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RESEARCH ARTICLES

The Short-Term Impact of a Continuing Education Program on Pharmacists' Knowledge and Attitudes Toward Diabetes

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Objectives. This study examined the short-term impact of a continuing education (CE) program on pharmacists' knowledge and attitudes toward diabetes.
Methods. A constructive 7-hour CE program for enhancing the ability to perform pharmaceutical care for diabetic patients was conducted by the Taipei Pharmacists Association. The Diabetes Knowledge Test in Mandarin (DKT-M) with 10 items and the Diabetes Attitude Scale in Mandarin (DAS-M) with 37 items were employed to measure the efficacy of the program.
Results. Pharmacists' mean scores on the DKT-M significantly increased from 4.89 ±1.93 before the CE program to 7.72 ± 1.96 after the educational intervention ($p < 0.0001$). The mean overall score and mean scores on 6 subscales on the DAS-M exceeded the neutral point of 3 before intervention, indicating positive attitudes toward diabetes. Nevertheless, their mean DAS-M score of 3.91 ± 0.30) significantly increased to 4.0 ± 0.28 after the intervention ($p < 0.0001$), indicating highly positive attitudes toward diabetes.
Conclusion. Although pharmacists already had positive attitudes toward diabetes, the CE program further improved their knowledge and attitudes toward the disease. Future studies of educational intervention using standardized instruments are needed to ensure and compare the efficacy of educational interventions for health care professionals.

Keywords: continuing education, diabetes, pharmaceutical care

INTRODUCTION

The practice of diabetes care has dramatically changed during the past 2 decades. Knowledge regarding diabetes pathophysiology has quickly accumulated and has led to the development of new medications. In addition to knowledge updates, the attitudes of health care professionals toward current concepts about diabetes care are even more critical. The core philosophy of modern diabetes care puts emphasis on patient autonomy and optimal utilization of health care professionals' different specialties. Research evidence derived from clinical, economic, and humanistic outcomes also strongly supports the importance of patient autonomy and a team approach to diabetes care. To address the needs in clinical practice, a continuing education (CE) program and a Certificated Diabetic Educator (CDE) designation were created to help pharmacists catch up with the developments in diabetes care.

The efficacy of a diabetes CE program should be systematically evaluated to ensure the fulfillment of its goal of bridging the gap existing in actual practice and the most updated, evidence-based guideline. Using quick indicators to evaluate the impact of a CE program could be an essential part of establishing integrated diabetes care. Assessing changes in knowledge provides direct, initial understanding of the impact of the CE program. However, improvements in knowledge often cannot predict the improvements in practice. The theory of reasoned action states that people intend to perform a behavior, such as encouraging patients to monitor blood glucose levels, only when they evaluate it positively.[1] Knowledge as well as health care providers' attitudes will influence their clinical practice and patient outcomes.

Measuring changes in attitudes toward diabetes provides better insight into the true influences of a CE pro-

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gram.[2] In 1975 the National Diabetes Commission submitted a report to the United States Congress suggesting that health care professionals' diabetes-related attitudes were inappropriate and might lead to deleterious effects on patient care.[3] The Diabetes Attitude Scale (DAS) for health care professionals was therefore constructed to measure the belief component of diabetes-related attitudes.[4] The DAS is a well-validated instrument and has been successfully and widely used to measure attitudes in physicians, nurses, dieticians, medical students, and physician assistant students.[5-7] But prior research has provided little information on pharmacists' attitudes toward diabetes and the relationship between educational intervention and attitude change.

Pharmacists' knowledge and attitudes toward diabetes could significantly influence patient outcomes. Given the prevailing concept of a team approach toward diabetes care, only when all health care providers share the same high level of knowledge and positive attitudes could the quality of patient care be ensured. Pharmacists are highly accessible to chronically ill patients such as those with diabetes, especially when the disease becomes controlled and the patient only needs to visit a pharmacy to have their prescription refilled. Pharmaceutical care has significantly reduced the occurrence of drug-related problems and fulfilled the desired outcomes of drug therapy in other diseases and conditions such as anticoagulation, hyperlipidemia, and asthma.[8-13] Studies have also shown that pharmacists' participation in the care of poorly controlled diabetic patients resulted in better outcomes.[14] However, pharmacists' participating in diabetic care are still not required to have CDE certification. Applying the practice of pharmaceutical care to CDE certification could strengthen the team approach toward diabetes care and therefore warrants careful consideration. The objectives of this study were to (1) describe pharmacists' knowledge and attitudes toward diabetes; and (2) examine the short-term impact of a 7-hour continuing education (CE) program on pharmacists' knowledge and attitudes toward diabetes.

METHODS

A CE program certified for 7 hours of credit was conducted by Taipei Pharmacist's Association (TPA) during November 2001. A faculty consisting of CDEs from the Taiwanese Association of Diabetes Educators (TADE), endocrinologists, and pharmacists developed the program. During the first 2 hours of the curriculum, the current standard of diabetes care according to the guidelines of the American Diabetic Association were covered, including the pathophysiology of the disease, signs and symptoms, diagnosis, goals of treatment, and results from recent clinical studies. During the next 5 hours of the course, the knowledge and skill needed to perform diabetic pharmaceutical care were discussed. One hour was spent on the advantages and disadvantages of various types and regimens of insulin therapy; 1 hour on methods of using the different forms of insulin and brands of glucose meters; 1 hour on the mechanisms of action, indication, contraindication, dosage, side effect, and patient education for oral hypoglycemic agents; and 2 hours on diabetic home care, including dietary control, foot care, and management of hyper- and hypoglycemia.

Participants had valid licenses and practiced either in Taipei City or Taipei County, Taiwan. Those who voluntarily agreed to be surveyed had to provide their demographic information and complete the preintervention questionnaire before entering the seminar room and complete the postintervention questionnaire at the end of the CE program. This survey was exempt from IRB review.

Questionnaire Development

Knowledge Test. The Diabetes Knowledge Test in Mandarin (DKT-M) was modified from the University of Michigan Diabetes Research and Training Center (MDRTC) Diabetes Knowledge Test (DKT).[15] The faculty of the School of Pharmacy at Taipei Medical University initially translated the DKT questions into Mandarin. The DKT-M was composed of 10 multiple-choice questions, divided into 3 test segments: (1) general test with 4 questions, (2) insulin use with 3 questions, and (3) OHA with 3 questions. Test scores were calculated by adding the number of correct answers with 10 being the highest possible score. The DKT-M is available by email from the corresponding author.

Attitude Measurement. Pharmacists' attitudes toward diabetes were measured using a questionnaire, the Diabetes Attitude Scale in Mandarin (DAS-M), consisting of 6 subscales and 37 items. The DAS-M was translated and modified from the third version of the Diabetes Attitude Scale (DAS-3) and other literature.[16] The DAS-3, with a total of 33 items, was divided into the following 5 subscales: (1) need for special training to provide diabetes care, (2) seriousness of type 2 diabetes, (3) value of tight glucose control, (4) psychosocial impact of diabetes, and (5) patient autonomy. The DAS-M included these 5 subscales with 33 items from DAS-3, as well as an additional subscale with 4 items for pharmacists' attitudes toward their role in diabetes care developed by Schapansky in 2000.[17]

All of the items in DAS-M were scored on a 5-point Likert scale, with 1 indicating strongly disagree, 2 indi-

Table 1. Demographic Characteristics of Participants

Characteristic	n (%)
Total	72 (100)
Gender	
Male	39 (54.2)
Female	33 (45.8)
Practice Setting	
Community	48 (66.7)
Hospital	16 (22.2)
Clinic	8 (11.1)
Education	
Graduate School	11 (15.3)
College	38 (52.8)
Institute	23 (31.9)
Year of Graduation	
1990s	14 (19.4)
1980s	15 (20.8)
1970s	35 (48.6)
1960s and earlier	8 (11.1)
Participants with diabetes	2 (2.8)
Participants with a diabetic family member	29 (40.3)

cating disagree, 3 indicating neutral, 4 indicating agree, and 5 indicating strongly agree. Higher scores represented more positive attitudes toward the statements on current concepts of diabetes care.

The same process was used in the development of the instruments to assure proper translation, reliability, and validity of the DKT-M and the DAS-M. After translation, a panel of endocrinologists, diabetes educators, and pharmacoeconomic experts assessed the content validity of the instrument, and 30 pharmacists assessed its face validity. The reliability of the test and retest method was assessed by testing 30 pharmacy students resulting in a Spearman correlation coefficient of 0.751.

Statistical Analyses

An internal consistency reliability coefficient (Cronbach alpha) was calculated for the total DAS-M. Attitude scores were analyzed by nonparametric statistics due to skewness of data. The Wilcoxon signed rank test was used to compare the differences between preintervention and postintervention scores. The Mann-Whitney U test and the Kruskal-Wallis test were used to assess intergroup differences. The McNemar test was used to assess the differences in correct rates, and paired *t* test to compare total knowledge scores in the knowledge test. All statistical analyses were performed using the computer software program *Statistical Package for the Social Science* (*SPSS*, version 10.0). Statistical significance for all analyses was defined as a $p < 0.05$.

RESULTS

In response to mailed invitations, a total of 111 pharmacists registered to attend the CE program. Only completed data for the 2 surveys before and after the educational intervention were included in the data analyses, and 72 participants (64.9%) completed and returned both the preintervention and postintervention surveys. The demographic characteristics of the participants are presented in Table 1. Thirty-nine (54.2%) of the participants were male and 33 (45.8%) were female. The largest proportion of pharmacists (66.7%) practiced in community settings. The majority of participants had a bachelor's degree in pharmacy (52.8%) and graduated before 1970 (59.7%). Twenty-nine of the pharmacists (40.3%) reported a family history of diabetes. Only 2 pharmacists were diabetic patients and both had a diabetic family member. The Cronbach internal consistency coefficient alpha for the total DAS-M was 0.83 and 0.80 in the preintervention and postintervention, respectively, showing good overall reliability of the responses in the studied subjects.

Knowledge related to diabetes had significantly increased after the education. The number of correct responses to 9 of the 10 items on the DKT-M increased by more than 20% after the educational intervention, and more than 90% of the respondents answered the one remaining item correctly in both the preintervention and postintervention test (Table 2). The total knowledge score significantly increased from a mean of 4.89 ± 1.93 to 7.72 ± 1.96 after the educational intervention ($p < 0.0001$).

Comparisons of preintervention and postintervention DAS-M scores are presented in Table 3. Before the educational intervention, the mean total scores on the DAS-M and on each of the 6 subscales exceeded the neutral point of 3, indicating positive attitudes toward current concepts of diabetes care. The mean scores in the subscales of Seriousness of Type 2 Diabetes, the Psychosocial Impact of Diabetes, and Patient Autonomy were in the range of 3 to 4. The mean scores in the subscales of Special Training, Value of Tight Control, and Pharmacist's Role were 4.35 ± 0.41, 4.05 ± 0.42, and 4.31 ± 0.49, respectively.

The educational intervention further increased the participants' already positive attitudes towards diabetes care. The mean score of the total DAS-M significantly increased from 3.91 ± 0.30 to 4.0 ± 0.28 after the educational intervention ($p < 0.0001$). Significant improvements were found after the educational intervention in the subscales of Seriousness of Type 2 diabetes, Psychosocial Impact of Diabetes, and Pharmacist's Role. The attitudes toward patient autonomy had the lowest score among the 6 subscales, with a mean score of 3.51 ± 0.40 in the preintervention and 3.52 ± 0.44 in the postintervention ($p = 0.719$).

Table 2. Comparison of Correct Rates in DKT-M Before and After Intervention

Component	Preintervention (% correct)	Postintervention (% correct)	*p* value
General test (items 1-4)			
1	36.1	83.3	<0.0001
2	20.8	54.2	<0.0001
3	40.3	63.9	<0.0001
4	93.1	91.7	1.000
Insulin use (items 5-7)			
5	59.7	77.8	0.011
6	51.4	87.5	<0.0001
7	50.0	84.7	<0.0001
OHA (items 8-10)			
8	27.8	69.9	<0.0001
9	68.1	81.9	0.041
10	41.7	83.3	<0.0001
Total DKT-M	48.9	77.2	

Table 3. Comparison of DAS-M Scores Before and After Intervention

Subscale	No. of Items	Preintervention, Mean (SD)	Postintervention, Mean (SD)	*p* Value
1. Special Training	5	4.35 (0.41)	4.44 (0.43)	0.104
2. Seriousness of Type 2 Diabetes	7	3.92 (0.48)	4.19 (0.41)	<0.0001
3. Value of Tight Control	7	4.05 (0.42)	4.11 (0.42)	0.233
4. Psychosocial Impact of Diabetes	6	3.67 (0.48)	3.82 (0.48)	0.016
5. Patient Autonomy	8	3.51 (0.40)	3.52 (0.44)	0.719
6. Pharmacist's Role	4	4.31 (0.49)	4.43 (0.62)	0.006
Total DAS-M (Subscale 1-6)	37	3.91 (0.30)	4.0 (0.28)	<0.0001

Subgroup analyses were performed to identify the influences of demographic characteristics on pharmacists' attitudes toward diabetes before the educational intervention. Dividing the participants into groups based on their practice setting, degree of pharmacy education, and year of graduation did not identify any significant differences in their total DAS-M scores. Only personal or family history of diabetes was associated with more positive attitudes toward diabetes. Those pharmacists having diabetes or a diabetic family member had a slightly higher total DAS-M score of 3.98 ± 0.25 than other pharmacists who had a mean score of 3.87 ± 0.32 ($p = 0.049$).

DISCUSSION

The current study evaluated the initial step toward integrating pharmaceutical expertise into diabetes team care in a structural manner. The ultimate goal is to certify an appropriate number of pharmacists as diabetes educators to closely work with patients in conjunction with other health care professionals. To advance toward this goal, evaluation and documentation of the changes in pharmacists' knowledge, attitudes, or other indicators will be needed to adjust the educational program not only to meet the demands of society, but also to maintain or enhance the quality of diabetes team care. Overall, the present educational intervention was associated with increased scores both in pharmacists' knowledge and attitudes toward diabetes.

The diabetes knowledge test evaluated by DKT-M resulted in a total correct rate at baseline of less than 50%, indicating a lack of self-learning in diabetes since most of the participants graduated from pharmacy school more than 30 years ago. After the intervention, the mean percentage of correct answers increased to 77.2%. However, the correct rate of the second item in the general test only was 54.2% after intervention. The lower percent of correct answers on this section suggests that pharmacists were not as familiar with general information about diabetes care, such as the signs of the disease and dietary management of hyperglycemia, as they were with information on medications; thus, general information should be emphasized in subsequent programs. Although there was a statistically significant increase in knowledge scores, the suboptimal correct rate in the second test indicated the needs for subsequent CE programs.

CE programs addressing health care professionals' attitudes toward diabetes, in addition to updating knowledge, might be more effective in influencing the quality of care for patients with the disease.[2] Consistent with the results of previous studies, the mean attitude score was above the neutral point of 3 at baseline, indicating the pharmacists had positive attitudes toward diabetes.[17-18] Direct comparisons were made with the studies using the third version of DAS, which is a shorter instrument with improved reliability. In a study published in 1998, baseline mean scores in the DAS-3 subscales measured by 567 dieticians, 531 nurses, and 320 physicians were all above 4 and higher than those found in the present study.[16] Although attitude scores significantly improved after the CE program, comparison with other studies implied continuing efforts should be made.

Among the 3 subscales with baseline mean scores less than 4, the educational intervention significantly elevated the mean score in the subscale of Seriousness of Type 2 Diabetes above 4. Although the mean score for the subscale on the Psychosocial Impact of Diabetes significantly increased after intervention, it was still less than 4. Similar to the results of previous studies, the lowest scores were observed in the subscale on Patient Autonomy, which appeared unchanged after the CE program.[17-18] A closer examination of the survey data revealed that a portion of the participants did not support the concept of treating patients as autonomous members of the patient care team. A more aggressive approach, such as behavioral simulation or cognitive intervention, could be employed to influence the pharmacists' attitude toward patient autonomy.[6]

The other 3 subscales with high baseline scores showed different results. Pharmacists reported mean scores of 4.35 ± 0.41 and 4.05 ± 0.42 in the subscales of Special Training and Value of Tight Control prior to the CE program, respectively, and consequently the changes were insignificant after intervention. The results observed in the subscale of Pharmacist's Role showed that at baseline, the studied subjects strongly believed that pharmacists could be important members in the diabetes health care team by contributing their pharmaceutical expertise. The baseline mean score in this scale was 4.31 ± 0.49, which was comparable to the result of 4.29 ± 0.52 found in the previous study.[17] The result was encouraging because pharmacists were prepared to assume greater responsibility for diabetes care.

Subgroup analysis based on demographics demonstrated the importance of behavioral simulation. The initial attitudes were assumed to be different based on characteristics of practice settings, educational background, and year of graduation. The results of the intergroup analysis showed no significant differences, except that pharmacists having diabetes or a diabetic family member had more positive attitudes toward diabetes. Those pharmacists had already experienced the lives of diabetes patients and thus showed a more positive attitude toward the disease. Applying the techniques of behavioral simulation, including living with diabetes, could be an effective method of changing pharmacists' attitudes toward diabetes.

There were a few major limitations in this study. The majority of participants (66.7%) indicated community pharmacy as their primary practice setting and interpretation of study results would better reflect community pharmacists in Taiwan. As the pharmaceutical care in community pharmacy in Taiwan was at a very early phase, the knowledge level of the participants was inadequate. The DKT-M will need to be revised before being used in subsequent or other CE programs. The second limitation was the potential selection bias. Pharmacists may have participated in this CE program because they had a strong interest in diabetes and that may have resulted in inflated positive attitudes prior to the educational intervention. Finally, changes brought about by the intervention may not persist weeks or months after the CE program, and the changes in knowledge and attitudes may not be able to cause behavior changes.[6]

CONCLUSIONS

This study demonstrated that pharmacists have positive attitudes toward diabetes and the CE program increased participants' knowledge and changed some of their attitudes. The continuity of diabetic care cannot be accomplished without pharmaceutical care. Pharmacists who are members of diabetic care teams are in a position to deeply implant the spirit of pharmaceutical care in community pharmacy; therefore, they should receive adequate educational preparation so they can share the positive attitudes toward diabetes care in accordance with CDE certification. Future efforts using standardized instruments are needed to ensure the efficacy of the combined pharmacy and CDE program.

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