医薬品相互作用研究
一 般 論 文
35 (3) 31-40 (2012)

Effects and Problems of Education from First Clinical Pharmacy Training at Hospital in the Six-Year System of Pharmaceutical Education: Questionnaire on Students and Instructing Pharmacists

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(Received January 13, 2012 ; Accepted March 22, 2012)

The first long-term practical training since the pharmaceutical education in Japan was shifted to a six-year system was started in the academic year of 2010. At Showa Pharmaceutical University (SPU), 211 fifth-year students received hospital pharmacy practical training (hereinafter referred to as "training") at 57 hospitals. A questionnaire survey was conducted to verify the educational effects of this training and identify problems.

The survey was conducted on the students who received the training as well as instructing pharmacists who provided these students with first-hand training. In this survey, self-completed questionnaires were used. The surveyed items for students included evaluation of the training and the level of learning from each unit of the training. For instructing pharmacists, evaluation of the training was surveyed.

The students made a generally high evaluation of training programs. The level of understanding achieved by learning from each unit of the training rose significantly ($p<0.001$). The instructing pharmacists made a generally high evaluation of their own training guidance and students instructed. However, they pointed out some problems with the training curriculum and support system provided by the university. In order to enrich and enhance the training, the system of collaboration between the university and hospitals that accept students must be further strengthened to address the problems and improve the course.

Key Words: pharmaceutical education, practical training, hospital pharmacy practical training, questionnaire survey, educational effects

INTRODUCTION

In association with the recent advancement of medical technologies and the progress of separation between healthcare and pharmaceutics, a new pharmaceutical education system (hereinafter referred to as "six-year system of pharmaceutical education") was adopted in pharmaceutical education. This six-year system of pharmaceutical

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education was started in 2006 and the course term of pharmaceutical departments was changed from 4 years to 6 years for the purpose of developing pharmacists with clinical capabilities in the medical field. Along with this change, "pharmaceutical education model/core curriculum" has been specified for students who graduated from pharmaceutical universities throughout Japan to obtain a certain level of knowledge, skills and attitudes as a pharmacist. Furthermore, "practical training model/core curriculum" (hereinafter referred to as "training curriculum") has been specified concerning practical training that characterizes the six-year system of pharmaceutical education[1,2].

This training curriculum is specified to be interactive with collaboration of instructing pharmacists and university faculties in the clinical field for the primary purpose of cultivating practical competencies of clinical pharmacists. To this end, students receiving practical training are required to pass common pharmaceutical tests — Computer-based Testing (CBT) and Objective Structured Clinical Examination (OSCE) — in order to demonstrate the knowledge, skills and attitudes required for the training to show that the students without a pharmacist license are qualified to take practical training. CBT mainly evaluates knowledge while OSCE mainly evaluates skills and attitudes. Specific programs of the practical training consist of community pharmacy practical training and hospital pharmacy practical training in the fifth year (11 weeks each) and pre-training for clinical pharmacy practice (pre-training) in the fourth year (5 weeks or longer training is provided in the university before CBT and OSCE). Each practical curriculum specifies general aims, achievement goals and standard learning methodology (strategy) for each session. The hospital pharmacy practical training (hereinafter referred to as "training") is intended to teach basic knowledge, skills and attitudes of pharmacist duties including dispensing, drug formulations and compliance guidance so that students will understand clinical practice and responsibilities of a hospital pharmacist, and importance of participating in the medical team [3-5].

At Showa Pharmaceutical University (SPU), students are assigned to training hospitals, taking into account the route and means of transportation to the training site. In 2010, a total of 57 hospitals accepted students in the fifth year and each student was trained at a hospital during the 1st training period from May to July, the 2nd training period from September to November, or the 3rd training period from January to March.

In order to identify education effects and problems with the training, a survey was conducted on students who received the training and instructing pharmacists at hospitals that accepted them.

METHODS

The survey was conducted in the form of questionnaires on 211 fifth-year students who received the training and 57 instructing pharmacists at 57 hospitals (a representative instructing pharmacist from each site). Self-completed questionnaires, in which subjects were required to give their names, were used. Before completing the questionnaires, the students and instructing pharmacists were told that the survey results in terms of personal information would be protected and used only for this study; they then agreed to answer the questions. A pre-questionnaire was conducted one month prior to the start of each training period and a post-questionnaire was then conducted one week after the end of the training period. The survey items included the following:

1. Attributes of respondents to this survey

Gender of students, training site and period in which they had been trained there, as well as desired future career (first choice) and attributes of the instructing pharmacist's site, were surveyed as attributes of the respondents.

2. Questionnaire survey on students

1) Evaluation of the training

Evaluation of the training by students was carried out in the post-questionnaire. Questions involved 10 items in total including 5 "questions about the training curriculum," 2 "questions about the university support system" and 3 "questions about aspirations for and satisfaction with training." Answers were chosen on a 5-point Likert scale as follows: "5: Strongly agree," "4: Agree," "3: Neither agree nor disagree," "2: Disagree" or "1: Strongly disagree" (Fig. 1).

	Questions about training curriculum
Q-S1	The training program had an adequate level of difficulty.
Q-S2	The training program stimulated my intellectual curiosity.
Q-S3	The training site's equipment (instruments and documents) was adequate.
Q-S4	The guidance methods and guidance itself of the instructing pharmacist were adequate.
Q-S5	The training period (2.5 months) was adequate.
	Questions about university support system
Q-S6	The support system of faculty members and university was sufficient.
Q-S7	The pre-training for clinical pharmacy practice was helpful.
	Questions about aspiration for and satisfaction with training
Q-S8	I felt this was necessary training to become a pharmacist.
Q-S9	I have grown as a human through this training.
Q-S10	I am generally satisfied with this training.

You have finished hospital training. Please choose an option that best applies to you to answer the following questions from "5: Strongly agree," "4: Agree," "3: Neither agree nor disagree," "2: Disagree" and "1: Strongly disagree."

Fig.1 Evaluation of Hospital Pharmacy Practice Training by Students (Questions)

2) Levels of learning from training units

Sixteen training units were established to understand students' levels of learning of the training curriculum and students were asked how well they were versed in each of the training units in the questionnaire: The survey was conducted twice through pre-questionnaire and post-questionnaire. Answers were chosen on a 5-point Likert scale as follows: "5: Fully learned," "4: Learned," "3: Neutral," "2: Not learned" or "1: Not learned at all" (Fig. 2).

	Training Units
U1	Overall flow of dispensing practice
U2	Counting and weighing dispensing and dispensing audit
U3	Compliance guidance toward outpatients
U4	Sterile technique and mixing injectable drugs
U5	Safety management
U6	Managing drug supply
U7	Drugs requiring special attention
U8	Adoption and suspension of drugs at hospital
U9	Drug information at hospital (receiving, assessment and processing of information)
U10	Drug information at hospital (information provision to medical staff)
U11	Role of a pharmacist at ward practice and team healthcare
U12	Medication management guidance at ward practice and prescription support activities of a pharmacist
U13	Hospital preparation
U14	Therapeutic drug monitoring (TDM)
U15	Contribution to medicine for intoxication such as drug poisoning
U16	Ethics and attitudes of pharmacist as a healthcare provider

Please choose an option that best applies to you about the following respective training units from "5: Fully learned," "4: Learned," "3: Neutral," "2: Not learned" or "1: Not learned at all."

Fig.2 Levels of Learning from Hospital Pharmacy Practice Training Units (Questions)

3. Questionnaire on instructing pharmacists

1) Evaluation of the training

Evaluation of the training by instructing pharmacists was carried out in the post-questionnaire. Questions involved 14 items in total including 5 "questions about the training curriculum," 1 "question about the university support system," 3 "questions about the students trained" and 5 "questions about the training guidance." Answers were chosen on a 5-point Likert scale as follows: "5: Strongly agree," "4: Agree," "3: Neither agree nor disagree," "2: Disagree" or "1: Strongly disagree" (Fig. 3).

	Questions about the training curriculum
Q-P1	The program of the training curriculum was adequate.
Q-P2	The training period (2.5 months) was adequate.
Q-P3	Evaluation by recording (training diary) for trainees was burdensome.
Q-P4	Evaluation of growing process (achievement check sheet for SBOs) for students was burdensome.
Q-P5	Evaluation by measuring students' growth (final evaluation sheet) was burdensome.
	Question about the support system from the university
Q-P6	The support system of faculty members and university was sufficient.
	Questions about the training students
Q-P7	The fundamental knowledge the students had was as expected.
Q-P8	The fundamental skills the students had were as expected.
Q-P9	The basic attitudes of students were as expected.
	Questions about training guidance
Q-P10	The training guidance had adequate levels of difficulty.
Q-P11	The training guidance was satisfactory.
Q-P12	Guiding the students led to self-enrichment.
Q-P13	It was good to accept students for practical training.
Q-P14	I would like to accept students for practical training in the future as well.

Please choose an option that best applies to you about the following questions from "5: Strongly agree," "4: Agree," "3: Neither agree nor disagree," "2: Disagree" and "1: Strongly disagree."

Fig.3 Evaluation of Hospital Pharmacy Practice Training by Instructing Pharmacists (Questions)

4. Free comment on the training

In the post-questionnaire, students and instructing pharmacists were asked to give comments freely on the training on a voluntary basis.

5. Analytical method

The results were analyzed for 2-1) and 3-1) by calculating the 2-top ratio, an approach used for customer satisfaction analyses (proportion of answers of "5: Strongly agree" and "4: Agree" chosen). For 2-2), answers were quantified to rank variables, namely, by giving 5 points to "5: Fully learned," 4 points to "4: Learned," 3 points to "3: Neutral," 2 points to "2: Not learned" and 1 point to "1: Not learned at all" to calculate the mean of all respondents as the level of learning. The difference in the level of understanding as a result of the learning obtained in the unit was tested using the Mann-Whitney U test. IBM SPSS Statistics 20.0 was used for the statistical analysis, and a significance level of less than 5% was set to indicate a significant difference.

RESULTS

Responses to the questionnaire (response rate) were obtained from 211 students (100.0%) and 48 hospital-based instructing pharmacists (84.2%).

1. Attributes of respondents to this survey

The 211 students consisted of 127 female (60.2%) and 84 male (39.8%) students. In terms of their desired

future career, 100 (47.4%) students answered hospital pharmacists after the training, while 38 (18.0%) and 37 (17.5%) students answered insurance pharmacists working in dispensing pharmacies and working at a pharmaceutical company or contract research organization (CRO), respectively. In addition, 8 (3.8%) students answered other careers and 24 (11.4%) answered that they had not decided yet. The numbers of students in the different training periods were 68 in the 1st training period (32.2%), 78 in the 2nd training period (37.0%) and 65 in the 3rd training period (30.8%). Overall, 115 students (55.5%) trained at a pharmacy prior to the training and 96 students trained at a pharmacy after the training (45.5%).

Instructing pharmacists from 48 hospitals consisted of those from 29 hospitals contracted with SPU for the training (60.4%) and from 19 hospitals in the Council on Pharmaceutical Education, Kanto-Chiku Chousei Kikou (39.6%). The types of hospitals were 3 University hospitals (6.3%) and 45 General hospitals (93.7%). Moreover, with regard to the scale of the general hospitals, 14 were large hospitals with more than 500 beds (31.1%), 29 were middle-sized hospitals with 100-499 beds (64.5%) and 2 were small hospitals with less than 100 beds (4.4%). In terms of the number of students admitted per annum, 35 hospitals received not more than 15 (72.9%) and 3 hospitals received more than 15 (27.1%).

2. Results of questionnaire survey on students

1) Evaluation of the training

The results of evaluation of the training by students are shown in Fig. 4. The 2-top ratios were 96.7% for Q-S9, the highest among the questions, and 50.2% for Q-S6, the lowest of all. All other questions except Q-S5, Q-S6 and Q-S7 had high 2-top ratios at 80% or higher (Fig. 4).

The results of this evaluation of the training were then analyzed in subgroups depending on the training period, type of hospital, hospital scale and the number of students accepted. However, no significant differences were observed from these analyses.

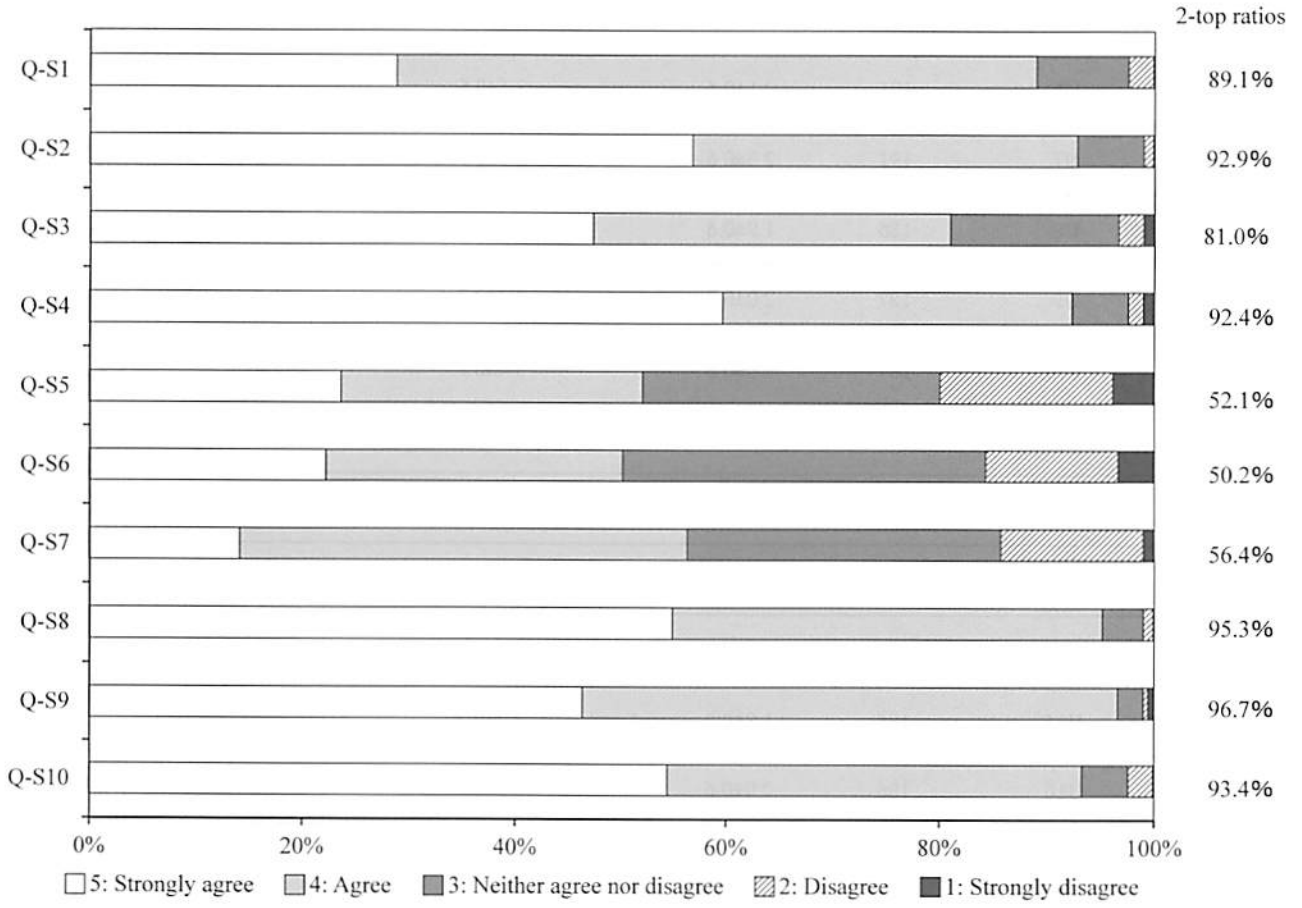

Fig.4 Evaluation of Hospital Pharmacy Practice Training by Students (Results)

2) Levels of learning from training units

The results of levels of learning from the training units are shown in Table 1. The levels of learning from training units from the pre-questionnaire ranged from 1.8 to 2.8 points with a mean learning level (mean±S.D.) of all 16 training units of 2.1±0.7 points. On the other hand, the post-questionnaire results gave the range from 3.2 to 3.7 points for the levels of learning from training units with a mean learning level of all 16 units (mean±S.D.) of 3.4±0.7 points. The mean difference in levels of understanding of each training unit between before and after training was 1.3 points. The minimum difference was 0.9 points from U2 while the maximum difference was 1.6 points from five units of U5, U11, U12, U13 and U16. The level of understanding based on learning from every training unit rose after the training in a statistically significant manner ($p<0.001$) (Table 1).

The results of these differences in levels of learning from the training units were further analyzed in subgroups on the basis of the training period, type of hospital, site scale and the number of students accepted. These analyses did not show significant differences.

Training unit	n	Pre-questionnaire (Mean±S.D)	Post-questionnaire (Mean±S.D)	*Difference*	*p*
U1	196	2.7±0.6	3.7±0.7	*1.0*	*p<0.001* *
U2	196	2.8±0.6	3.7±0.7	*0.9*	*p<0.001* *
U3	187	2.3±0.6	3.3±0.7	*1.0*	*p<0.001* *
U4	189	2.1±0.6	3.5±0.7	*1.4*	*p<0.001* *
U5	188	2.0±0.6	3.6±0.6	*1.6*	*p<0.001* *
U6	191	2.1±0.6	3.5±0.6	*1.4*	*p<0.001* *
U7	191	2.0±0.6	3.5±0.7	*1.5*	*p<0.001* *
U8	186	1.9±0.6	3.4±0.7	*1.5*	*p<0.001* *
U9	187	2.0±0.6	3.4±0.7	*1.4*	*p<0.001* *
U10	187	2.0±0.6	3.4±0.7	*1.4*	*p<0.001* *
U11	189	2.0±0.6	3.6±0.7	*1.6*	*p<0.001* *
U12	184	2.0±0.6	3.6±0.7	*1.6*	*p<0.001* *
U13	187	1.9±0.6	3.5±0.7	*1.6*	*p<0.001* *
U14	190	1.8±0.6	3.3±0.8	1.5	*p<0.001* *
U15	186	1.8±0.6	3.2±0.7	1.4	*p<0.001* *
U16	186	2.0±0.6	3.6±0.7	1.6	*p<0.001* *
All of training units (Mean±S.D)		2.1±0.7	3.4±0.7	1.3	*p<0.001* *

*Mann-Whitney U test : $p<0.05$

Table 1. Levels of Learning from Hospital Practice Training (Results)

3. Survey on instructing pharmacists

1) Evaluation of the training

The results of evaluation of the training by instructing pharmacists are shown in Fig. 5. The 2-top ratios were 93.8% for Q-P12, the highest among the questions, and 35.4% for Q-P1, the lowest of all. All other questions except Q-P1, Q-P2, Q-P3, Q-P4 and Q-P5 had high 2-top ratios at 70% or higher (Fig. 5).

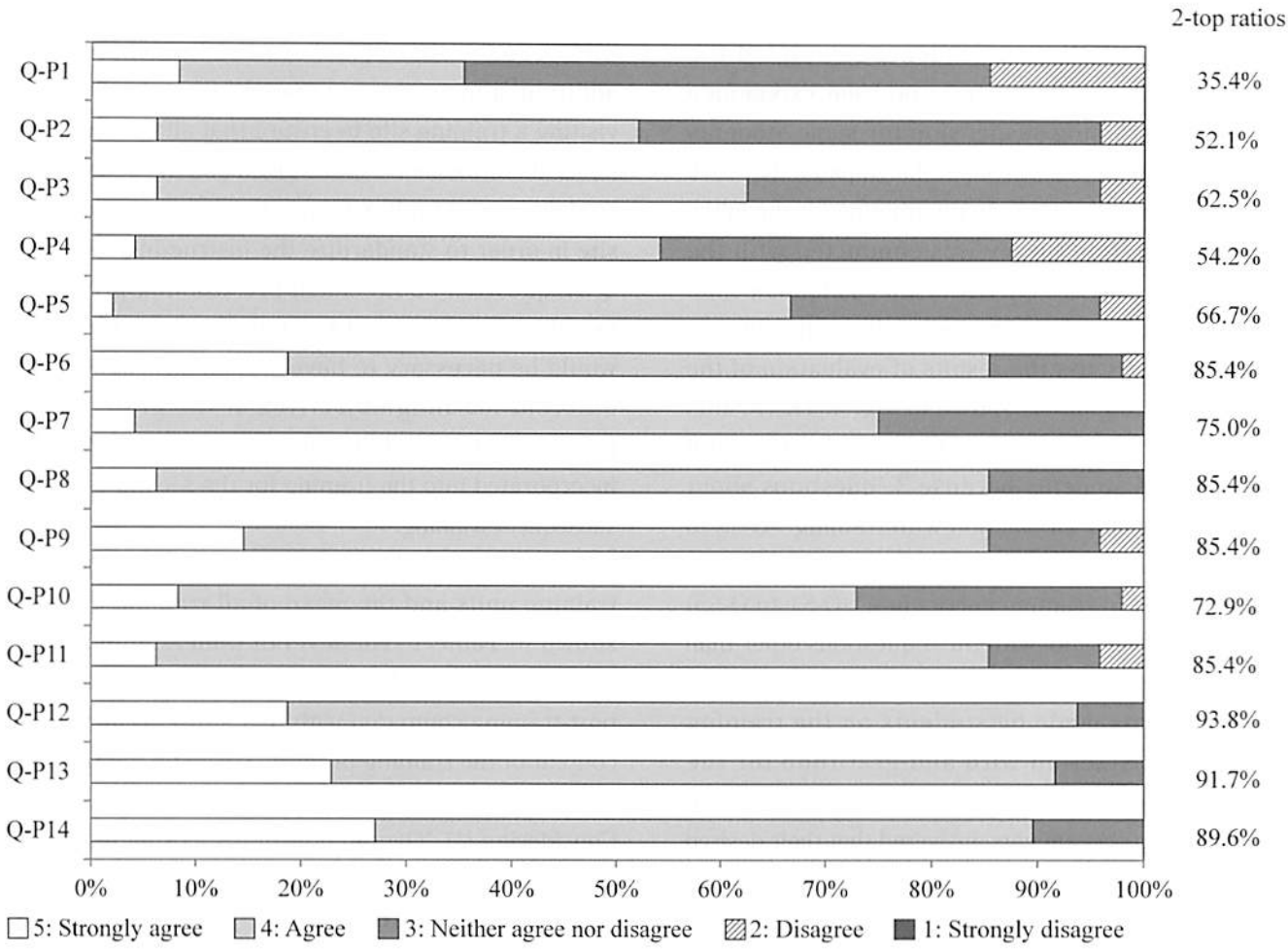

Fig.5 Evaluation of Hospital Pharmacy Practice Training by Instructing Pharmacists (Results)

4. Free comments on the training

In total, 66 free comments on the training were made by students, including 35 (53.0%) with the most common type of comment, referring to "satisfaction with and gratitude for the training," followed by 13 (20.0%) showing "dissatisfaction with the university support system" and 11 (16.7%) showing "dissatisfaction with training guidance and training site." Sixty-five free comments on the training were made by instructing pharmacists, including 18 (27.7%) with the most common type of comment, expressing that they "got a good impression from students' attitudes," followed by 9 (13.8%) showing "dissatisfaction with the score evaluation methods of training" and 8 (12.3%) comments each for "(dissatisfaction with) training curriculum (program and training period)," "dissatisfaction with students' attitudes" and "dissatisfaction with the university support system."

DISCUSSION

At SPU, the Educational and Research Center for Clinical Pharmacy Practice faculty staff has played a leadership role in establishing a Practical Training Committee since 2006. The staff has developed and implemented the program for pre-training for clinical pharmacy practice, contracted with hospitals for long-term practical training and coordinated with them for preparation of the training, as well as enrolled hospitals and pharmacies through the Council on

Pharmaceutical Education, Kanto-Chiku Chousei Kikou, in order to make smooth progress with practical training in the six-year system of pharmaceutical education. In 2010, the first students in the six-year system of pharmaceutical education entered the fifth year and the first long-term practical training was conducted. At SPU, 211 students completed the practical training without a major problem, except for a few days of training suspension for some students affected by the Great East Japan Earthquake that took place on March 11, 2011. As the training for the initial year finished, this survey was conducted with the objective of using the survey results as fundamental data to provide training of higher quality in the future.

Firstly, we discuss the results of evaluation of the training by students as shown in Fig. 4. The results suggest that the training was generally evaluated highly by the students because 3 "questions about aspiration for and satisfaction with training" (Q-S8 to Q-S10) had a very high 2-top ratio exceeding 90%, 5 "questions about training curriculum" (Q-S1 to Q-S5) had a high 2-top ratio, with the 4 questions other than Q-S5 having a value exceeding 80%, and the majority of free comments made by students on the training showed "satisfaction with and gratitude for the training." A more interesting result revealed that about half (47.3%) of the students answered that their desired career in the future is hospital pharmacist. The same question was asked of the same students in their fourth year after completion of the pre-training and only 28.0% of the students answered hospital pharmacist, indicating that there was an increase of 19.4%[6]. This suggests that this training was highly effective not only because the training was highly appreciated but also that it may have affected the students in terms of their desired future path. On the other hand, three items of Q-S5, Q-S6 and Q-S7 were low in the 50%s of the 2-top ratios. Negative answers to Q-S5 question about "training period" amounted to 20% of all responses. However, the majority of students' comments in a free-style text format on "satisfaction with and/or appreciation for the training" include some to read, "This training was rich and full of learning aspects and I hope the training period will be extended," which suggests that students desire a longer period than this, but this question did not enable us to know how long students hope the training to last. To Q-S6 question about "support system from the university" 16% of the answers were negative. Students' free-style comments include similar ones, but this question did not enable us to know what dissatisfied them with "support system from the university." To cope with this, a mailing list of students and instructors in charge as well as all members of the Practical Training Committee was put into practice that can share the information. In addition, a manual was created for the instructors visiting a training site to ensure that all the checking items about the instructions given and the situation of students are not missed during a visit to the training site in order to standardize the instructing visits. To Q-S7 question about "ideal pre-training program" negative answers were 14% of all. To cope with this, it would be necessary to have students recognize the different learning objectives of the pre-training program and Clinical Pharmacy Training, and this was incorporated into the training for the second year and subsequent training.

We now discuss the results of levels of learning from training units and the mean of all training units as shown in Table 1. The level of understanding as a result of learning from every training unit rose at post-training compared with that at pre-training. The content of the training program based on the training curriculum suggests general achievement of learning. Considering U1 "Overall flow of dispensing practice," U2 "Counting and weighing dispensing and dispensing audit" and U3 "Compliance guidance toward outpatients," which showed low values. U1 and U2 showed higher points already from the pre-questionnaire, naturally showing low points in terms of the difference in the level of learning. This underlies the high levels of learning by students of U1 and U2, as these are considered as units in which students are already well versed from the pre-training practice. However, the value for U3 was 2.3 points in the pre-questionnaire and 3.3 points in the post-questionnaire, which are both low in terms of the levels of learning. This is probably because in-house compliance guidance toward outpatients was reduced due to the recent increase in the proportion of external prescriptions to outpatients at the hospitals. These units can be fully learned in pharmacy training practice and need to be reviewed by a revision of the training curriculum.

Now, we consider five practical training units that showed high points in the differences in levels of

learning before and after the training: U5 "Safety management," U11 "Role of a pharmacist at ward practice and team healthcare," U12 "Medication management guidance at ward practice and prescription support activities of a pharmacist," U13 "Overall hospital preparation" and U16 "Ethics and attitudes of a pharmacist as a healthcare provider." What these five items have in common is that they can only be learned at hospital training and the high scores confirm that this hospital training was useful for the students.

Next, the results of evaluation of the training by instructing pharmacists shown in Fig.5 are discussed. It is suggested that this training is appreciated at a certain level from the perspectives of instructing pharmacists since 1 "question about the support system from the university" (Q-P6), 3 "questions about the training students" (Q-P7 to Q-P9) and 4 "questions about training guidance" (Q-10 to Q-P14) were highly evaluated, with 2-top ratios exceeding 70%. On the other hand, Q-P1, Q-P2 and Q-P4 showed relatively low 2-top values of 35.4%, 52.1% and 54.2%, respectively. Likewise, similar free comments were made by instructing pharmacists. Of them the 2-top ratio to Q-P1 "programs of the training curriculum" was the lowest at 35.4%. Yet, this training has just begun. The "programs of the training curriculum" are still going through the process of trial and error at each site and could thus be self-rated low. Answers to Q-P2 "Training period" did not clearly tell whether students found the training too long or short. Q-P3 "Burden of evaluation of the developmental process of students" includes the burden of time-consuming evaluation on meticulous items. The developmental process evaluation method for students, however, needs to be accepted, even though it might be burdensome, as it is a method commonly used in Japan. The burden could be eased once the evaluators get used to it. These evaluation items need to be reviewed in the subsequent years.

Levels of learning after the practical training have already been reported in questionnaire surveys of practical training on students[7-9] conducted by the Hospital & Pharmacy Practical Training Kantou Chousei Organization and other universities and in questionnaire survey[10] of practical training on hospital pharmacists conducted by the Japanese Society of Hospital Pharmacists. Our survey in this report is, however, noteworthy because it measured pre and post-training learning levels of respective training units contained in this training program to determine the changes in learning levels, which eventually indicated there existed differences in learning levels among the units trained.

Nonetheless, the measurement methods of evaluation of the survey were based only on subjective evaluations by the students and instructing pharmacists and are limited in terms of objective evaluation. We must consider whether these methodologies could truly measure the evaluation of the training correctly. In the future, we would like to consider correlations with formative and comprehensive assessments of training.

The survey on the training in the initial year of the six-year system of pharmaceutical education enabled us to identify effects of and problems with the training. We must strive to secure the quality of training practice further, including pre-training, and strengthen systems of collaboration with training hospitals. In addition, the faculty staff and instructing pharmacists in the clinical field must make a concerted effort to teach and develop new junior pharmacists.

ACKNOWLEDGMENT

We thank the pharmacists at the institutions for providing kind instructions for the training.

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