

## INSTRUCTIONAL DESIGN AND ASSESSMENT

### An Active-Learning Assignment Involving Peer-to-Peer Presentations to Improve Pharmacy Students' Attitudes and Knowledge of Dietary Supplements

Rabia S. Atayee, PharmD,<sup>a</sup> Renu F. Singh, PharmD,<sup>a</sup> Brookie M. Best, PharmD,<sup>a,b</sup> Beverley A. Freedman,<sup>a</sup> and Candis M. Morello, PharmD<sup>a,c</sup>

<sup>a</sup>Skaggs School of Pharmacy, University of California San Diego, La Jolla, CA

<sup>b</sup>San Diego School of Medicine, University of California San Diego, La Jolla, CA

<sup>c</sup>Veterans Affairs San Diego Healthcare System, San Diego, CA

Submitted January 6, 2012; accepted March 13, 2012; published August 10, 2012.

**Objective.** To design and implement a small-group self-guided active-learning format for a complementary and alternative medicine (CAM) curriculum, and assess changes in first-year doctor of pharmacy (PharmD) students' attitudes and knowledge of CAM.

**Design.** Students received an overview CAM lecture from a faculty member, and brief presentations with defined parameters on natural products from their peers.

**Assessment.** Based on pre- and post-intervention survey responses, the percentage of students who strongly agreed about the importance of CAM in pharmacy practice increased from 28% to 55% and the percentage of students who agreed or strongly agreed about the harmful effects of dietary supplements increased from 60% to 96%. Overall, students' attitude toward and self-assessed knowledge of dietary supplements improved significantly from pre- to post-intervention survey.

**Conclusion.** Small-group self-guided learning of CAM, followed by peer presentations on dietary supplements, was successful in significantly improving pharmacy students' attitude toward and knowledge of CAM.

**Keywords:** dietary supplements, complementary and alternative medicines, assessment, pharmacy education

## INTRODUCTION

The National Center for Complementary and Alternative Medicine defines CAM as healthcare and medical practices that are not an integral part of conventional medicine.<sup>1</sup> Over the last 2 decades, the use of CAM has significantly increased.<sup>2-4</sup> Dietary supplements (herbals, botanicals) are included in CAM therapy along with multivitamins, acupuncture, and yoga, among others. According to the Office of Dietary Supplements and National Institute of Health, the prevalence of dietary supplements and vitamin products use among US adults aged 20 years and older was estimated at 52% in 2000.<sup>5</sup> Health care practitioners must meet the challenge of providing guidance to the increasing number of patients using these alternative therapies. This responsibility usually lies within the scope of a pharmacist's practice. Because pharmacists are cited as the most accessible and trusted healthcare professionals,

patients and other healthcare practitioners often ask them for their advice related to dietary supplements.

Pharmacists have expressed concern about their ability to confidently respond to patient and practitioner inquiries about dietary supplements because of their lack of knowledge and training in this area.<sup>6-8</sup> In one study of US pharmacists, the majority agreed that additional training in dietary supplements was needed, as well as increased regulation of and quality of information on dietary supplements.<sup>6</sup> Both pharmacists and pharmacy students recognize the importance of their role in dietary supplement guidance and are advocates of including dietary supplement instruction in pharmacy curricula.<sup>9,10</sup> Pharmacy students also believe that their knowledge about herbal supplements is lacking and they desire more practice-based information about herbal supplements.<sup>11</sup> Many pharmacy colleges and schools are establishing structured curricula on dietary supplements to optimize student learning.<sup>11-13</sup> Lecture courses on dietary supplements have been positively correlated with improvements in students' knowledge of, attitudes toward, and perceptions about dietary supplements, as well as with increased confidence in their

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**Corresponding Author:** Rabia S. Atayee, PharmD, Skaggs School of Pharmacy, University of California San Diego, 9500 Gilman Drive, MC 0657, La Jolla, CA 92093. Tel: 858-822-3549. E-mail: ratayee@ucsd.edu

future competence as pharmacists and increased personal interest in dietary supplements.<sup>12-14</sup>

In another study, 55% of faculty members and 36% of students at a college of pharmacy felt that they had adequate training in herbals, yet 78% of faculty members and 73% of students desired additional training. Pharmacy students in this study cited the lack of high quality clinical trials as the main barrier to recommending dietary supplements.<sup>9</sup> Knowledge gained from a structured dietary supplements curriculum could better prepare future pharmacists to assist patients in safely using dietary supplements.

The importance of pharmacists having adequate training in dietary supplements has been acknowledged by several national pharmacy organizations. The Nonprescription Medicines Academy, which represents faculty members of self-care courses, recommends that vitamins, minerals, dietary supplements and herbal products be taught within a self-care curriculum using an evidence-based approach.<sup>15</sup> The North American Pharmacist Licensure Examination includes a competency statement on being able to recommend and provide information on dietary supplements to educate the public.<sup>16</sup> Key components include being able to recognize documented uses, adverse effects, and toxicities for dietary supplements.

The Accreditation Council for Pharmacy Education (ACPE) Standards and the Center for Advancement of Pharmacy Education (CAPE) education outcomes encourage both the use of active-learning techniques and increased knowledge of dietary supplements.<sup>17,18</sup> ACPE standards and guidelines for curricula leading to the doctor of pharmacy (PharmD) degree states that curricula “should encourage and assist students to assume responsibility for their own learning.”<sup>17</sup> Furthermore, the ACPE states that pharmacy college and schools should encourage “students to participate in the education of others, including patients, care givers, other students, and health care providers” in both the preclinical and clinical years.

At the University of California, San Diego (UCSD) Skaggs School of Pharmacy and Pharmaceutical Sciences (SSPPS), the first-year curriculum includes a pharmacy practice course that focuses on therapeutics of self-care diseases. Based on the ACPE Standards and CAPE Outcomes, the course co-chairs decided to provide additional opportunities for pharmacy students to engage in active learning and peer-to-peer presentations. Specifically, curricular content on alternative therapy practices, including dietary supplements (naturopathy, homeopathy, allopathy, acupuncture, dietary supplements, Chinese medicine, Ayurveda, Qigong) was included in a self-guided learning module with peer presentations for first-year pharmacy students (P1) in which student groups created presentations and then presented them to their peers. Faculty members

hypothesized that students’ participation in the active-learning assignment would result in increased knowledge and improved attitudes about dietary supplement use.

## DESIGN

The objective of the study was to determine whether a small-group self-guided peer presentation on dietary supplements would change students’ attitudes toward and improve their knowledge of dietary supplements. Supplements selected for the assignment were either listed in the required textbook<sup>19</sup> for the course or found from researching online literature sources that discussed commonly used dietary supplements in the United States.

The assignment was conducted in the first quarter of the required Pharmacy Practice course for P1 students. Nineteen groups, consisting of 3 students each, were assigned 1 dietary supplement to evaluate and present. Dietary supplements were selected based on a literature search of those commonly used in 2009: black cohosh, cinnamon, coenzyme Q10, cranberry, dehydroepiandrosterone (DHEA), echinacea, feverfew, fish oil, garlic, ginger, ginkgo biloba, ginseng, glucosamine/chondroitin, green tea, kava, melatonin, saw palmetto, St. John’s wort, and valerian. The learning objectives were reflected in the assignment, which was to: (1) list the active ingredient(s) of the dietary supplement; (2) identify common indications for use; (3) describe purported mechanisms of action; (4) describe the most frequent and/or serious adverse side effects and drug-drug interactions; (6) conclude whether they would recommend their dietary supplement to a patient; (7) list the dose(s) for indications discussed; (8) list counseling points; and (9) present a few fun facts about the assigned dietary supplement. As part of their assignment, students were asked to conduct a literature search, read the chapter section in the *American Pharmacists Association Handbook of Nonprescription Drugs*<sup>19</sup> that related to their dietary supplement, and review the Natural Medicines Database.<sup>20</sup> The assignment was given to each group and within each group the students could decide to work on the project as a whole or divide the work. Each student group was allotted 5 minutes of class time to give their presentation

One week prior to their presentations, all students attended a 50-minute lecture that included a brief overview of alternative medicine practices including dietary supplements (naturopathy, homeopathy, allopathy, acupuncture, dietary supplements, Chinese medicine, Ayurveda, Qigong); regulatory oversight of dietary supplements; basic evaluation of dietary supplement studies using an evidence-based approach; and reputable dietary supplement reference sources. The dietary supplement assignment was explained to the students and topics and groups

were assigned by course faculty members. The students were instructed to meet within their small groups to complete the assignment as well as practice their presentation. Students were given 6 weeks to prepare for the presentation, and were asked to e-mail a summary of their presentations, in table format, to the course chair 2 days prior to their presentation date. The course chair provided a summarized table of the dietary supplements that would be covered in the presentations to the students in the class. Students used this table to write notes during the presentations and as a reference for study purposes. The course chair advised students to use the summarized table as a pocket guide during their pharmacy intern experiences.

## EVALUATION AND ASSESSMENT

### Assignment

A grading rubric was used by faculty members to evaluate each presentation. Students were given the grading rubric in advance of the presentation. (Appendix 1). Sixty students (100%) completed the assignment. Presentation grades ranged from 80% to 90% (median grade was 90%).

### Pre- and Post-Intervention Survey

A 2-part survey instrument was developed to assess changes in students' attitude and knowledge of CAM. The survey instrument was developed by the course chairs and the faculty instructor, similar to the tools developed by Dutta and Evans.<sup>21,14</sup> The pre-survey instrument was administered during the first week of class, before the students had any exposure to alternative medicine or dietary supplement material. The same survey instrument was re-administered 1 week after the students completed their presentations. Part 1 of the survey instrument consisted of 13 items on knowledge and attitudes towards dietary supplements and asked students to select their comfort level using the following 5-point Likert scale: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree. The median score for each concept was used to compare pre- and post-assessment answers. The second part of the survey instrument consisted of questions based on 5 clinical cases that assessed knowledge related to indications for, adverse side effects of, and drug interactions associated with specific dietary supplements. Students were asked to select the best of 5 answers for each question. To minimize random guessing, one of the response options was "I don't know."

All completed survey instruments were coded and the data were entered into Microsoft Office Excel 2007. Quantitative data were summarized using descriptive statistics (medians and interquartile ranges). Wilcoxon signed-rank tests compared pre- vs. post-numerical survey responses and chi-square tests compared pre-

vs. post-categorical variables using STATA (STATA Corp LP, College Station, TX). Significance was set at  $p < 0.05$ . This project received approval from UCSD Human Research Protections Program and verbal consent was obtained from participating students.

Forty-seven of 60 students (78%) completed the pre- and post-survey instruments. The majority of respondents were female (74.5%), Asian (63.8%), and an average of 24 years of age (range 21-36 years) (Table 1).

On the pre-intervention survey instrument, most students agreed or strongly agreed that pharmacists should learn about complementary and alternative medicine, that such knowledge would be useful in their practice, and that dietary supplements can have harmful effects. Even though the median scores on these items were high on the pre-intervention survey, the median scores on the post-intervention survey significantly increased (Table 2). For example, the percentage of students' who responded "strongly agree" to the statement "knowledge of complementary and alternative medicine will be required in my future practice of pharmacy" increased from 28% to 55%. The percentage of students who responded "agree/strongly agree" to the statement "dietary supplement use can have harmful effects" increased from 60% to 96%.

Students' perception of their knowledge of dietary supplement use, mechanism of action, adverse effects, and drug-drug interactions improved significantly ( $p < 0.05$ ) from pre-intervention survey to post-intervention survey (Table 2). On the pre-intervention survey, the majority of students disagreed that they would be able to identify the common uses, mechanisms, side effects, or interactions

Table 1. Demographics of Students Who Completed a Self-Guided Peer-to-Peer Assignment on Complementary and Alternative Medicines

Characteristic, n = 47	No. (%)
Sex	
Male	12 (25.5)
Female	35 (74.5)
Age (years)	
Average	24
Range	21 – 36
Race	
White	13 (27.7)
Black or African American	2 (4.3)
Asian	30 (53.8)
Native Hawaiian/Pacific Islander	1 (2.1)
American Indian/Alaskan Native	0
Other	1 (2.1)
Ethnicity	
Hispanic or Latino	1 (2.1)
Not Hispanic or Latino	46 (97.9)

Table 2. Pharmacy Students Attitudes Toward Complementary and Alternative Medicines Before and After Completing a Self-Guided Peer-to-Peer Assignment

Question	Preintervention Survey, Median (IQR) <sup>a</sup>	Postintervention Survey, Median (IQR) <sup>a</sup>
A pharmacist should be aware of complementary and alternative medicine approaches in health care	5 (4, 5)	5 (4, 5) <sup>b</sup>
Knowledge about complementary and alternative medicine will be required in my future practice of pharmacy	4 (4,5)	5 (4, 5) <sup>b</sup>
Complementary and alternative medicine is an important aspect of my culture	4 (3, 4.5)	4 (3, 5)
I can identify common types of complementary and alternative medicine	3 (3, 4)	4 (4, 4) <sup>b</sup>
The use of dietary supplements can have harmful effects	4 (3, 4)	4 (4, 5) <sup>b</sup>
I can describe the common uses of several dietary supplements	3 (2, 4)	4 (3.5, 4) <sup>b</sup>
I can discuss the mechanism of action of several dietary supplements	2 (1.5, 2)	3 (3, 4) <sup>b</sup>
I can identify common drug-drug interactions of several dietary supplements	2 (1, 2)	4 (3, 4) <sup>b</sup>
I can recognize common adverse effects of several dietary supplements	2 (1, 2)	4 (3, 4) <sup>b</sup>

Abbreviations: IQR= interquartile (25<sup>th</sup>-75<sup>th</sup> percentile).

<sup>a</sup> Responses to questions were based on a Likert scale on which 1 = strongly disagree and 5 = strongly agree.

<sup>b</sup>  $p < 0.05$  compared to pre-survey.

of dietary supplements. After completion of the educational program, the majority of students agreed that they could identify this information.

The overall percentage of correct answers on the case-based questions increased threefold from pre- to post-intervention survey (24% to 74%,  $p < 0.001$ ) For each of the 5 specific case-based questions, the percentage of correct answers significantly increased from the pre-intervention to the post-intervention survey: 47% to 100%, 4% to 28%, 19% to 66%, 17% to 40%, and 13% to 83% ( $p < 0.05$  for each question). Median scores on attitude questions were not different between subjects who correctly or incorrectly answered the related case-based knowledge questions on the post-intervention survey.

## DISCUSSION

By implementing a self-guided peer-presentation teaching method, faculty members hypothesized that students' attitudes toward the use of dietary supplements and knowledge of the specific dietary supplements studied would improve. Students' attitudes changed from the pre-intervention survey to the post-intervention survey in all categories. In particular, students' opinions changed about the importance of a pharmacist having knowledge of dietary supplements in clinical practice, and understanding the harmful potential of dietary supplements used alone or in combination with other medications. Because the general population tends to categorize dietary supplements as "natural," believing that they are without adverse effects or drug interactions, having healthcare providers knowledgeable of pharmacologic outcomes and potential barriers is essential for medication safety. Pharmacists, who are on the front lines of providing medication therapy management

services and direct patient education, are optimally positioned to provide this information to patients.

Significant improvements were also realized in students' general knowledge regarding uses of, mechanisms for, and adverse events and drug interactions caused by dietary supplements. Making pharmacy students more aware of the common types of dietary supplements used by patients may prompt these future pharmacists to ask patients if they are combining dietary supplements with their conventional drug therapy. This provides the opportunity for further patient education and potential improvement in medication safety.

Using a case-based knowledge test also helped the faculty members evaluate how students assimilated and applied their newly acquired knowledge of dietary supplements. Based on the results, significant improvements were achieved using this method of evaluation. In addition, using this active-learning method increased students' awareness of dietary supplement therapy, as well as met the call for educating future pharmacists on these commonly used treatment modalities. Based on direct student feedback and responses on course evaluations, our students enjoyed this self-guided peer-presentation format. They seemed to enjoy using different learning strategies with their peers and working in a team, and were more engaged than when this lecture was presented in a traditional lecture format.

Other than setting time limits on student presentations, faculty members did not encounter any barriers in the implementation of this assignment and these teaching methods. This active-learning assignment could be easily implemented at other colleges and schools of pharmacy when teaching dietary supplements to pharmacy students and should have successful outcomes.

At our school, class size is limited to 60 students. In schools with large student populations, this assignment may be more difficult to organize, but could be remedied by having presentations on more than 1 day. However, increasing the size of the groups would not allow the students much time to practice their presentation skills, and reducing the presentation times below 5 minutes may not be realistic. For our course, 5 minutes allowed enough time to present the required information, while also allowing the students to practice communicating information in a concise way. Students also submitted a detailed, written summary of the contents of their presentation in the form of a summarized table provided by the course chairs. In future course offerings we will have students' include a summary of their literature search. Based on its success, course instructors plan to keep this innovative, interactive, peer-to-peer assignment current by identifying dietary supplements commonly used by the general population and covering different ones in the course each year. This teaching method could be adopted in teaching other subjects in the pharmacy curriculum such as nonprescription and prescription medications, as well as implemented into the curriculum of other health science curricula.

## SUMMARY

Small group self-guided learning of dietary supplements, followed by peer presentations, was successful in significantly improving students' attitudes towards, and knowledge of, dietary supplements. This format encouraged active participation and learning by students, while the defined parameters for the assignment aided them in focusing their searches in dietary supplement databases and in preparing their presentations.

## ACKNOWLEDGEMENT

The authors thank Andrew Ryan, PharmD, and the pharmacy students of the UCSD Skaggs School of Pharmacy and Pharmaceutical Sciences Class of 2013.

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Appendix 1. Dietary Supplement Grading Rubric

<b>Objective</b>	<b>Points</b>
Active ingredients	0.5
Top 2 indications	1 (0.5 for each indication)
Mechanism of action	0.5
Top 3 adverse side effect	3 (1 for each ADR)
Top 2 drug-drug interactions	1 (0.5 for each DDI)
Would you recommend this product?	2
Dose for recommended indication(s) if any	0.5
Top 3 counseling points	1.5 (0.5 for each counseling point)
<b>TOTAL</b>	<b>10 points</b>