very interested)
Previous instruction received	Pre only	How many hours of instruction on this topic have you previously received?	Open text
		In what context did this instruction occur? (required/elective) (medical school/residency)	Checkbox
Instruction needed	Pre & post	How many hours of instruction on this topic should students receive?	Open text
		In what context should this instruction occur? (required/elective) (medical school/residency)	Checkbox
Workshop utility	Post only	Did you find this curriculum helpful?	Scale: 1–5 (not at all–very helpful/likely)
		How likely are you to use the information presented in this course when discussing herbs and supplements with patients?	

assessing attitudes, interest, and education students should receive, and also reported future intentions to discuss supplements with patients (two items) and perceived workshop utility (two items). This was a pilot study and no relevant measures previously existed; measures were practical and had face validity for this evaluation.

Analysis

We used descriptive statistics to assess participants' attitudes toward supplements, intentions to address supplements with patients, perceived need for MSE and GME on supplements, and perceptions of workshop utility. We used McNemar's test to evaluate differences in proportions and dependent samples *t*-test and Fisher's exact test to examine

changes in attitudes and intentions pre/postworkshop. Analyses were conducted using SAS Version 9.4.

Results

Sample Characteristics

The sample included 65 FM residents with a mean of 1.75 years in residency. This consisted of 34% of the population of Colorado FM residents (8-13 residents from each of

the 6 participating programs). Demographic data (eg, age, gender, race/ethnicity) on participants were not collected.

Although 100% of didactic session participants filled out surveys, 6.2% were filled out incompletely and 4.6% filled out only one survey (pre or post) due to arriving late or leaving early. Missing data were handled via listwise deletion.

Perceived Need for Supplement Education

Comparing individual resident hours and setting of instruction received vs needed, 57 out of 62 residents (91.9%) responded that they should have received more education. On the presurvey, residents reported having received significantly less education on supplements than they believe they should have received (Table 3). At the MSE level, 47.6% of respondents received required classes on supplements, whereas 72.6% of respondents said students should have received required classes (McNemar test: $P=.0002$). At the GME level, 20.6% of respondents received required classes, whereas 56.4% of respondents said residents should receive required classes (McNemar test: $P<.0001$). A greater proportion of residents believe this instruction should be received at the MSE level than at the GME level, both preworkshop (72.6% MSE, 56.4% GME, McNemar test: $P=.03$) and postworkshop (77.0% MSE, 59.0% GME, McNemar test: $P=.02$).

Relationships Among Perceived Norms, Attitudes, Past Behavior, and Intentions

On the presurvey, residents whose faculty recommend supplements (perceived faculty norms) were more likely to report that they themselves recommend supplements to patients (past resident behavior; $r=0.48$, $P<0.0001$); preworkshop attitudes (perceived effectiveness and risk) were not associated with past resident behavior ($P_s=ns$). Conversely, postworkshop, resident intentions to recommend supplements in the future were not associated with faculty norms reported preworkshop ($r=.07$, $P=ns$), but were positively associated with postworkshop perceived effectiveness ($r=.54$, $P<.001$), and negatively associated with postworkshop perceived risk of adverse reactions relative to pharmaceuticals ($r=-.31$, $P=.01$) and risk relative to pharmaceuticals when used with physician guidance ($r=-.32$, $P=.01$).

Changes in Attitudes and Intentions to Address Supplements Following Workshop

Preworkshop, 33 out of 65 respondents (50.8%) indicated they would address supplements during clinical encounters (Figure 1). Postworkshop, 55 out of 65 (84.6% of respondents) indicated they intended to address supplements during future clinical encounters (pre/post difference: $P=.006$, Fisher exact test, two-sided).

A dependent samples t -test showed that, postworkshop,

respondents intended to ask patients about supplements more frequently ($M_{\text{change}}=0.52$, $SD_{\text{change}}=0.77$, 95% CI: 0.32, 0.72, $t(59)=5.20$, $P<.0001$). Similarly, respondents planned to recommend some supplements more frequently postworkshop ($M_{\text{change}}=0.67$, $SD_{\text{change}}=0.77$, 95% CI: 0.47, 0.87, $t(59)=6.67$, $P<.0001$).

A dependent samples t -test showed respondents exhibited increased perceptions of effectiveness of some supplements pre/postworkshop ($M_{\text{change}}=0.26$, $SD_{\text{change}}=0.46$, 95% CI: 0.14, 0.38, $t(60)=4.38$, $P<0.0001$). Similarly, respondents showed lower perceptions of risks of supplements pre/postworkshop, including beliefs that supplements have adverse reactions ($M_{\text{change}}=-0.43$, $SD_{\text{change}}=1.07$, 95% CI: -0.70, -0.15, $t(60)=-3.11$, $P=0.003$), beliefs that supplements pose more risks than pharmaceuticals, both with physician guidance ($M_{\text{change}}=-0.20$, $SD_{\text{change}}=1.00$, 95% CI: -0.45, 0.06, $t(60)=-1.54$, $P=0.13$) and without physician guidance ($M_{\text{change}}=-0.37$, $SD_{\text{change}}=1.18$, 95% CI: -0.67, -0.06, $t(60)=-2.41$, $P=0.02$).

Workshop Utility

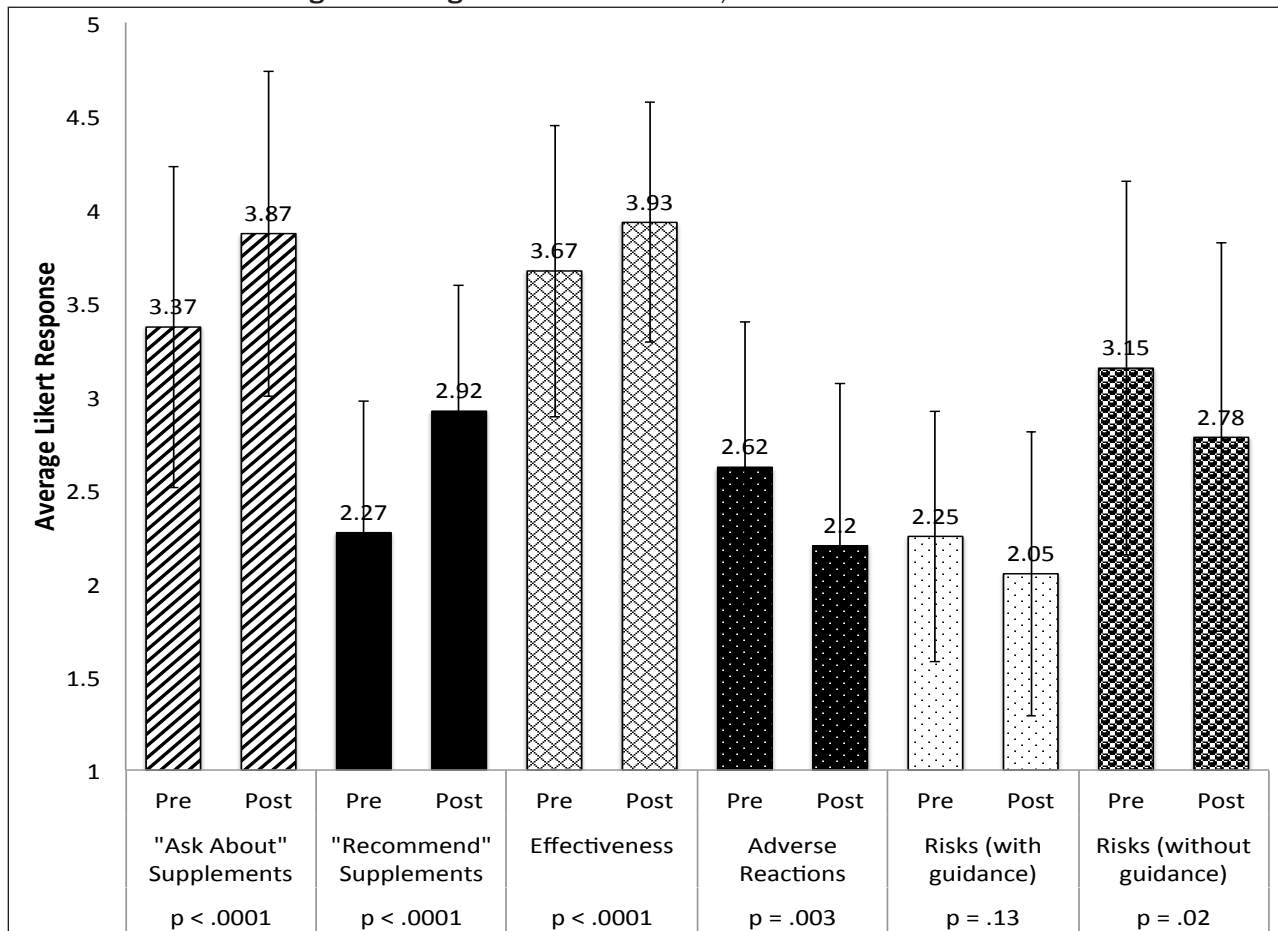
Overall, participants indicated that they were likely to use the information presented and that they found the workshop helpful. Mean response to how helpful residents found the workshop was 4.41 (SD=0.69), and mean response to how likely residents were to use the information presented was 4.38 (SD=0.58).

Table 3: Previous Instruction Received vs Instruction Needed

	Previous Instruction Received N (%)	Instruction Needed	
		Preworkshop N (%)	Postworkshop N (%)
Hours of Instruction	(n=62)	(n=60)	(n=56)
0 hours	9 (14.5 %)	0 (0.0%)	0 (0.0%)
0>x≥5 hours	34 (54.8 %)	23 (38.3 %)	25 (44.6 %)
5>x≥10 hours	14 (22.6 %)	17 (28.3 %)	14 (25.0 %)
>10 hours	2 (3.2 %)	11 (18.3 %)	13 (23.2 %)
Other	3 (4.8 %)	9 (15.0 %)	3 (5.4 %)
Setting of Instruction	(n=63)	(n=62)	(n=61)
MSE	30 (47.6 %)	45 (72.6 %)	47 (77.0 %)
GME	13 (20.6 %)	35 (56.4 %)	36 (59.0 %)

Abbreviations: MSE, medical school education; GME, graduate medical education.

Figure 1: Changes in Resident Attitudes, Intentions and Behaviors



Discussion

Results supported our hypotheses that FM residents perceive past MSE and GME as inadequate and that our curriculum improves their attitudes about supplements and increases the proportion of residents intending to address supplements with patients. Furthermore, results indicate that a larger proportion of residents perceive a need for expanded supplement education in MSE than in GME, although a majority believe supplement education should be expanded at both levels.

Almost all residents believed they should have received more education on supplements than provided in medical school. Inadequacy of current MSE was further supported by the significantly smaller proportion of residents who received required instruction on supplements in medical school than the proportion

believing this instruction should be required. Although this same trend was observed at the GME level, this discordance could be explained by residents' only partial completion of residency training at the time that their opinions were sampled.

These findings are not surprising given the paucity of current MSE on supplements. Although 50.8% of medical schools offer courses in CAM, only 69.9% of these courses include information on supplements, providing a median of 2 hours of instruction on this topic during an average 20-hour course.¹⁵ A majority of these courses are offered electively, with only 29% provided in a required setting.¹⁵ Thus, 35.5% of US medical schools (69.9% of 50.8%) provide a median of 2 hours of coursework on supplements and only 10.3% of schools (29% of 35.5%) provide this education in a required setting.¹⁵

Regarding GME, evaluation of the Integrative Medicine in Residency (IMR) online course shows that only 8.6% of content hours are devoted to supplements (16/186 total hours).¹⁸

In accordance with predictions from the TRA, findings in this study illustrated that perceived faculty norms and resident attitudes influence residents' intended behavior. Prior to the workshop, resident behavior was correlated with perceived faculty norms. Following the workshop, resident intended behavior was correlated with attitudes about supplements, and was no longer correlated with the perceived faculty norms reported preworkshop. Lack of correlation between preworkshop attitudes and resident behavior was surprising and might be attributable to insufficient prior instruction on supplements to adequately inform attitudes, such that

residents emulated faculty behaviors without a deeper understanding of the reasons for those behaviors. Postworkshop, however, resident attitudes about supplements correlated strongly with intended behavior, supporting our hypothesis that changing resident attitudes can evoke corresponding changes in intended behavior.

Our results further supported our hypotheses that our workshop improves resident attitudes about supplements and increases the proportion of residents intending to address this topic with patients. These results align with prior studies that observed associations between increased CAM education, improved attitudes towards CAM therapies, and intentions to apply the curricular content taught to medical practice.^{10,26,27}

Similar to the postsurvey administered in this study, the more extensive IMR course used an exit survey to sample FM residents' intent to utilize content learned.¹⁰ Ratings on a 5-point scale after the IMR course (4.2) were nearly identical to postworkshop ratings (4.38) in our study with respect to intent to apply content learned/address supplements with patients.¹⁰ The high ratings for our workshop were also comparable to high ratings of dietary supplement curricula at the MSE level. Following a month-long, fourth-year elective course at Pennsylvania State University College of Medicine, students highly rated their preparedness to discuss supplements postcourse while participants in our workshop demonstrated increased intent to address supplements with patients pre/postworkshop.⁷

Although pre/post ratings between our workshop and these courses were comparable, both the IMR and the fourth-year elective differed substantially from our workshop with respect to duration. Completion time for the IMR course was 186 total hours (16 hours on supplements) vs 4 weeks for the fourth-year elective vs 1 hour for our workshop.^{7,18} These

differences in course duration may offer an opportunity for programs to improve participants' competence discussing supplements with patients without adding substantial course time to medical students' and residents' already packed schedules. This answers concerns expressed at both the MSE and GME level that one of the top barriers to integrating CAM content into the curriculum is finding time for it.^{12,20}

Limitations

This study was limited by lack of a comparison group due to pre/post single-group design. It is not clear that the changes in attitudes or intentions were attributable to the educational content itself. Simply having contact with an educator perceived to support CAM may have influenced participants, particularly since faculty influence was noted to affect attitudes. Results are limited by self-report surveys, which may have been subject to demand characteristics, such that participants may have responded as they believed the investigator wanted them to respond. The sample was limited by size, selection bias, and the geographical boundaries of Colorado. Although Colorado residents come from schools across the country, they may share characteristics attracting them to Colorado, making findings potentially less applicable to programs in other states. Additionally, the sample consisted of only 34% of Colorado FM residents and demographic data were not collected to evaluate how well this sample represents the population.

Next Steps

Further research could evaluate the efficacy of this workshop when incorporated into required MSE, since a larger proportion of residents identified a need for increased supplement education in MSE than in GME. The workshop could also be expanded and evaluated in FMR programs in other states and in residency programs in other specialties.

Conclusions

Results suggest FM residents perceive a lack of adequate curricula on dietary supplements, believe curricula is most needed at the MSE level, and exhibit increased intentions to discuss supplements with patients following our workshop. Enhancing curricula to include content on supplements, such as engaging patients in shared decision making around supplement use, may be warranted. Further work is needed to examine the extent to which additional education, beyond this brief workshop, has an effect on physician knowledge and behavior, and patient-centered outcomes.

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