INSTRUCTIONAL DESIGN AND ASSESSMENT

A Training Program for Pharmacy Students on Providing Diabetes Care

Supakit Wongwiwatthanakit, PharmD, PhD,^a Paula Zeszotarski, PhD,^a Anthony Thai, PharmD,^b RaeAnne Fuller, PharmD,^c Yaw Owusu, PharmD, MS,^a Candace Tan, PharmD,^a Lara Gomez, PharmD,^a and Scott Holuby, PharmD^d

^aDaniel K. Inouye College of Pharmacy, University of Hawaii at Hilo, Hilo, Hawaii

^bPhoenix VA Health Care System, Phoenix, Arizona

^cPhoenix Indian Medical Center, Phoenix, Arizona

^dBrooke Army Medical Center, San Antonio, Texas

Submitted January 2, 2013; accepted March 22, 2013; published September 12, 2013.

Objective. To compare second- and third-year pharmacy students' competence, attitudes, and self-confidence in providing diabetes care before and after completing a hand-on diabetes training program and to determine if the program had an impact on students' attitude and self-confidence based on their year in the curriculum.

Design. The program included classroom lectures and hands-on learning sessions in 5 facets of diabetes care. Pre- and post-test instruments measured students' competence, attitudes, and confidence in diabetes care.

Assessment. Students' competence and the mean overall confidence score significantly improved after completing the program, while mean overall attitude score did not. Third-year students had significantly higher confidence scores than did second-year students on both pre- and post-program tests. No significant difference was found for attitude scores between second- and third-year students.

Conclusion. The hands-on learning program was an effective approach to training pharmacy students in diabetes care, improving both their competence and confidence.

Keywords: diabetes, competence, confidence, attitude, training program

INTRODUCTION

Studies in the United States and abroad have found that improved glycemic control benefits people with diabetes and can result in a reduced risk of microvascular complications (retinopathy, nephropathy, neuropathy).¹ Pharmacists play a pivotal role in the healthcare team for managing diabetes and have the skills to become diabetes educators.^{2,3} However, despite that pharmacists are most often the last line of contact between the patient and the medication, they remain an underused resource in the management of chronic diseases. Pharmacists have the knowledge, attitudes, skills, and capacity to improve glycemic control, increase medication effectiveness, improve patient adherence, and minimize adverse drug effects.³⁻⁷

Providing diabetes education workshops to pharmacy students before their clinical practice experiences

allows students to integrate knowledge obtained in the classroom with practice skills. If pharmacists have the knowledge base but little or no self-confidence, predictably, they will be poor practitioners because they will not transmit and/or use their knowledge and skills for the good of the patient.⁸ Alternatively, practitioners with little knowledge but much confidence may pose a definite threat to those they attempt to serve. The result would be a stagnation of professional performance that never achieves the profession's ultimate goal of delivering patient care. Maximizing the profession's contribution to society in its mission to deliver pharmaceutical care requires developing and balancing practitioners' knowledge, skills, and self-confidence.

Colleges and schools of pharmacy recognize the importance of preparing pharmacy students to master the knowledge and skills necessary to provide diabetes care and education. This goal fits into Standards 11 and 12 of the Accreditation Council for Pharmacy Education,⁹ which are in alignment with the educational outcomes promulgated by the Center for the Advancement of Pharmacy Education.¹⁰ These standards emphasize that the curriculum must foster active-learning strategies to enable

Corresponding Author: Supakit Wongwiwatthanakit, PharmD, PhD, Department of Pharmacy Practice, Daniel K. Inouye College of Pharmacy, University of Hawaii at Hilo, 34 Rainbow Drive, Hilo, HI 96720. Tel: 808-933-2947. Fax: 808-933-2974. E-mail: supakit@hawaii.edu

students to transition from dependent to active, self-directed, lifelong learners in providing patient-centered care and promoting health improvement, wellness, and disease prevention. A few studies have examined the impact of diabetes education modules on pharmacists' confidence, attitudes, and competence. Practicing pharmacists who responded to the Diabetes Attitude Scale showed positive attitudes toward team care, special training, and control/complications factors.² In pre- and post-intervention assessments of the efficacy of diabetes continuing education programs for licensed pharmacists, participants' knowledge of the disease state and positive attitude toward diabetes care increased significantly after completion of the program.^{11,12}

Colleges and schools of pharmacy have developed unique instructional methods to provide enhanced learning experiences to students about diabetes mellitus. These have included a diabetes certificate program integrated into a 2-year elective course for third- and fourth-year students¹³; a multistation, skills-based laboratory for second-year students¹⁴; a 2-week lecture, Web-based case evaluation, and role-play for third-year students¹⁵; a 1-credit semester-long elective including a 1-week simulation for second- and third-year students¹⁶; a week-long living-with-diabetes simulation during a clinical assessment course for third-year students¹⁷; and an American Pharmacists Association/American Association of Diabetes Educators diabetes certificate program integrated longitudinally into the third-year pharmacy curriculum.¹⁸ These instructional methods improved knowledge, competence, attitudes, and/or confidence in providing diabetes.

The instruments used in these studies were either faculty-developed instruments or existing published instruments, such as the Diabetes Attitude Survey (DAS). However, few studies have reported the internal consistency reliabilities of the instruments used in collecting data, which may influence the power of the study to detect any significance, the outcome data collected, and the ability to draw rational conclusions from the data. While several instructional methods have displayed positive results on students' outcomes, they may not be feasible and practical to implement in the programs of newly established colleges and schools because of significant limitations in time and resources. Thus, a simple, practical, and effective instructional method is needed.

The objectives of this study were to: (1) compare the competence, attitudes, and self-confidence scores of pharmacy students in providing diabetes care before and after completing the diabetes training program, and (2) to determine if there was a difference between second- and third-year pharmacy students' attitudes towards diabetes and their self-confidence in providing diabetes

care. No study has explored whether the effect of the program on students' scores relating to their attitudes toward diabetes and to their self-confidence in providing diabetes care vary at different points/stages in the doctor of pharmacy (PharmD) curriculum. This information is important in determining where in the curriculum the diabetes training best fits. Such tangible evidence could be used to guide how colleges and schools of pharmacy develop and foster students' attitudes toward diabetes and their self-confidence in providing diabetes care during their education, thereby increasing the likelihood that they will provide patient-centered care as professionals.

DESIGN

At the Daniel K. Inouye College of Pharmacy University of Hawaii at Hilo, second- and third-year pharmacy students participated in the diabetes training program as a component of their Integrated Therapeutics course. The program consisted of 10-hour classroom lectures on diabetes (ie, pedagogy for formal knowledge and conceptual understanding), after which students participated in a hands-on, 4-hour workshop consisting of stations directed toward certain aspects of diabetes management (ie, pedagogy of practice, performance, and improvement). The second- and third-year pharmacy students received diabetes lectures during the same semester (ie, fall semester) of their respective curriculum years. For the third-year students, it was a part of the Integrated Therapeutics III course, according to the original plan of the curriculum, and for the second-year students, the Integrated Therapeutics I course. The curriculum had been revised to offer diabetes lectures to the second-year students and future cohorts instead of the third-year students. This revision was made to better prepare the second-year students for ambulatory introduction to pharmacy practice experiences (IPPEs), where the predominant conditions they encountered were hypertension, diabetes, and dyslipidemia. Students in the 2 classes did not attend the diabetes lectures and the diabetes training program at the same time; instead, they were scheduled 1 week apart for the respective courses. Following the lecture portion, students in each year participated in a diabetes training workshop that consisted of rotating through stations, as described in Table 1.

Two faculty members in the department of pharmacy practice, including a certified diabetes educator (CDE), designed and implemented the diabetes training program. Three faculty members in the department, 2 volunteer certified nurse diabetes educators from Hilo Medical Center and 1 drug representative, acted as instructors for stations during the workshop (ie, 1 faculty member

Table 1. Station Activities Performed by Second- and Third-Year Pharmacy Students in a Diabetes Training Program

Blood glucose station
Reviewed normal and diabetic blood glucose levels
Performed an individual blood glucose check
Administering insulin station
Reviewed proper injection sites and technique
Performed an insulin (saline) self-injection
Diabetic foot examination station
Performed a comprehensive foot examination on a fellow student using a monofilament
Role played pharmacist/patient counseling points on proper foot care
Insulin delivery devices (pen, syringe) education station
Reviewed on the preparation, administration, mixing and storage of insulin
Performed injections with insulin pens into a pad
Examined a variety of insulin injection devices
A1c screening station
Reviewed normal and diabetic A1c levels
Were briefed on importance of A1c monitoring

each for the blood glucose station, administration insulin station, and A1C screening station; 2 nurse CDEs for the diabetic foot examination station; and 1 drug representative for the insulin delivery education station). The training would help foster early clinical immersion in the IPPEs as well as a continuous connection of formal classroom knowledge and conceptual understanding from the first through third years to the advanced pharmacy practice experiences (APPEs) in the fourth year. At the workshop for each class, students were randomly divided into 5 groups of approximately 18 students. Each group spent approximately 20 to 30 minutes at each station before rotating to the next assigned station. Instructional and active-learning methods used in the delivery of the training program for each station were combinations of instructor-led modeling, role-playing, self-performed/practiced skills, small-group discussion, and station instructor observation of students' performance.

At the blood glucose station, the instructor reviewed the basic glucose checking technique with students. Students were also shown how to calibrate a glucometer as well as the specific steps in taking an accurate blood glucose reading. The instructor then reviewed blood glucose goal levels for diabetics, and students were given time to conduct their own blood glucose check. Students were either paired up with a classmate or assigned to perform the glucose check on their own finger using the proper technique. Based on their glucose reading, students were asked to interpret the levels and were provided with feedback from the station instructor. At the end

of the station, the instructor signed off on the students' worksheets if they showed that they could independently check someone's blood glucose using proper technique and if they demonstrated a basic understanding of glucose values.

Prior to attending the workshop, students were told that they would be either self-injecting or injecting another student with normal saline. The goal was for students to experience what it is like to be injected with a needle or to inject someone else with a needle. At this station, students were given a short review on how to properly inject insulin as well as selecting appropriate needle sizes. The station instructor also reviewed proper injection sites, technique, and how to draw insulin and monitoring for signs and symptoms of hypoglycemia. Students chose whether they wanted to self-inject with saline or take turns with another student injecting each other. Each student independently performed the task of injecting insulin and demonstrated proper technique. If the students' performance was satisfactory, the instructor would sign the students' worksheet.

At the foot examination station, nurse CDEs from Hilo Medical Center instructed the class on how to properly perform a foot examination. The nurses gave instructions on how to use a monofilament sensory testing device and record the readings. Students in this station were paired off for role-playing as patients and pharmacists conducting a foot examination and the roles were then reversed. Each pair was observed by a nurse and given immediate feedback on proper technique. Students in the role of a pharmacist had to provide proper foot care education to the patient.

The goal of the insulin delivery device education station was to familiarize students with the different types of insulin pens and syringes available to patients with diabetes. The instructor at this station provided students with an assortment of insulin pens, and students used injection pads to mimic injecting someone with an insulin device. They also reviewed how to properly use an insulin pen and the correct storage, preparation, administration, and mixing of insulin.

At the next station, an instructor reviewed the importance of A1c, how to interpret A1c readings, and the correlation of A1c to average glucose based on the International Expert Committee Report on the importance of the A1c.¹⁹ Students were verbally quizzed on target A1c levels for diabetic individuals and what level should be used to properly identify someone with diabetes. At the conclusion of the station, the instructor signed the students' worksheets if they had demonstrated satisfactory understanding and interpreting of A1c. The American Diabetes Association 2010 clinical

update, which now recommends using A1c levels for the diagnosis of diabetes,^{20,21} was released after this study concluded.

EVALUATION AND ASSESSMENT

Assessment of the diabetes training program included 3 areas: competence, attitudes, and self-confidence in providing diabetes care. Student competence was assessed before and after students' completion of the training program. Preintervention competence was assessed by student self-evaluation. Students were asked to respond yes or no regarding their ability to perform each task at each station independently and correctly. Postintervention competence was measured after each task at each station using performance-based assessment. An instructor at each station observed how students performed skills, either in pairs or on an individual basis, and then signed the students' worksheets if they had adequately demonstrated competence in the skill assessed at that particular station. In this study, competence was defined as a student's ability to perform skills and interpretations well, independently, and rarely with assistance or guidance from the instructor. The station instructor observed, provided feedback, and suggested changes to improve the students' competence and performance. Students were required to repeat the station exercises until they achieved proficiency before rotating to the next assigned station.

Students completed questionnaires related to self-confidence in diabetes care and attitudes about diabetes before and after completing the diabetes training program. Each instrument contained 15 items assessing students' confidence as well as their attitudes toward providing diabetes care. Students were also assessed as being competent or not competent as they completed each station. Prior to starting the survey, students were asked to create a 4-digit code that would enable the instructors to match their pre- and post-intervention test scores and ensure that student responses remained anonymous.

For the self-confidence instrument, students ranked their self-confidence on a 5-point scale on which 1 = not at all confident, 3 = moderately confident, and 5 = completely confident. A pre- and post-intervention test design allowed for a comparison of each student's level of confidence before and after the diabetes training program. The self-confidence instrument used in this study was based on an existing instrument¹² and literature review.^{2,3,7-15} Four clinical faculty members from the Pharmacy Practice Department were asked to constitute an internal expert content panel to review for content, grammatical correctness, organization, readability, and clarity. They were also asked to share/suggest any additional items that were germane to self-confidence in providing diabetes care. The

instrument was then pretested with 5 pharmacy students for clarity and understandability. This process resulted in a 15-item instrument.

The attitude instrument included 14 items from the 33-item DAS,²² which covered 5 subscales: need for special training, seriousness of type 2 diabetes, psychosocial impact of diabetes, value of tight glucose control, and patient autonomy. One item relating to pharmacists' beliefs was added to the instrument, resulting in a 15-item attitude instrument. In response to each instrument item, students were asked to choose 1 of the 5 response options: 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree. We selected a subset of 14 items instead of using all 33 items of the DAS because of concerns about the feasibility of the instrument in terms of the students' accuracy in reporting their attitudes. The DAS had too many questions to assess, took a long time to complete, and some items were not applicable to tasks performed in the diabetes training program or to pharmacy students (eg, some items related to nurses and dietitians).

The 15-item attitude instrument was reviewed by 4 clinical faculty members of the Pharmacy Practice Department and went through the same review process as used for the self-confidence instrument to reflect the attitudes students were expected to gain from the diabetes training program. Students were asked to rate their level of satisfaction with the program on a 5-point scale on which 1 = poor, 2 = fair, 3 = good, 4 = very good, and 5 = excellent. The preintervention assessment of student satisfaction was based on the program briefing. Students were told they would be participating in a hands-on training workshop to develop each of the skills taught at the diabetes stations. Post-intervention test for satisfaction was assessed at the conclusion of the program.

Descriptive statistics were calculated for all relevant variables, including students' demographic data. A paired *t* test was performed to compare each item and overall pre- and post-intervention test scores for self-confidence and attitudes before and after the diabetes training program. An internal consistency reliability coefficient (ie, Cronbach coefficient alpha) was calculated for the instruments assessing attitudes toward diabetes and self-confidence in providing diabetes care. Two-way ANOVA with repeated measures on one factor (2-way mixed ANOVA) was used to analyze whether the effect of the diabetes training program on students' scores for attitudes toward diabetes and for self-confidence in providing diabetes care varied for students in different curriculum years. All statistical analyses were performed using the SPSS for Windows (version 17.0). Level of significance for all analyses was set at an alpha equal to 0.05.

Table 2 shows student demographic data. While most of the 175 participants (85 in the third year and 90 in the second year) completed both the self-confidence and diabetes attitude instruments, only 87 students provided valid 4-digit codes on their pre- and post-intervention tests. Class demographic statistics for the second- and third-year students showed that approximately 41% and 39% were male, and 59% and 61% were female, respectively. The mean (SD) ages of second- and third-year students were 26.5 years (4.6) and 28 years (4.7), respectively. Percentages of students with a prior college degree were 74% and 71%, respectively. Nonresponse bias was checked for these variables and the results showed no significant difference between the students who provided valid responses and the statistics for each class ($p>0.05$), except for the second-year students' gender variable. Thus, students who provided valid responses were relatively similar to and representative of all second- and third-year students.

Of the 87 students who provided valid 4-digit codes on their pre- and post-intervention tests, 38 were third-year students and 49 were second-year students. Fifty-six (64%) of the students were female and 31 (35.6%) were male. The majority were Asian-American or Caucasian. Thirty-eight (100%) of the third-year students were doing a hospital IPPE and had already completed an ambulatory care clinic IPPE in the previous year. Half of second-year students were doing a long-term care IPPE and the other half were doing an ambulatory care clinic IPPE. The time since the last practice experience varied. Twenty-six (68%) of third-year students and 37 (76%) of second-year students had a prior college degree. In both classes, approximately two-thirds of students reported having friends or family members with diabetes. Twenty-four (63%) third-year students had prior diabetes training compared with 26 (53%) second-year students.

The results of the students' competence tests are reported in Table 3. Students passed if they could

Table 2. Demographic Characteristics of Second- and Third-Year Pharmacy Students Participating in a Diabetes Training Program

Characteristics	Third-Year Students, N=38	Second-Year Students, N=49	Both Classes, N=87
Gender, No. (%)			
Male	15 (39.5)	16 (32.7)	31 (35.6)
Female	23 (60.5)	33 (67.3)	56 (64.4)
Age, y			
Mean (SD)	28.3 (4.8)	26.6 (3.0)	27.6 (3.9)
Range (min-max)	23-50	22-39	22-50
Ethnicity, No. (%)			
African-American	0	0	0
Asian-American	15 (39.5)	31 (63.3)	46 (52.9)
Caucasian	13 (34.2)	11 (22.4)	24 (27.6)
Hispanic	2 (5.3)	1 (2.1)	3 (3.4)
Native American/Alaska Native	0	1 (2.1)	1 (1.1)
International (non-USA)	2 (5.3)	0	2 (2.3)
Hawaiian/Pacific Islander	3 (7.9)	4 (8.2)	7 (8.1)
Other	2 (5.3)	1 (2.1)	3 (3.4)
Last completed practice experience, No. (%)			
Long-term care	0	23 (46.9)	23 (26.4)
Clinic	0	26 (53.1)	26 (29.9)
Hospital	38 (100)	0	38 (43.4)
Community	0	0	0
Time since last practice experience, No. (%)			
Less than 1 week	0	28 (57.1)	28 (32.2)
2-3 weeks	17 (44.7)	10 (20.4)	27 (31.1)
1-2 months	4 (10.6)	7 (14.3)	11 (22.4)
More than 2 months	17 (44.7)	4 (8.2)	21 (42.9)
Prior college degree, No. (%)	26 (68.4)	37 (75.5)	63 (72.4)
Participants with a diabetic family member or friend, No. (%)	25 (65.8)	33 (67.3)	58 (66.7)
Prior diabetes training, No. (%)	24 (63.2)	26 (53.1)	50 (57.5)

competently demonstrate the skill addressed by each station. Appointed instructors evaluated every student who participated. Upon completion of the diabetes training program, 100% of the students were considered to have the necessary skills to competently perform each task. Table 4 shows the results of the self-confidence pre- and post-intervention tests. Cronbach alpha reliability for the pre- and post-intervention self-confidence instruments was above 0.9 for both classes. Overall, students were more confident on all items measured on the pre-intervention test. For third-year students, the mean total self-confidence scores were 2.7 ± 0.8 on the pre-intervention test and 4.2 ± 0.7 on the post-intervention ($p < 0.0001$). For the second-year students, the total self-confidence mean score was 1.9 ± 0.9 and the mean score on the post-intervention test was 4.0 ± 0.7 , ($p < 0.001$). Compared with third-year students, second-year students showed a greater increase in confidence after completing the diabetes training program.

Scores for self-confidence in providing diabetes care for the second and third-year students were compared to see whether there was significant difference between classes. The overall mean self-confidence score (Table 4) significantly improved after the training program for both classes ($p < 0.001$), but students in the third-year scored significantly higher ($p < 0.001$) than did those in the second-year on both the pre- and post-intervention tests for self-confidence. The effect of the pre- and post-intervention diabetes training program on students' self-confidence scores was significantly different between the 2 classes ($p = 0.001$).

The scores for attitude in providing diabetes care for the second- and third-year students were compared between class years (Table 5). The overall mean attitude score (Table 5) did not change significantly for either class (third-year students $p = 0.166$, second-year students

$p = 0.124$). Two-way mixed ANOVA revealed no significant interaction effect ($p = 0.965$) and main effect for class ($p = 0.342$). However, there was a significant main effect of the scores for the pre- and post-intervention attitude tests ($p = 0.039$). Cronbach alpha reliability for the pre- and post-intervention attitude instruments was above 0.7 for both classes.

The level of pharmacy students' satisfaction was also measured using a rating scale on which 1=poor, 2=fair, 3=good, 4=very good, and 5=excellent. Overall, students were satisfied with the diabetes training program (Table 6).

DISCUSSION

This study assessed the competence, self-confidence, and attitude of pharmacy students regarding providing diabetes care. A hands-on training program was added to the students' classroom lecture in diabetes. Previous studies have examined the benefit of active-learning in increasing the understanding of classroom material and providing students a way to apply it to real-life situations.^{14-18,23} These results, which were similar to ours, showed that providing supplementary courses and practice increases students' overall knowledge and confidence in performing practical skills. To our knowledge, this is the first study to determine that the effect of the diabetes training program on pharmacy students' self-confidence and attitudes toward diabetes care was different among students depending on their year in the curriculum.

Our study found that students in the third year had higher scores than those in the second-year on both the pre-and post-intervention tests of self-confidence ($p < 0.001$). This difference in self-confidence scores may have been attributable to third-year pharmacy students having had more experience in clinical practice experiences (ie, IPPEs) than second-year students. Third-year students also had completed more of the curriculum's classroom courses and thus, may have gained knowledge and experience in other disease states, which may have been an additional benefit. Results (Table 2) also show that more of the third-year students had prior diabetes training compared with the second-year students (63% vs 53%, respectively). Other research has identified age, grade-point average, and community service/volunteerism as variables that affect pharmacy student self-confidence levels. These variables are significant predictors of self-confidence ($p < 0.05$).⁸ Although no significant interaction effect and main effect for class year were found for attitudes toward diabetes, there was a significant main effect of the pre- and post-intervention test of diabetes attitude scores for class year.

Table 3. Comparison of Pharmacy Student Competence in Diabetes Care Management Before and After Completing a Diabetes Training Program (N = 175)

Component	Students Providing Correct Response, %	
	Pre-intervention (N=175)	Post-intervention (N=175)
Blood glucose check	30	100
Administration of insulin	15	100
Diabetic foot examination	10	100
Insulin pen devices	20	100
A1c screening	25	100

Table 4. Pharmacy Students' Self-Confidence Assessed Before and After Completing a Diabetes Training Program^a

I am confident in my ability to . . .	Third-Year Students (N=38)			Second-Year Students (N=49)		
	Preintervention, Mean (SD)	Postintervention Mean (SD)	P ^b	Preintervention Mean (SD)	Postintervention Mean (SD)	P ^b
Educate patients regarding self-management of diabetes	2.8 (0.9)	4.2 (0.8)	<0.001 ^c	2.1 (0.9)	3.9 (0.8)	<0.001 ^c
Create a patient-specific regimen for a patient with Type 2 diabetes	2.4 (0.9)	4.1 (0.8)	<0.001 ^c	1.6 (0.9)	3.7 (0.8)	<0.001 ^c
Explain the basis of nutrition as a therapeutic modality for the treatment of diabetes	2.9 (0.9)	4.1 (0.8)	<0.001 ^c	2.3 (1.1)	4.1 (0.8)	<0.001 ^c
Explain the basis of exercise as a therapeutic modality for the treatment of diabetes	3.2 (1.0)	4.2 (0.8)	<0.001 ^c	2.4 (1.3)	4.2 (0.8)	<0.001 ^c
Explain the differences of glucose meters for self-monitoring of blood glucose	2.9 (1.2)	4 (1.0)	<0.001 ^c	1.8 (1.1)	3.8 (1.1)	<0.001 ^c
Appropriately teach a patient with diabetes how to use a blood glucose meter	3.3 (1.1)	4.4 (0.9)	<0.001 ^c	2.3 (1.4)	4.4 (0.8)	<0.001 ^c
Interpret fingerstick glucose readings sufficiently to recommend changes in insulin dosing	2.6 (1.1)	4.2 (1.1)	<0.001 ^c	1.8 (1.2)	4.2 (0.8)	<0.001 ^c
Appropriately select a patient who meets the criteria for intensive insulin therapy use	2.2 (0.9)	3.9 (0.9)	<0.001 ^c	1.5 (0.9)	3.8 (1.0)	<0.001 ^c
Identify the goals of glucose control for patients with diabetes as recommended by the ADA	2.8 (1.2)	4.4 (0.7)	<0.001 ^c	1.9 (1.2)	4.4 (0.8)	<0.001 ^c
Appropriately identify patients at risk for development of diabetes and know how and when to perform screening tests	2.9 (1.1)	4.3 (0.8)	<0.001 ^c	1.9 (0.9)	4.1 (0.9)	<0.001 ^c
Appropriately initiate insulin therapy in a patient with diabetes	2.1 (0.9)	3.9 (0.9)	<0.001 ^c	1.5 (0.9)	3.9(0.8)	<0.001 ^c
Explain the rationale for selecting different medication regimen for diabetes	2.3 (1.1)	4.2 (0.9)	<0.001 ^c	1.5 (0.9)	3.9 (0.8)	<0.001 ^c
Appropriately use HbA1c measurements as an assessment of a patient's risk for developing long-term complications from diabetes	2.8 (1.1)	4.4 (0.8)	<0.001 ^c	2.2 (1.2)	4.2 (0.8)	<0.001 ^c
Design a monitoring plan to assess medication safety and efficacy in patients with diabetes	2.6 (0.9)	4.3 (0.6)	<0.001 ^c	1.6 (0.9)	3.9 (0.8)	<0.001 ^c
Comprehensively provide professional pharmacy services to a patient with diabetes	2.6 (1.1)	4.3 (0.8)	<0.001 ^c	1.6 (1.1)	3.9 (0.8)	<0.001 ^c
Total self-confidence score	2.7 (0.8)	4.2 (0.7)	<0.001 ^c	1.9 (0.9)	4.0 (0.7)	<0.001 ^c

Abbreviation: ADA=American Diabetes Association.

^a 5-point rating scale: 1=not at all confident; 3=moderately confident; 5=completely confident The higher the students' score from the self-confidence instrument, the more confidence they felt in the statements.^b Paired *t* test used for preintervention vs postintervention test scores; significance set at $\alpha \leq 0.05$.^c $P < 0.05$.

Table 5. Pharmacy Students' Diabetes Attitude Assessed Before and After Completing a Diabetes Training Program^a

I believe that...	Third-Year Students (N = 38)			Second-Year Students (N = 49)		
	Preintervention Mean (SD)	Postintervention Mean (SD)	P ^b	Preintervention Mean (SD)	Postintervention Mean (SD)	P ^b
Need for special training						
Healthcare professionals who treat people with diabetes should be trained to communicate well with their patients	1.5 (1.0)	1.2 (0.8)	0.118	1.2 (0.5)	1.2 (0.6)	0.766
Healthcare professionals should be taught how daily diabetes care affects patients' lives	1.4 (0.9)	1.3 (0.8)	0.413	1.3 (0.5)	1.2 (0.7)	0.341
It is important for the healthcare professionals who teach patients with diabetes to learn counseling skills	1.6 (1.0)	1.3 (0.8)	0.073	1.6 (0.9)	1.3 (0.8)	0.005 ^c
Healthcare professionals should learn how to set goals with patients, not just tell them what to do	1.5 (0.9)	1.4 (0.9)	0.373	1.4 (0.7)	1.2 (0.5)	0.159
Seriousness of Type 2 diabetes						
Blood sugar testing is not needed for people with Type 2 diabetes	1.8 (1.4)	2.1 (1.6)	0.443	1.5 (0.8)	1.8 (1.3)	0.234
Type 2 diabetes is a very serious disease	1.5 (1.2)	1.3 (0.9)	0.242	1.3 (0.5)	1.3 (0.7)	0.518
People who take diabetes pills should be concerned about their blood sugar as people who take insulin	1.7 (1.1)	1.5 (0.9)	0.228	1.4 (0.6)	1.3 (0.6)	0.118
Psychosocial impact of diabetes						
Diabetes affects almost every part of a diabetic person's life	1.4 (0.9)	1.2 (0.8)	0.169	1.4 (0.6)	1.3 (0.8)	0.417
Value of tight glucose control						
There is not much use in trying to have good blood sugar control because the complications of diabetes will happen anyway	2.1 (1.6)	2.6 (1.8)	0.092	1.6 (1.1)	1.9 (1.6)	0.127
Almost everyone with diabetes should do whatever it takes to keep their blood sugar close to normal	1.8 (1.0)	1.6 (1.1)	0.186	1.8 (0.9)	1.6 (0.9)	0.118
Patient autonomy						
Healthcare professional should help patients make informed choices about their care plans	1.5 (1.0)	1.3 (0.9)	0.090	1.2 (0.4)	1.2 (0.6)	0.411
The person with diabetes is the most important member of the diabetes care team	1.6 (1.0)	1.4 (0.9)	0.048 ^c	1.8 (0.9)	1.4 (0.7)	0.002 ^c
People with diabetes should learn a lot about the disease so that they can be in charge of their own diabetes care	1.5 (1.1)	1.4 (0.9)	0.183	1.3 (0.6)	1.2 (0.7)	0.636
What the patient does has more effect on the outcome of diabetes care than anything a health professional does	1.6 (1.1)	1.4 (0.8)	0.083	1.6 (0.9)	1.4 (0.8)	0.044 ^c
Pharmacists' belief						
Pharmacists have sufficient skills and training to become diabetes educators	1.7 (1.1)	1.4 (0.8)	0.048 ^c	1.8 (1.0)	1.4 (0.7)	0.009 ^c
Total Diabetes Attitude Score	1.6 (0.9)	1.5 (0.8)	0.166	1.5 (0.3)	1.4 (0.5)	0.124

^a 5-point rating scale: 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree. Higher scores indicated that they disagree; lower scores indicated agreement.^b Paired t test used for preintervention vs postintervention test scores; significance set at $\alpha \leq 0.05$.^c $P < 0.05$.

Table 6. Pharmacy Students' Level of Satisfaction with the Diabetes Training Program (N = 87)

Item	Third-Year Students (N = 38)		Second-Year Students (N = 49)	
	Preintervention	Postintervention	Preintervention	Postintervention
Rate the level of satisfaction regarding the diabetes education program ^a , mean (SD)	2.7 (0.8)	4.5 (0.6)	2.4 (0.9)	4.1 (0.8)
Would you recommend this diabetes education program				
Yes, %	63.2 ^b	97.4 ^c	63.3 ^d	98
No, %	10.5	0	28.6	2.0

^a 5-point rating scale: 1=poor, 2=fair, 3=good, 4=very good, 5=excellent.

^b 10 participants did not respond to this question.

^c 1 participant did not respond to this question.

^d 4 participants did not respond to this question.

Our study showed that the diabetes training program, which included lectures and hands-on activities, can be used to significantly improve the competence and self-confidence of pharmacy students in diabetes care. Students were more confident in all items measured. Third-year students showed more of an increase in confidence than did second-year students, a difference that could be attributed to the third-year students having learned and gained more knowledge and experiences from the diabetes training program, classroom curriculum, and IPPEs compared with second-year students. The results support the theory that self-confidence can be easily developed in a short timeframe but that developing and instilling a positive attitude may require more time, effort, and determination.²⁴⁻²⁷ It is crucial not to have unrealistic expectations for rapid change because attitudes are formed over a lifetime through the process of socialization.^{24,25} This socialization process affects not only attitude toward work but also related behavior. We believe that this process can be developed and fostered in academic programs through hands-on training, classroom and experiential programs, and extracurricular activities (eg, professional organization, community services, health fairs).

A college or school of pharmacy can design and/or adopt specific instructional methods (eg, Bandura's sources of self-confidence/efficacy,²⁶ the Attention, Relevance, Confidence, and Satisfaction [ARCS] model,²⁷ cultivating intellectual confidence²⁸) to assist students in developing or balancing their level of confidence. Bandura proposed that a person's perception of self-confidence is dynamic and developed in response to cognitive processing of information from 4 sources that influence how an individual judges his/her capability²⁶: (1) performance accomplishment; (2) vicarious observation (ie, observing another person's performance of a behavior); (3) verbal/social persuasion; and (4) physiological/psychological

states (ie, emotional arousal such as anxiety, stress, fatigue). Of these, performance accomplishment is the most influential source of confidence and efficacy information because it is based on actual mastery experiences. This information corresponds with the primary goal of the diabetes training program, which provided hands-on learning sessions to students. Additionally, confidence in the ARCS model refers to how the student perceives his/her likelihood of achieving success through personal efforts and control.²⁷ The 3 confidence subcategories are: (1) learning requirements (ie, developing a positive expectation for success); (2) success opportunities (ie, supporting or enhancing student's belief in his/her competence); and (3) personal responsibility (ie, establishing student's effort and ability as his/her basis for success). Many motivational strategies are available to develop the student's confidence for each subcategory.²⁷

There are potential limitations to our study. With respect to student competence, our assessment did not use score rubrics to evaluate student performance. We believe that rubrics can restrict students' learning and imagination in that they will feel that they need to complete station exercises strictly according to the rubric rather than taking the initiative to explore their learning with the station instructor. Additionally, because of the limited number of faculty members available and the amount of time required to use rubrics, we instead had each station instructor provide feedback and suggest changes to improve the students' performance. As a result, student competence ratings may have been more subjective and dependent on individual station instructors' expertise and skills.

The difference in direction of the ranking scores on the self-confidence and attitude survey instruments may have confused some students and impacted the accuracy of student responses, however, the investigators emphasized this difference in scales to the whole class before

the students responded to the survey instrument. The diabetes workshop was resource-intensive and time-consuming for both faculty members and students. Students had to complete not only the pre- and post-intervention instruments for assessment of self-confidence and attitude but also the demographic data and satisfaction survey instruments. With so many instruments to complete, students can become frustrated and disengaged, potentially resulting in superficial and haphazard answers.

Additionally, the reliability coefficient (Cronbach alpha) was high and indicated reliable data/scores obtained from these instruments.²⁹ Results indicated strong support and good internal consistency reliabilities for the self-confidence and attitude instruments. Another explanation is that attitudes toward diabetes care may require more time to develop and instill in pharmacy students.^{17,25} We also believe the methods used to assess the students' self-confidence and attitudes were effective. The pre- and post-intervention survey allowed students to evaluate their skills before and after taking part in the diabetes training program and post-intervention scores showed significant improvement in students' self-confidence. Overall, the students seemed to enjoy taking part in the training program and their self-confidence and competence increased. The diabetes training program which included hands-on learning sessions that helped in developing and fostering physical/psychomotor skills, allowed students to gain experience in areas that cannot be covered in classroom lectures because of time constraints.

SUMMARY

A hands-on diabetes training program as an adjunct to the classroom course is an effective means of instilling self-confidence and competence in pharmacy students in both the second and third years of their pharmacy education. Students' scores in competence and self-confidence in diabetes care improved. Third-year students scored higher than second-year students in both the pre- and post-intervention tests for self-confidence and attitude. This diabetes training program emphasizing hands-on learning was an effective approach to improving pharmacy students' competence and self-confidence in providing diabetes care.

REFERENCES

1. Centers for Disease Control and Prevention. National diabetes fact sheet: national estimates and general information on diabetes and prediabetes in the United States, 2011. Atlanta, GA: U.S. Department of Health and Human Services. <http://www.cdc.gov/diabetes/pubs/factsheet11.htm>. Accessed April 14, 2011.
2. Schapansky LM, Johnson JA. Pharmacists' attitudes toward diabetes. *J Am Pharm Assoc*. 2000;40(4):371-377.
3. Younis WY, Campbell S, Slack MK. Pharmacists' attitude toward diabetes and their involvement in diabetes education. *Ann Pharmacother*. 2001;35(4):841-845.
4. Cranor CW, Bunting BA, Christensen DB. The Asheville Project: long-term clinical and economic outcomes of a community pharmacy diabetes care program. *J Am Pharm Assoc*. 2003;43(2):173-184.
5. Fera T, Bluml BM, Ellis WM, Schaller CW, Garrett DG. The Diabetes Ten City Challenge: interim clinical and humanistic outcomes of a multisite community pharmacy diabetes care program. *J Am Pharm Assoc*. 2008;48(2):181-190.
6. Wubben DP, Vivian EM. Effects of pharmacist outpatient interventions on adults with diabetes mellitus: a systematic overview. *Pharmacotherapy*. 2008;28(4):421-436.
7. Grossman S. Management of type 2 diabetes mellitus in the elderly: role of the pharmacist in a multidisciplinary health care team. *J Multidiscip Healthc*. 2011;4(5):149-154.
8. Wongwiwatthanakut S, Newton G, Popovich NG. Development and validation of an instrument to assess the self-confidence of students enrolled in the advanced pharmacy practice experience. *Am J Pharm Educ*. 2002;66(1):5-19.
9. Accreditation Council for Pharmacy Education. Accreditation standards and guidelines for the professional program in pharmacy leading to the doctor of pharmacy degree. <http://www.acpe-accredit.org/pdf/FinalS2007Guidelines2.0.pdf>. Accessed February 20, 2013.
10. American Association of Colleges of Pharmacy, CAPE Educational Outcomes - Center for the Advancement of Pharmaceutical Education. <http://www.aacp.org/resources/education/Documents/CAPE2004.pdf>. Accessed February 20, 2013.
11. Chen HY, Lee TY, Huang WT, Change CJ, Chen CM. The short-term impact of a continuing education program on pharmacists' knowledge and attitudes toward diabetes. *Am J Pharm Educ*. 2004;68(5):Article 121.
12. Monaghan MS, Turner PD, Skrabal MZ, Jones RM. Evaluating the format and effectiveness of a disease state management training program for diabetes. *Am J Pharm Educ*. 2000;64(2):181-184.
13. Ryan GJ, Foster KT, Unterwagner W, Jia H. Impact of a diabetes certificate program on PharmD students' knowledge and skills. *Am J Pharm Educ*. 2007;71(5):Article 84.
14. Darbishire PL, Plake KS, Nash CL, Shepler BM. Active-learning laboratory session to teach the four M's of diabetes care. *Am J Pharm Educ*. 2009;73(2):Article 22.
15. Odegard PS, LaVigne LL, Ellsworth A. A diabetes education program for pharmacy students. *Am J Pharm Educ*. 2002;66(3):391-395.
16. Westberg SM, Bumgardner MA, Brown MC, Frueh J. Impact of an elective diabetes course on student pharmacists' skills and attitudes. *Am J Pharm Educ*. 2010;74(3):Article 49.
17. Delea D, Shrader S, Phillips C. A week-long diabetes simulation for pharmacy students. *Am J Pharm Educ*. 2010;74(7):Article 130.
18. Sterrett J, Croom M, Phillips CM, Shrader S. Incorporating a diabetes certificate program in a pharmacy curriculum. *Am J Pharm Educ*. 2012;76(5):Article 89.
19. International Expert Committee. International expert committee report on the role of the A1C assay in the diagnosis of diabetes. *Diabetes Care*. 2009;32(7):1327-1334.

20. American Diabetes Association. Summary of revisions for the 2010 clinical practice recommendations. *Diabetes Care*. 2010;33 (Suppl 1):S3.
21. American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes Care*. 2010;33(Suppl 1):S62-S69.
22. Anderson RM, Fitzgerald JT, Funnell MM, Gruppen LD. The third version of the diabetes attitude scale. *Diabetes Care*. 1998;21 (9):1403-1407.
23. Faro B, Ingersoll G, Fiore H, Ippolito KS. Improving students' diabetes management through school-based diabetes care. *J Pediatr Health Care*. 2005;19(5):301-308.
24. Purkerson-Hammer D. Professional attitudes and behaviors: the "A's and B's" of professionalism. *Am J Pharm Educ*. 2000;64(4):455-464.
25. Pickens J. Attitudes and perceptions. In: Borkowski N, ed. *Organizational Behavior in Health Care*. Sudbury, MA: Jones and Bartlett Publishers; 2005:43-76.
26. Bandura A. *Self-Efficacy: The Exercise of Control*. W.H. Freeman and Company, New York, NY; 1997.
27. Wongwiwatthanakit S, Popovich NG. Applying the ARCS model of motivational design to pharmaceutical education. *Am J Pharm Educ*. 2000;64(2):188-196.
28. Popovich NG. Cultivating intellectual confidence in our students. *Am J Pharm Educ*. 1991;55(4):402-403.
29. Devellis RF. *Scale Development: Theory and Applications*. Applied Social Research Methods Series, Volume 26. Newbury Park, CA: Sage; 1991.