医薬品相互作用研究
一　般　論　文
39（1）17-23（2015）

Hands-on experiential training of self-monitoring of blood glucose and self-injection of insulin, and its learning effects in 4th year pharmacy students

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（Received February 12, 2015; Revised April 7, 2015; Accepted April 22, 2015）

Self-monitoring of blood glucose (SMBG) and self-injection of insulin (SII) are complex and difficult for diabetes patients. In the education of pharmacists and medical students, it is important to experience these procedures to adequately understand the psychological state of patients. Therefore, Showa Pharmaceutical University students participated in SMBG and SII experiential training, followed by a questionnaire survey to evaluate the training. Participants were 4th year students enrolled in the university in 2013 and 2014. The experiential training was implemented within the 4th year practical training (pre-training) program. Training comprised lectures on diabetes education, as well as SMBG and SII experiential training. According to an analysis of survey results obtained from 439 students who completed the SMBG and SII experiential training, 96% responded that they “were able to understand how patients who continually engage in SMBG and SII must feel”. Additionally, 97% responded that they “were able to understand the need for diabetes patient education through the SMBG and SII hands-on experiential training”. It can therefore be considered that SMBG and SII experiential training enables students to understand the feelings of diabetes patients who perform SMBG and SII on a daily basis. The results also suggest that the training enables students who will go on to become pharmacists to recognize the need for diabetes patient education.

Key Words: Self-monitoring of blood glucose, Self-injection of insulin, Patient education, Pre-training, Questionnaire survey

Introduction

In 2006, the requirements for pharmaceutical education in Japan changed from the former 4-year system to a 6-year system. This 6-year pharmaceutical education system, which focuses on pharmaceutical health care, bioethics, and communication studies, uses the 'Model Core Curriculum for Pharmaceutical Education' as a base and aims to develop pharmacists with good clinical skills by emphasizing medical professional training[1,2]. One goal of the 'Model Core Curriculum for Pharmaceutical Education' is for students to “understand and consider the emotional state of the patient”, but training or education that incorporates such a goal has not yet been established within universities.

According to the results of the 2012 National Health and Nutrition Survey, about 9.5 million individuals are “strongly suspected to have diabetes” and there are about 11.0 million individuals whose “possibility of having diabetes is undeniable”; thus, a total of 20.5 million people are

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affected by diabetes[3]. In the treatment of diabetes, it is important to have many pharmacists involved, and diabetes is one of the diseases that is listed within category "F. Pharmacy Clinical Education" of the 'Model Core Curriculum for Pharmaceutical Education'. This curriculum, whose revision is to begin in 2015, specifically lists diabetes as a disease where practical training should be utilized in education[4]. Among chronic diseases, diabetes stands out as one where constant, ongoing willpower from the patient and ongoing supportive care from medical staff are important in treatment. To support patients, medical staff must consider their emotional condition and understand the difficulties that they face, and to foster this understanding, treatment should be experienced through simulation. Experiential training can provide an effective method for this.

Self-monitoring of blood glucose (SMBG) and self-injection of insulin (SII) are difficult and complicated processes, and thus education provided by doctors, pharmacists, and nurses is an important factor for patients. Therefore, these processes should be experienced hands-on as a student to provide education that fosters understanding of the emotional status of patients.

There have been reports on the implementation of experiential training on SMBG and SII for the purposes of diabetes patient education training for medical students. There have also been reports on the implementation of experiential training on diet for nursing students as well as experiential training on pharmaceutical treatments for diabetes. However, no reports have evaluated the implementation of both SMBG and SII hands-on experiential training for pharmaceutical students[5-10].

For this reason, SMBG and SII hands-on experiential training was structured within our university's 4th year practical pre-training curriculum. A questionnaire survey was later distributed to students who completed the SMBG and SII hands-on experiential training with the aim of evaluating the training and clarifying students' learning process throughout the SMBG and SII hands-on experiential training course.

Methods

1. Outline of SMBG and SII hands-on experiential training

The training strategy is shown in Table 1. Training was conducted in groups of 15–17 students. The procedures were strategically planned by combining lectures about diabetes, specifically, on the pathophysiology of diabetes and drug treatment as well as diabetes education, with hands-on training on SMBG and SII with students divided further into small groups of 2 or 3. The SMBG experiential training was conducted utilizing the Medi Safe®Mini (TERUMO, Tokyo, Japan) through verbal explanation and through students actually using it on themselves. SMBG was conducted twice, at approximately 1 and 2 hours after lunch, exposing students to the experience of changes in self-monitored glucose level as well as experiencing the emotional aspects of SMBG. SII experiential training with an insulin kit (Flex Pen®, Novo Nordisk, Tokyo, Japan; commonly used for the treatment of diabetes) was conducted through verbal explanation and through learning how to use two types of pen needles (Penneedle®30G, NIPRO, Tokyo, Japan; NANOPASS®34G, Novo Nordisk, Tokyo, Japan) by actually injecting the needle into the arm. Both types of needles were used in the experiential training, because Penneedle®30G has a large outer diameter (0.3 mm) while NANOPASS®34G ®has a small one (0.18 mm), and they are clinically used in the treatment of diabetes. The students experienced the emotional aspects of SII as well as the pain of self-injecting.

2. Questionnaire survey of students regarding SMBG and SII hands-on experiential training

The 4th year students who partook in the 2013 and 2014 practical pre-training were given a verbal explanation of the experiential training contents before giving their written consent to participate in the study. Self-administered questionnaire surveys were given to the students after completing the experiential training.

The questionnaire comprised 6 items in relation to the students' realizations obtained through the SMBG training, 6 items in relation to the students' realizations obtained through the SII experiential

Learning Strategy	Time (min)	Specific Behavioral Objects (SBOs)
1	15	Overall Explanation Informed Consent
2	40	Experiential Training 1-1 SMBG Explanation, demonstration of procedure SMBG Experience, first time (Within 1 hour after lunch)
3	35	Lecture (1) “Pathophysiology of Diabetes and Drug Treatment“
4	20	Experiential Training 1-2 SMBG Experience, second time (Within 2 hours after lunch)
5	20	Experiential Training (2) Self-Injection with Pen Needle, explanation demonstration Self-Injection with Pen Needle, experience
6	35	Lecture (2) “Diabetes Patient Education”
7	45	Summary Reporting, Questionnaire Survey

Table 1. SMBG and self-injection of insulin hands-on experiential training

training (including hands-on experience of self-injecting the pen needle), and 4 items in relation to what students gained through the experiential training (overall evaluation). Thus, a total of 16 questions were asked. The responses to each question were scored on a 5-point Likert scale, comprising “Strongly agree”, “Agree”, “Neither”, “Disagree”, and “Strongly disagree”. To capture possible trends by subject attribute, the questionnaire also asked about the students’ current year in school, gender, and future prospects after graduation.

Data analysis and descriptive statistics were conducted via Microsoft Office® Excel 2013 (Microsoft).

3. Ethical considerations

The present study was conducted following approval from the Showa Pharmaceutical University Research Ethics Committee (approval number H25-9, H26-12). Additionally, efforts were taken not to compel the students to participate. Students were assured verbally and in writing that whether they consented to or opted out of the study would not affect their grades, and that while the questionnaire contents may be made public for the study, their anonymity would be maintained.

Results

1. Implementation of SMBG and SII hands-on experiential training

The SMBG and SII hands-on experiential training (including self-injection with the pen needle) was implemented as per the experiential training strategy shown in Table 1 for both sessions (Fig. 1, 2). A total of 433 students, comprising 238 and 195 students in 2013 and 2014, respectively, participated in the “practical pre-training” course in the second half of their 4th year term. Of those students, a total of 424 students (98%), 234 students and 190 students in 2013 and 2014, respectively, were able to participate in the SMBG experiential training and the SII hands-on experiential training. Those who were unable to participate in the training experience (9 students, 2%) were able to observe the training experience of their classmates.

Fig. 1 Students during SMBG experiential training

Fig. 2 Students during experiential training of self-injection with pen needle

2. Results of questionnaire survey distributed to students regarding SMBG and SII hands-on experiential training

2-1. Subjects

In total, 424 questionnaire subjects comprising 259 women (61%) and 165 men (39%) completed the SMBG and SII hands-on experiential training. First-choice future prospects were as follows: 24% were hoping to work for a hospital pharmacy (102 people), 20% for a dispensary or drugstore (85 people), 8% for a pharmaceutical company (33 people), 3% "other" (11 people), and 45% "undecided" or did not give an answer (193 people).

2-2. Students' realizations acquired through SMBG experiential training

Fig. 3 shows the results for the questions in regards to students' realizations acquired through the SMBG experiential training. For the following 4 items, 80% or more of the responses were "Strongly agree" or "Agree": "I was able to understand the need for SMBG" (96%), "I was able to retain the procedures and methods of SMBG" (97%), "I was able to understand how patients who continuously engage in SMBG must feel" (96%), and "I am able to teach SMBG education (84%). The question with the lowest percentage of "Strongly agree" or "Agree" responses was "I thought the injection hurt more than I thought it would" (45%).

In addition, an analysis of the data stratified according to students in 2013 and 2014 found no significant differences between the two groups.

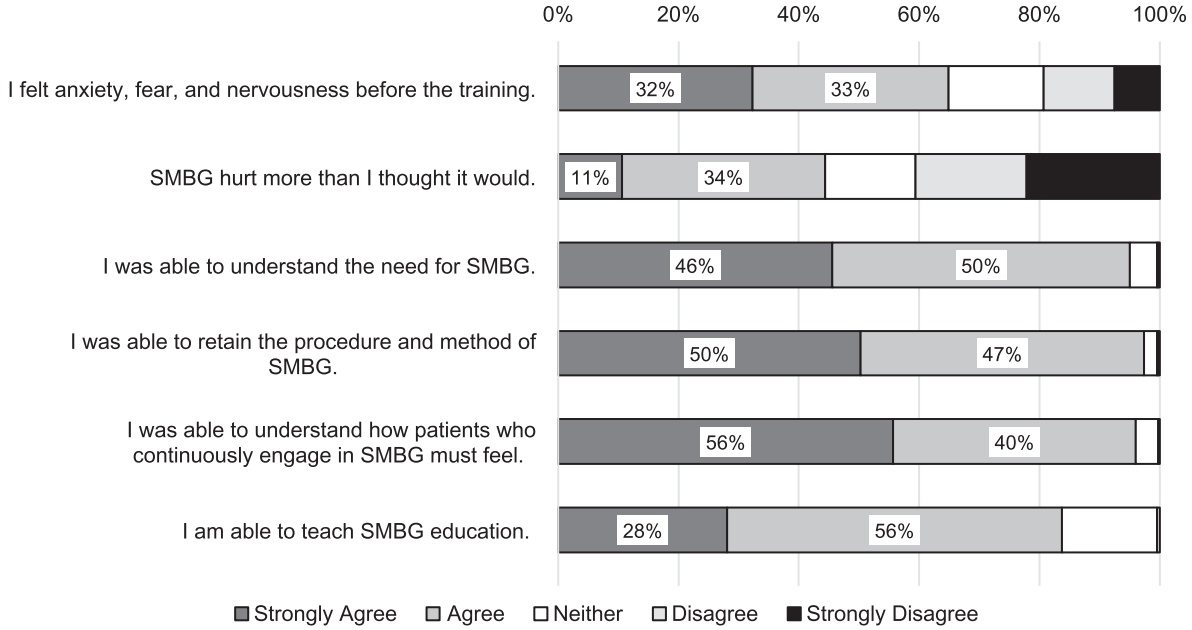

Fig. 3 Students' realizations acquired through SMBG experiential training (n=424)

2-3. Students' realizations acquired through SII hands-on experience

Fig. 4 shows the results to the questions in regards to students' realizations acquired through the SII hands-on experiential training (including self-injection of the pen needle). For the following 4 items, 80% or more of the answers were "Strongly agree" or "Agree": "I felt anxiety, fear, and nervousness prior to this training" (81%), "I was able to understand the need for self-injection" (94%), "I was able to retain the procedures and methods of self-injection" (95%), and "I was able to understand how patients who continuously engage in SII must feel." (96%). The question with the lowest percentage of "Strongly agree" or "Agree" responses was "SII hurt more than I thought it would." (64%).

In addition, an analysis of the data stratified according to students in 2013 and 2014 found no significant differences between the two groups.

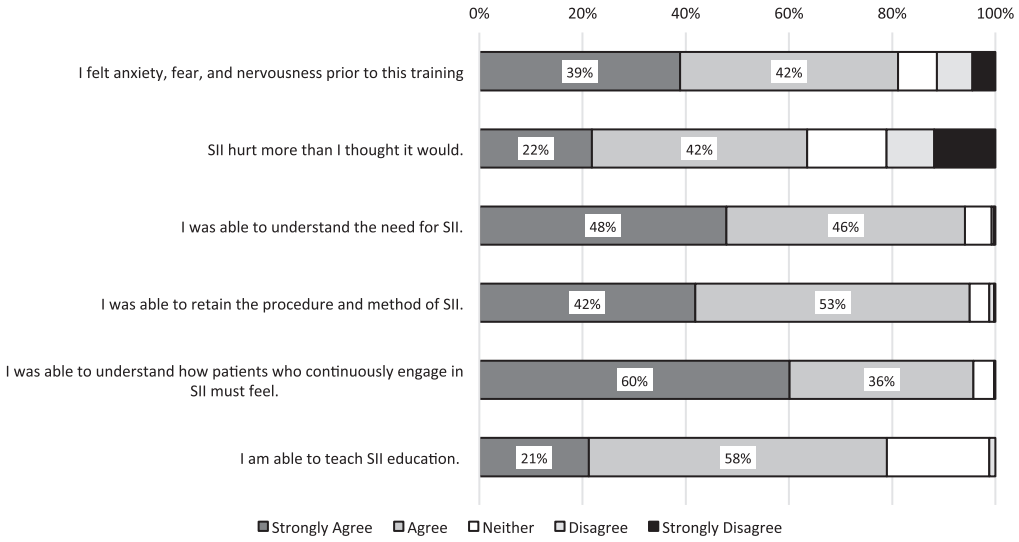

Fig. 4 Students' realizations acquired through SII experiential training (n=424)

2-4. What students gained from SMBG-SII experiential training (overall evaluation)

Fig. 5 shows the results in regards to what the students gained from the experiential training overall. For all 4 items, 80% or more of the responses were "Strongly agree" or "Agree" (median: 94%, range: 83–97%).

In addition, an analysis of the data stratified according to students in 2013 and 2014 found no significant differences between the two groups.

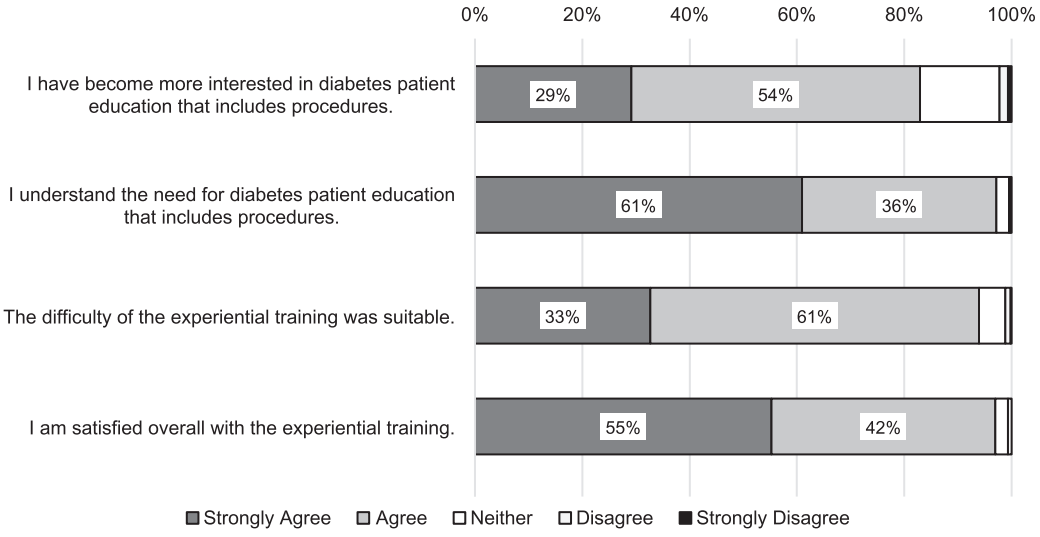

Fig. 5 Students' realizations acquired from the experiential training and overall evaluation (n=424)

Discussion

In the present study, we implemented the SMBG and SII hands-on experiential training within the university's practical pre-training program for 4th year students with the aim of uncovering the learning effects of the training. Questionnaire surveys were distributed to students who completed the experiential training. Several findings were obtained from the results.

1. Implementation of SMBG and SII hands-on experiential training

The results in Fig. 5 indicate that the experiential training was suitable in respect to difficulty, ability to facilitate understanding of diabetes patient education, fostering increased interest, and overall student satisfaction. This suggests that the value of the program, including the planning of the training, time allocation, grouping, and program content, is high. However, 9 students (2%) were unable to carry out self-injection, likely due to anxiety or other negative feelings regarding the procedure. A few of the students who were not able to participate in the training indicated that they were "able to better understand the difficulties of diabetes patients who perform SMBG and SII every day, from the experience of not being able to do it themselves". They also indicated that "if given the chance, they would like to attempt the SMBG and SII procedure again". From these positive remarks we would like to believe that even for those who were unable to experience the training, the training experience was one that increased their consciousness of diabetes patient education. Furthermore, when they become pharmacists in the future, we hope that these students will revisit the SMBG and SII hands-on experience and enthusiastically take part in diabetes patient education.

2. Questionnaire survey results of students in regards to SMBG and SII hands-on experiential training

First, we will consider the students' realizations in regards to the SMBG and SII hands-on experiential training, which are shown in Fig. 3 and Fig. 4, respectively. All 6 question items in both questionnaires aimed to capture the learning process of the students, starting from their emotions before experiential training, skill retention through experiential training, and emotions after experiential training. The survey revealed that, the students had anxiety, fear, and nervousness in regards to the SMBG and SII hands-on experience, but once they implemented the SMBG and SII procedures in their experiential training, they did not feel as much pain as they thought they would. Additionally, from the experiential training, they were able to acquire the procedures and methods of SMBG and SII hands-on, understand the patients' feelings, recognize the need for these procedures, and realize that they are capable of teaching the SMBG and SII procedures. These results and the questionnaire answers regarding students' overall evaluation of the program (Fig. 5) suggest that the evaluation of the program was quite high. Similar results were produced in a study by Kawai et al. [6] in their study of SMBG and SII experiential training in nursing students. This suggests that the value of SMBG and SII experiential training is not specific to nursing students but also applies to pharmacy students. It is important for students to obtain needed knowledge regarding SMBG and SII, and be able to realistically imagine diabetes patient education through experiencing the procedures themselves.

The present study is limited in that it included only a single university's students as subjects in its evaluation of SMBG and SII hands-on experiential training. Thus, when considering the differences in program implementation theories for pharmaceutical practical pre-training programs at other educational institutions, there is a limit to which the present findings can be generalized. Additionally, because we conducted only simple descriptive statistics when analyzing and evaluating the questionnaire surveys, there is a limitation to generalizing the interpretation of the results. However, despite these limitations, we could conclude that the training enabled students seeking to become pharmacists in the future to recognize the need for diabetes patient education. Students were able to recognize this need by understanding patients' feelings of having to carry out a self-invasive treatment, such as SMBG or SII,

on a daily basis by taking part in SMBG and SII hands-on experiential training. Our findings can possibly become basic data for other educational institutions when implementing SMBG and SII hands-on experiential training within a pharmaceutical practical pre-training program.

Acknowledgement

We would like to express our deepest appreciation and gratitude to the 4th year students of Showa Pharmaceutical University (Class of 2013 and Class of 2014) who participated in the evaluation of this training.

Conflict of interest

The authors declare that they have no conflict of interest.

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