JAASP http://www.aaspjournal.org
Journal of Asian Association of Schools of Pharmacy 2021; 10: 35–39

Research Paper

Academic detailing exercise course in RIKADAI: Toward the integration of basic and clinical science

Hideyo Takahashi[1,*], Takao Aoyama[1], Akiyoshi Saitoh[1], Shuji Shimada[1], Tatsunori Suzuki[1], Ryoko Takasawa[1], Makiya Nishikawa[1], Yasunari Mano[1] and Masayo Komoda[1,2,*]

[1] *Faculty of Pharmaceutical Sciences, Tokyo University of Science, Chiba, Japan*
[2] *Department of Pharmacy, Chiba Nishi General Hospital, Tokushukai Medical Corporation, Chiba, Japan*

Received September 29, 2021
Revised November 16, 2021
Accepted November 22, 2021

* Corresponding authors
Faculty of Pharmaceutical Sciences, Tokyo University of Science, 2641Yamazaki, Noda-shi, Chiba 278-8510, Japan
E-mail: hide-tak@rs.tus.ac.jp

ABSTRACT

A historic reform in pharmacy education was proposed in Japan in 2006. Japanese universities established a six-year education program that integrated pre-pharmacy, basic pharmacy, and specialized pharmacy courses with on-the-job training in hospitals and pharmacies. The goal of the six-year program was to produce pharmacists who are well-versed in science, arts, and humanities. Our university offers an academic detailing exercise course that provides opportunities for students to integrate basic and clinical science. Additionally, this course enables faculty members to participate in a collaborative investigation. Such experiences allow faculty members to expand their learning and develop a good rapport with one another. An academic detailing exercise course is likely to contribute to the progress of the pharmacy education system, yielding well-informed pharmacists with in-depth knowledge.

Key words: academic detailing, mutual understanding, pharmacist scientist, pharmaceutical science

1. Introduction

Before 2006, colleges of pharmacy in Japan had a four-year curriculum. After graduation, students immediately took a national examination for pharmacists. Most proceeded to work as licensed pharmacists at pharmacies or hospitals. There was also a choice to pursue a two-year master's program. Most students who completed the two-year course were hired as researchers by pharmaceutical companies. A three-year doctoral course was also available for pharmacy students. Students who received doctorates typically became assistants to university professors. At that time, graduates generally chose diverse careers. In 2006, the Japanese pharmacy education system was modified to a six-year curriculum, causing a considerable shift. This new curriculum corresponds to the increasing standards of pharmaceutical education since the role of pharmacists in the medical field has expanded. In clinical settings, physicians, nurses, and pharmacists collaborate to treat patients. To make an optimal contribution to team treatment practices, clinical pharmacists require extensive knowledge. The reform to a six-year program was based on reflections on how the previous four-year pharmacy education focused on basic science (e.g., oraganic chemistry, biochemistry). It was realized that basic science was inadequate for developing pharmacists as medical professionals who could provide high-quality healthcare with maximum patient safety and comfort (Ozawa, 2018). Therefore, in the fifth year of the six-year program, students receive on-the-job training, which consists of 11 weeks in a retail setting as well as a hospital. Students learn various skills, such as syrup measurement, preparation of infusion sets, and how to interview patients. Many professors in the faculty of pharmaceutical sciences consider clinical pharmacy to be the most important element in this six-year program. As a result, graduates pursuing the six-year program participate in team-based healthcare in hospitals and community-based healthcare settings. However, there are concerns that pharmacy students might lack sufficient knowledge of basic science, which should be their main strength. We should not overlook the fact that drugs are compounds, and only pharmacists can evaluate their characteristics based on their chemical structure. Clinical pharmacists should have a solid foundation in basic science as well as the skills needed in the clinical setting.

To address this problem of integrating basic science and clinical science, our faculty's current education program

offers an academic detailing exercise course that integrates basic and clinical knowledge. Academic detailing is a form of personalized support for improving clinical decision-making by relying on the latest noncommercial evidence-based data (Avorn and Soumerai, 1983). In Canada, Australia, and the US, academic detailers, who are clinical pharmacists or academic teachers, play active roles in clinical settings (Moss et al., 2019). In the exercise course, students learn how to integrate basic and clinical science, which will be useful for academic detailers in the future.

This paper attempts to introduce the academic detailing exercise course offered at our university, Tokyo University of Science, commonly known as RIKADAI. We also discuss the importance of mutual understanding amongst faculty members considering the lessons learned from this program.

2. Methods

2.1. Educational environment

The practice session comprised a total of eight classes, which consisted of two 90-minute exercise sessions per week held for four weeks. Twenty-three fourth-year pharmacy students (23% of the enrolled students) were divided into groups of five or six. In this exercise course, students approached a clinical case to determine the most appropriate prescription for the patient. They learned through lectures, problem-based learning, and small-group discussion (SGD). The human resources comprised faculty members: three professors who specialized in basic science and five who specialized in clinical pharmacy, one of them is a physician. They delivered lectures and served as facilitators, providing adequate feedback to students during SGD. After this exercise course, we administered a multiple-choice questionnaire survey to obtain student feedback.

2.2. Components and schedule of the exercise course

As shown in Table 1, Day 1 started with orientation, in which students learned the significance of an academic detailing in the clinical setting. A professor with clinical experience shared examples of academic detailing in foreign countries. The objective of the exercise course was communicated to the students. They were asked to determine the most suitable drug for the case presented in the class and provide a clear-cut oral presentation in the last session, which was expected to improve the clinical decision-making. The clinical case presented to the students was that of a 50-year-old man who worked as a door-to-door salesman. He was a smoker diagnosed with *Mycobacterium avium complex*. His symptoms included upset stomach, chest pain, and cough. He was taking the following medicines: rifampicin, ethambutol, and clarithromycin. Based on this information, the students attempted to pick up on the problem with the patient in SGD 1. After SGD 1, more precise information about the patient was provided; the students researched the patient's clinical condition using the internet and textbooks during SGD 2 and deduced the patient's condition as gastroesophageal reflux disease (GERD). Following this, the students discussed the pharmacological treatment for GERD and made a joint decision that reducing the stomach acid level would be the most appropriate treatment. At an appropriate time, the first lecture was delivered by a professor working as a hospital physician (Lecture 1). He confirmed the GERD diagnosis and explained the characteristic symptoms, causes, and treatment of GERD. During the lecture, the physician professor explained the clinical condition of the patient, and the students were given the opportunity to seek clarifications from the physician regarding the patient's medical treatment in the clinical setting.

On the second day, a pharmacology professor explained the pharmacodynamics of acid-reducing agents (Lecture 2). He explained the mechanism of gastric acid secretion and summarized the available acid-reducing agents, such as proton pump inhibitors (PPIs), histamine H2-blockers, and muscarine M3-antagonists. After the lecture, the students participated in a discussion to determine the most suitable acid-reducing agent for the patient and concluded that PPIs would be the most appropriate (SGD 3). On the same day, another professor, specializing in clinical pharmacy, summarized the practice guidelines pertaining to the concerned illness and provided an explanation regarding their implementation (Lecture 3). He prompted the students to verify the practice guidelines on their own (SGD 4). The

Table 1. Schedule of academic detailing exercise course.

	30 min	30 min	30 min	30 min	30 min	30 min
1st day	Orientation	SGD 1		SGD2		Lecture 1
2nd day	Lecture 2	SGD 3	Lecture 3	SGD 4	Lecture 4	SGD 5
3rd day	Presentation	Lecture 5	Lecture 6	Lecture 7	SGD 6	
4th day	Lecture 8	Lecture 9	SGD7		Presentation	Overview

Note: SGD: small-group discussion

professor then explained the practice guidelines for pharmacological treatment of GERD (Lecture 4). Thereafter, additional information about this patient was provided, and the students discussed it amongst themselves (SGD 5).

On the third day, the students summarized the information they had gathered thus far and gave presentations in a group setting. Afterward, a professor of pharmacokinetics explained the metabolism of each PPI (Lecture 5). With reference to this, another professor who specialized in clinical pharmacy delivered lectures explaining the cross-interaction of metabolism by cytochrome P450 (Lecture 6). Moreover, a professor of molecular biology discussed the background of genetic polymorphisms in the Japanese population and their effect on pharmacokinetics (Lecture 7). After these lectures, the sixth SGD started, during which students compared several PPIs concerning pharmacokinetics. Then, the focal point of discussion progressed to the chemical structures of PPIs. The students drew the chemical structures and compared them. They realized that the structures were quite similar, except for that of vonoprazan (Figure 1).

On the fourth day, a professor of medicinal chemistry described the characteristics of the chemical structures and the action mechanisms of PPIs (Lecture 8). The students learned that the main feature of the action mechanism of PPIs, except for vonoprazan, is irreversible inhibition, which means that the drug completely inhibits the target enzyme proton pump (Andersson and Carlsson, 2005). Thereafter, a professor with clinical experience shared practical advice with the students to help them prepare a successful presentation for attending doctors (Lecture 9). Following this, SGD 7 was conducted, which pertained to the choice of the most appropriate PPI prescription for the patient. Students reconsidered the discussions held in the past sessions, including how to provide information on the most appropriate pharmaceuticals to attending doctors. Afterward, each group representative presented the group decision for the most suitable drug that could be prescribed to this patient. Each group representative attempted to provide an easy explanation through the oral presentation to help the attending doctors. After the presentation, an overview session of the exercise classes was scheduled.

After the exercise course, the students' feedback on the program was collected. At that time, the students were informed of the potential publication of results of the questionnaire under the condition of anonymity. The students were also informed that their responses on the questionnaire would not be considered for academic assessment. The responses of students who consented are depicted in the result section of the report.

2.3. Assessment of student achievement

We used two rubric assessments to assess the achievement of each student: one for each group to determine whether the group members had attained the objectives of the exercise

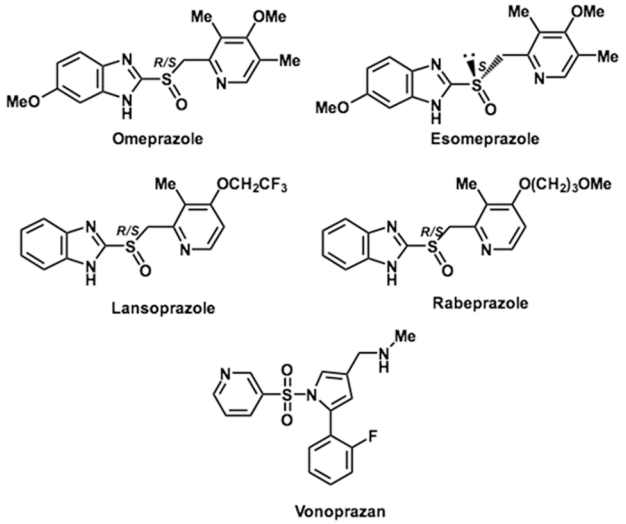

Figure 1. Chemical structures of proton pump inhibitors.

(Table 2) and one for examining their individual attitudes during SGDs. Before conducting the course, the purpose of the exercise and the rubrics was communicated to the participants. The goals for the exercise course were as follows: "Be able to critically examine the differences in basic sciences perspectives of chemistry, pharmacology, pharmacokinetics, and genomics and suggest the optimal medicine for the case." Their achievement was evaluated based on the following criteria: "understanding of academic detailing," "understanding of pathophysiology and selection of drugs from a pharmacological perspective," "drug selection from the perspective of pharmacokinetics," and "utilizing differences in the structural formulae of drugs in proposal for prescription." Each group participated in the exercise to achieve Level 4 on the rubric. All professors evaluated the rubric for each group. Furthermore, a similar five-level rubric evaluation was conducted to assess the individual students' SGDs concerning "attitude toward the course," "a sense of participation," "proactiveness," and "listening attitude."

3. Results and Discussion

The students' feedback on this program is illustrated in Figures 2 and 3. The recovery rate of the questionnaire was 70%. The average score of the four groups on the rubric was 11.5 ± 1.4 (mean ± S.D.) with 16 being the highest. Additionally, the average score of individual students on the rubric for SGD was 12.5 ± 2.8 with 16 being the highest. The results concerning the responses to the questions are discussed below.

1. What did you think about this academic detailing exercise course?

About 81% of the students selected one of the following options: "very interesting," "interesting," or "slightly interesting" (Figure 2). The results revealed that most students had a favorable impression of the academic

Table 2. Rubric of the basic academic detailing exercise.

Criteria	Level 4	Level 3	Level 2	Level 1	Level 0
Understanding Academic Detailing	To be able to understand the definition of academic detailing and propose it in an easy-to-understand manner based on the patient's disease state and from a pharmaceutical perspective.	To be able to understand the definition of academic detailing and propose it in an easy-to-understand manner from a pharmaceutical perspective.	To be able to explain the definition of academic detailing.	To be able to provide a rough explanation of the definition of academic detailing.	Level 1 is not attained.
Understanding the pathophysiology and selecting drugs from a pharmacological perspective	To be able to select the appropriate medicine for a patient keeping the different pharmacological effects of medicines related to the treatment of a disease state in mind.	To be able to predict the disease state based on the symptoms and list the pharmacological mechanisms of action related to the treatment.	To be able to predict the disease state based on the symptoms and list the drugs for the treatment of the disease.	To be able to predict the disease based on the symptoms.	Level 1 is not attained.
Drug selection from the perspective of pharmacokinetics	To be able to select the appropriate medicine for treating the patient suffering from a particular illness (renal failure, hepatic failure, etc.) from the perspective of pharmacokinetics.	To understand the differences in the pharmacokinetics of the same drug groups in terms of excretion and metabolism pathways, enzymes involved in metabolism, and genetic polymorphisms.	To be able to determine whether each drug is renally excreted or hepatically metabolized and to visualize the pharmacokinetics of each drug considering the genetic polymorphisms of drug-metabolizing enzymes.	To be able to explain whether each drug is renally excreted or hepatically metabolized and explain the genetic polymorphisms of drug-metabolizing enzymes.	Level 1 is not attained.
Utilizing differences in the structural formulae of the drugs while proposing the prescription	To be able to explain the criteria for the selection of appropriate drugs for the patients based on differences in their structural formulae.	To be able to explain the differences in pharmacokinetics and interactions with concomitant drugs based on their structural formulae.	To be able to explain the interaction modes and mechanisms of action of drugs with target receptors and enzymes based on their structural formulae.	To be able to draw the structural formula of each drug.	Level 1 is not attained.

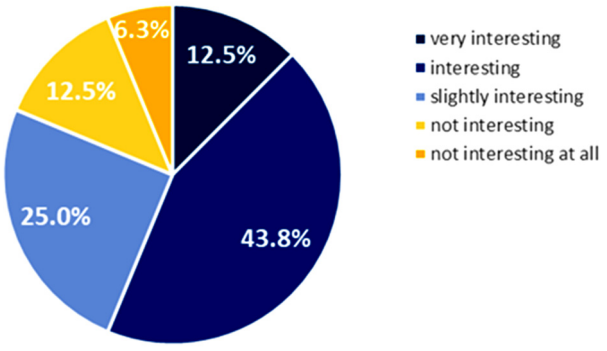

Figure 2. Students' feedback (n = 16) on the academic detailing exercise course.

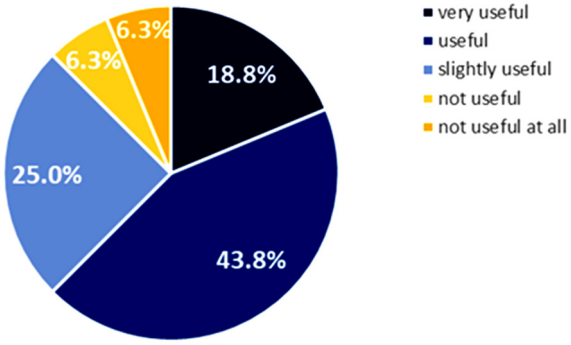

Figure 3. Students' feedback (n = 16) on the usefulness of academic detailing exercise course.

detailing exercise course.

2. Do you think this academic detailing exercise course is useful for pharmacists?

About 88% of the students selected one of the following options: "very useful," "useful," or "slightly useful" (Figure 3). Most students were interested in the course and recognized the value of academic detailing for pharmacists.

On the fourth day, the students gave an unexpected response. During the presentation, while discussing the most appropriate drug for the patient, one student reported that rabeprazole was the best drug, because it was metabolized non-enzymatically. In the explanatory leaflet provided by the drug manufacturer, the reaction scheme was described in the section on metabolism of rabeprazole, which mentioned that the reaction was non-enzymatic; namely, there was no effect of cytochrome P450 on rabeprazole. Therefore, rabeprazole

appeared safe as well as convenient to use, because pharmacokinetics or drug interactions do not affect it. Another student inquired whether non-enzymatic reduction occurred only with rabeprazole. No explanation could be provided regarding the non-enzymatic metabolism of other PPIs, which meant that other PPIs were metabolized by cytochrome P450. Surprisingly, most students did not accept this, because they drew the chemical structures of PPIs individually and found that the chemical structures of omeprazole, esomeprazole, rabeprazole, and lansoprazole were similar (Figure 1). Moreover, they understood the lecture on medicinal chemistry, which explained that all PPIs, except for vonoprazan, have the same mechanisms of inhibitory effect against proton pumps. Considering all the factors, the students felt that the description of the non-enzymatic metabolism of rabeprazole in the explanatory leaflet lacked clarity. They insisted that rabeprazole and other PPIs should undergo metabolism by cytochrome P450. Interestingly, all professors supported the students' opinions because they delivered multiple lectures to this course, researched along with the students, and were also doubtful of the description provided in the explanatory leaflet about rabeprazole, which was not metabolized by cytochrome P450.

This exercise course was beneficial for the students because they had the opportunity to be taught by professors from different fields. It is quite uncommon for professors specializing in basic science and clinical pharmacy to work collaboratively on a specific disease (such as GERD in this study) and deliver lectures cooperatively from their own viewpoint. The lectures were interesting and of high quality. Additionally, students could influence one another through SGDs. This valuable experience promoted in-depth understanding in the students. The students were able to gain comprehensive knowledge and discovered that no evidence was found to confirm the description of non-enzymatic metabolism of rabeprazole.

The benefit of this academic detailing exercise course for faculty members was that they could listen to each other's lectures, which is a rare opportunity. Professors usually never attend other professors' classes; specifically, they possess expertise in their own field and generally are not specialized in other areas. However, the professors were given the opportunity to integrate their knowledge of basic and clinical science by attending the exercise classes. They also acted as facilitators in SGDs to receive feedback on their lectures directly from the students. These experiences initiated integrative study and allowed professors to expand their learning while developing a good rapport among themselves. After the exercise course, the professors undertook a collaborative investigation on whether non-enzymatic reduction occurred only with rabeprazole. The results, supporting the students' impressions, were irrelevant to the main subject of this study. Further in-depth studies can be undertaken to explore the details.

Currently, students receiving pharmacy education through the six-year program are expected to contribute to advances in healthcare and support systems and meet the needs of the new era. Was the swing of the educational pendulum too great for clinical pharmacies? Formerly, a "pharmacist" was referred to as a "chemist," which reminded people of their scientific ability. Professor Inui once suggested that each pharmacist should be a pharmaceutical scientist (Inui, 2017, 2019). We suggest that the integration of basic and clinical science explored in our academic detailing exercise course is an effective strategy to enable pharmacists to play the essential role of scientists. It is necessary to strengthen collaborative education of clinical and basic science, which will lead to an overall improvement in students' abilities, especially those required in a proficient pharmacist. It should be noted that such a collaborative exercise course also improves the understanding among faculty members involved in the collaborative investigation. Professors, as specialists in their fields, must develop a mutual understanding and work cooperatively to transform the educational system for the better in the future.

4. Conclusion

The academic detailing exercise course that incorporated SGDs and lectures focused on the treatment of specific diseases, which provided a great opportunity for the students to integrate the study of basic and clinical science. This educational program yielded better learning outcomes for both the students and professors. Although we realized that basic science alone was not enough to develop pharmacists as medical professionals providing high-quality healthcare, we suggest that basic science should be properly integrated into the six-year pharmacy education course, which will contribute to students' success in the future.

References

Andersson K and Carlsson E. Potassium-competitive acid blockade: A new therapeutic strategy in acid-related diseases. Pharmacol Ther. 2005; 108: 294-307.

Avorn J and Soumerai SB. Improving drug-therapy decisions through educational outreach: A randomized controlled trial of academically based 'detailing'. N Engl J Med. 1983; 308: 1457-1463.

Inui K. Responsibility and pride of 6-year pharmacy education. Yakuzaigaku. 2017; 77: 15-18.

Inui K. Current status and perspectives of the 6-year pharmaceutical education in Japan: Aiming to train pharmacist-scientists. In: Proceedings of the 9th Asian Association of Schools of Pharmacy Conference 2019, Suwon, Korea, July 3-5, 2019.

Moss JM, Bryan III WE, Wilkerson LM, King HA, Jackson GL, Owenby RK, et al. An interdisciplinary academic detailing approach to decrease inappropriate medication prescribing by physician residents for older veterans treated in the emergency department. J Pharm Pract. 2019; 32: 167-174.

Ozawa K. Progress of pharmacy education in Japan—Model core curriculum for pharmacy education and the evaluation standards. J Asian Assoc School Pharm. 2018; 7: 8-14.