"Kampo-sommelier Practice": A Trial for an Active Learning Program in Kampo (Japanese Traditional) Medicine

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Objective: This study aimed to assess the effectiveness of Kampo-sommelier practice, an active learning program on crude drugs used in Kampo formulations.
Methods: The participants were fourth-year Tokai University School of Medicine students as of 2017. Eighteen small teams attended a 20-minute Kampo-sommelier practice session and were provided 10 kinds of crude drugs (Licorice, Cinnamon, Ginger, etc.) in three forms, original, cut, and powdered, while blinded to the drugs. Each team was asked to distinguish each drug in terms of form, scent, flavor, and color with reference to described characteristics. The ability to match the names of the drugs with their descriptions was assessed in the participants one month later, and also in human science "A" and medicine "B" students, without prior education, and pharmacy "C" students, with professional education.
Results: The 117 participants received an average score of 6.2 ± 2.4 (mean ± S.D.) out of 10, which was significantly higher than 3.4 ± 1.8 in 97 "A" students and 3.1 ± 2.4 in 85 "B" students and lower than 8.4 ± 2.1 in 135 "C" students ($p < 0.05$ for all).
Conclusions: The effectiveness of this team-based learning approach is suggested by the significantly higher scores of the participants.

Key words: Kampo medicine, Kampo-sommelier practice, undergraduate education, crude drug, experience-based learning (EBL)

INTRODUCTION

Kampo medicine, i.e., Japanese traditional medicine, was introduced into Japan from China via the Korean Peninsula 1500 years ago, and has developed into a unique Japanese medicine over a relatively long period of time in the context of the Japanese climate and culture [1]. Kampo medicine has, therefore, developed into a system that is completely different from traditional Chinese and Korean medicines. In recent years, complementary and alternative medicine (CAM), of many countries, including Kampo medicine, has attracted attention worldwide. CAM education is described in the global standard of medical education [2], which is accepted in all Japanese medical universities. The terminology of traditional medicine is widely introduced in the ICD-11 [3], and therefore the notion and use of CAM will be expected to expand in the world. Reports and articles on Kampo medicine have been increasing worldwide recently. Therefore, Kampo medicine is now globally recognized and actively introduced into the education curricula for medical students and residents in Japan.

Regarding Kampo education in Japan, all medical students have some chance to study Kampo medicine and prescriptions as a part of the curriculum. However, Japanese medical schools provide only limited classes in Kampo education, and therefore students have little opportunity to become familiar with the crude drugs [4]. Considering that each Kampo formula consists of several kinds of crude drugs, most of which are made from medicinal plants and the others from animal or mineral sources, it is important for medical students to become familiar with the crude materials to motivate themselves to learn Kampo medicine. This study aimed to assess the effectiveness of "Kampo-sommelier practice," an active learning program on crude drugs proposed for undergraduate medical education environments.

PARTICIPANTS AND METHODS

Participants

Fourth-year Tokai University School of Medicine students as of 2017, third-year human sciences students of "A" University and fourth-year medical students of "B" University, all three university students having learned only introductory Kampo theory class, but having no prior education on crude drugs, and fourth-year pharmacy students of "C" University, who had received professional education in the field including crude drugs also participated.

Experience-based learning (EBL) course

At Tokai University School of Medicine, after

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attending 6-hour lectures about Kampo medicine, the students were divided into nine groups (12 to 14 students per group) for a 3-hour experience-based learning (EBL) course consisting of a 1-hour session for each of three subjects: Kampo medicine, acupuncture and moxibustion, and crude drugs (Fig. 1). Three instructors and three part-time assistants were responsible for the overall sessions, and three pairs of one instructor and one assistant each were in charge of the three subjects, respectively. The training was given to three groups per day once a week and completed in three weeks. For training with crude drugs, Kampo-sommelier practice was newly introduced in addition to Kampo-tasting practice, in which the students simply had tasted a Kampo formula in three typical dosage forms: extract, decoction, and powder.

Kampo-sommelier practice

Eighteen teams composed of 6 to 7 students each attended a 20-minute Kampo-sommelier practice session. Before training, all students were confirmed to have no allergy to any of the crude drugs to be used. Each team was provided with 10 kinds of crude drugs (Licorice, Cinnamon, Ginger, Perilla, Jujube, Citrus Peel, Peach Kernel, Ginseng, Pinellia, and Moutan), which are used at relatively high frequency clinically (Fig. 2), each in original, cut, and powdered forms (Fig. 3), and their flavors and scents were distinguished by the students while they were blinded to the types of crude drugs.

Each team distinguished each crude drug in terms of form, scent, flavor, and color with reference to descriptions of characteristics of each drug obtained from famous herbal textbooks. Regarding the powder form, crude drugs with high hygroscopicity were sufficiently dried in a desiccator and then ground into powder with a hand mixer. To enhance the learning effect, an environment in which the students could actively participate with a sense of game-playing among teams was prepared, and finally the teams that correctly answered all questions were honored.

Evaluation

To evaluate the learning effect, an examination consisting of 10 questions involving matching the names of the 10 kinds of crude drugs with their descriptions was administered one month after the EBL course (Appendix). In the regular examination of Kampo medicine, no questions about EBL had been asked, and no information about the questions on this subject was provided to the students in advance.

After obtaining verbal consent, the same questions were answered anonymously within 10 minutes by human sciences students of "A" University and medical students of "B" University, and pharmacy students of "C" University, without notifying them of the questions in advance.

Furthermore, we conducted a questionnaire survey of the students on which training sessions were most impressive among the three subjects: Kampo medicine, acupuncture and moxibustion, and crude drugs (multiple responses allowed), at the end of the EBL course and compared the results with those of questionnaires conducted in the past.

One-way ANOVA and Tukey's multiple comparison tests were used to compare the correct answers among universities. All p values less than 0.05 were considered statistically significant. The study did not require approval by the Institutional Review Board for Clinical Research of Tokai University, because this study was conducted as a part of the regular classes and all results and questions were handled anonymously. The principles of the Helsinki Declaration were confirmed to have been adhered to in this study.

RESULTS

Correct answer scores for the questions about crude drugs

Regarding the results of the examination on crude drugs, the average score of 117 Tokai University students (67 men and 50 women) was 6.2 ± 2.4 (mean ± S.D.) points out of 10, which was significantly higher than that of 97 students from "A" University, at 3.4 ± 1.8 ($p < 0.05$), and 85 students from "B" University, at 3.1 ± 2.4 ($p < 0.05$), and significantly lower than that of 135 students from "C" University, at 8.4 ± 2.1 ($p < 0.05$) (Fig. 4).

Questionnaire survey after EBL course

In the questionnaire survey conducted after the EBL course, 112 (96%) of Tokai University students provided effective responses. The number of students who thought the training with crude drugs was most impressive among the three trainings increased to more than 35% of all responses after introducing the Kampo-sommelier practice (Fig. 5).

DISCUSSION

In the actual field of Kampo education in Japan, with Kampo as a required subject the mean number of Kampo class meetings during the 6 years of medical school was 7.25 classes [5], and only 23% of all training hospitals introduced Kampo education during a 2-year internship [6], mainly due to a lack of qualified Kampo instructors and because there is no standardized Kampo curriculum. Kampo lecture time in undergraduate education is so limited that development of an efficient method of teaching Kampo medicine within such a short time is needed. Therefore, we previously conducted unique lectures focusing on the selected core concepts of "excess-deficiency pattern" and "qi, blood, and fluid systems [7, 8]," which are at the basis of Kampo medicine, and EBL sessions in small groups to enhance the educational effect [4]. However, the EBL sessions, consisting of three subjects, Kampo medicine, acupuncture and moxibustion, and crude drugs, had not been completed yet and needed to be repeatedly improved. Regarding the crude drug practice, it might have been somewhat boring for medical students only to taste a few kinds of crude drugs, although they are main constituents that make up the formulae of Kampo medicine. In the Japanese Pharmacopoeia [9], 158 kinds of herbal medicine and 55 kinds of powder, derived mainly from medicinal plants and partially from animals and minerals, are described in the section on crude drugs. Thus, it is indispensable to have knowledge of each of these herbal medicines to understand the pharmacological actions or efficacy of the Kampo medicines that contain them. However, medical students have little opportunity to

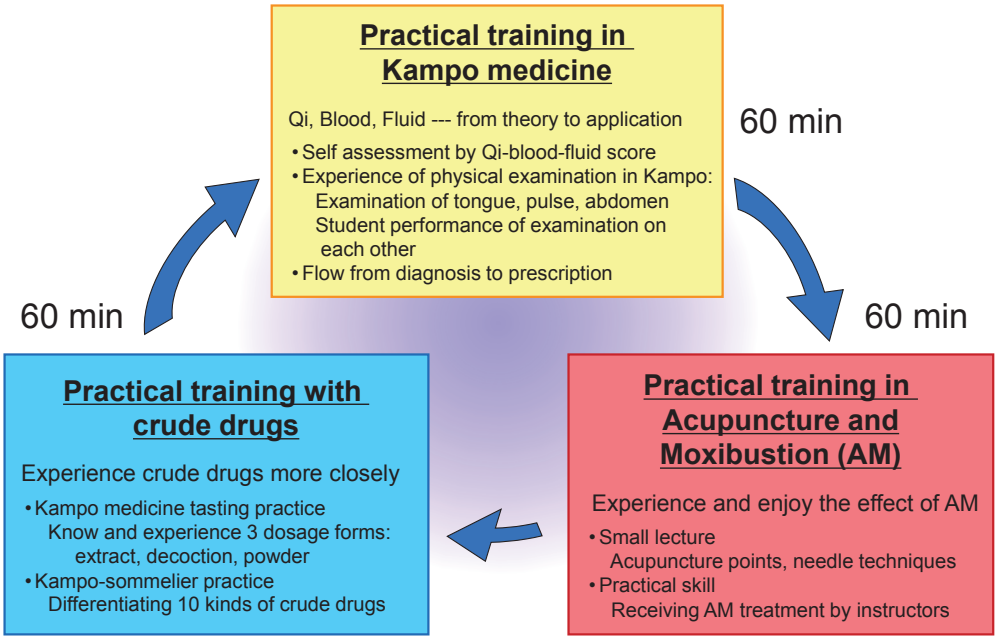

Fig. 1 The contents of the EBL course

Fig. 2 Ten kinds of crude drugs used in the Kampo-sommelier practice (original forms)

Fig. 3 Cinnamon in three forms of original, cut, and powdered

Appendix The examination, consisting of 10 questions involving matching the names of the 10 kinds of crude drugs with their descriptions.

Which descriptive text applies to each of the following 10 kinds of crude drugs (Licorice, Cinnamon, Ginger, Perilla, Jujube, Citrus Peel, Peach Kernel, Ginseng, Pinellia, Moutan) used for Kampo formulae? Enter the corresponding number in the answer table.

1 Fruit. The fruit is about the size of the thumbnail, and larger ones are about 3 cm in diameter. The overall shape is oval, with many large wrinkles but few small ones. The color is deep red and shiny. The pulp is yellowish white or light tan in color; thick, wet, and sticky, and elastic like bread. The flavor is richly sweet and sour. There is a sharp-edged seed inside.
2 Leaf. Leaves are rounded, pointed, thin, and wrinkled, having a long petiole. The stem has four ridges. The stems and leaves have unique aromas. The color is close to purple and lacks clarity, and the flavor is not clear. It is better to use purple and fragrant leaves.
3 Root. Each root has a somewhat long, spindle shape, with a trace of stem on the head, long and straight or branched, with a total length of 6 to 15 cm. The outer surface is somewhat yellowish white, with many wrinkles in the longitudinal direction, and the inside is white or off-white. The cut end is round, and there is some jagged unevenness on the rim. The root bark is obviously white, with a slight scent, a sweet flavor at the beginning and a bitter flavor afterwards. Those from Korea have long been considered best.
4 Peel. It is yellowish brown and has aroma. The flavor is slightly hot and bitter inside. Good ones are fine on the outside, crimson in color, thin, with many white strings on the inner surface and are bitter in flavor.
5 Root. The thickness is about 0.6 to 3 cm. The bark is thin, wrinkled, easy to peel, and the color resembles that of a pine tree. The inside of the root is yellow, and there are many gaps oriented radially from the center toward the outside. The roots are generally dry, lightweight, and easily broken, but some are heavy, smooth, and damp. The flavor is sweet. Choose those that are richly sweet.
6 Root. It is white, with a spherical shape. Small samples are at most as big as a soybean, and big ones almost the size of a thumbnail. It is easily broken, and has a slightly unique, peculiar odor. Although it has no flavor, after chewing it for a while, the inside of the mouth is stimulated, as if pierced. When the sensation is strong, you may feel as if many chestnut thorns are in your mouth, which can be unbearable.
7 Root bark. The surface is gray, and the inside is off-white or light brown. The shape is tubular or semi-tubular, and its thickness ranges from 0.15 to 0.6 cm. It has a unique, strong aroma (somewhat sweaty smell), with a refreshing flavor. Bright needle-like crystals may form in those stored for a long time. This is the principal ingredient named "paeonol." It is fragile and easily broken.
8 Root. It has a strong, hot flavor and unique aroma. Regardless of the size, those with strong hot flavor are considered better. Fresh and compact ones are recommended.
9 Seed. It is 1.2 to 1.8 cm in length and 0.6 to 0.9 cm in width. Its shape is a flattened and sharply pointed oval, and the central part is a little raised on both sides. The surface is covered with thin reddish-brown skin, which is easy to peel off, and the surface of the seed is white and smooth. It contains a lot of oil, which easily comes out if you scratch it. The flavor is mild after chewing it, and then has an apricot-like aroma. It looks roughly like a persimmon seed.
10 Bark. It is rolled or semi-rolled shape, and 0.3 to 1.2 cm in thickness. Although the length varies, it is usually within 30 cm. The outer surface is like the bark of an oak tree, while the inner surface is smooth and reddish brown. The outside is almost flavorless, but the inside takes on medium purplish-black color, and it is sweet and delicious when used in baking.

Licorice	Cinnamon	Ginger	Perilla	Jujube	Citrus Peel	Peach Kernel	Ginseng	Pinellia	Moutan

become familiar with crude drugs, even though they have some chances to learn Kampo medicines and prescriptions. Therefore, we found it necessary to make the crude drug practice more attractive to the students. The Kampo-sommelier practice we conducted was characterized by not only practical training in tasting crude drugs as an experience, but also an active learning environment in which the students could actively participate with a sense of game-playing among teams. The training was so named because the work, mainly involving distinguishing many kinds of crude drugs only based on each flavor, scent, color and shape, was similar to that of a sommelier, who is a trained and knowledgeable wine professional specializing in all aspects of wine service as well as wine and food pairings. This name was also designed to be attractive to the students.

Here, we discuss the validity of the Kampo-sommelier practice. To evaluate the learning effect of this training, we compared the results of the examinations consisting of 10 questions among the students of four universities: Tokai University, "A" University school of human sciences, and "B" University school of medicine, without prior education on crude drugs,

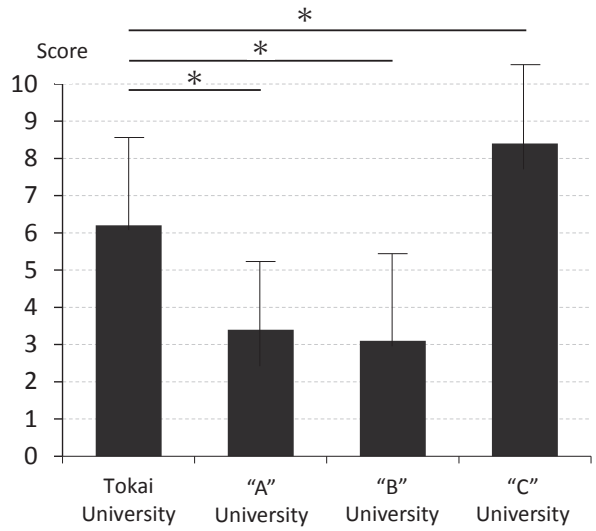

Fig. 4 The results of the examination on crude drugs. One-way ANOVA and Tukey's multiple comparison test, Tokai University; n = 117, "A" University; n = 97, "B" University; n = 85, "C" University; n = 135, *$p < 0.05$

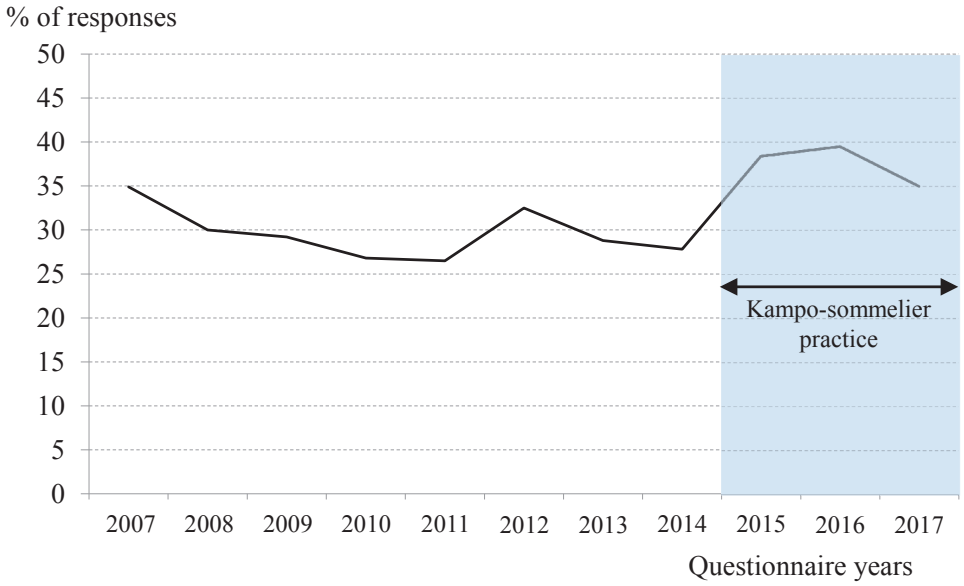

Fig. 5 The percentage of students who thought crude drug practice was most impressive among the three practices. Students were asked which training sessions were most impressive among the three subjects: Kampo medicine, acupuncture and moxibustion, and crude drugs (multiple responses as well as 'none' were allowed), at the end of the EBL course and compared the results with those of questionnaires conducted in the past.

and "C" pharmaceutical University, with professional education in the field. If the 10 questions are randomly answered, the expected score was 1.0. Because the average score of "A" University students was 3.4 and that of "B" University student was 3.1, even with no knowledge about crude drugs, correct answers would be obtained based on hand-out descriptions to some extent. Although they did not reach the score of "C" University, 8.4, the fact that Tokai University students attained a relatively high score of 6.2 on the exam performed without notice one month after practicing for only 20 minutes suggested the Kampo-sommelier practice was effective in enabling students to retain their knowledge of crude drugs.

Also, the questionnaire surveys conducted after the annual Kampo practice showed a trend of increasing rate among students favoring crude drug session after introduction of Kampo-sommelier practice (Fig. 5). These results suggested that Kampo-sommelier practice in addition to conventional tasting-only practice might be more attractive to the students, though we did not compare the results of conventional tasting-only practice with those of Kampo-sommelier practice. The devised students' Kampo practice was evaluated as highly regarded by the students [10].

Regarding the relations between practice time and learning effect, it is known from a study on residents that the amount that can be learned in a 20-minute lecture is equal to the amount that can be learned in a 50-minute lecture [11], and that student attention during lectures tends to wane after approximately 10–15 minutes [12]. Therefore, considering these reports, it seems that the practice time of 20 minutes was relatively appropriate to increase the students' concentration and to gain effective learning. Next, we chose to include only 10 kinds of major crude drugs to be

distinguished in this practice. If we had chosen more kinds of crude drugs, not only would the practice time of 20 minutes needed extension, but also the motivation of the learners might have declined because of a decrease in correct answer rate. Due to these speculations, we refrained from increasing the types of crude drugs for this practice. In addition, these 10 materials were selected from crude drugs that are commonly used in Kampo medicine, and that are characterized by their form, scent, flavor, and color, and seem to be relatively easy to recognize. Raising the correct answer rate of the exam led to improved students' motivation for learning. The results of the exams at four universities and the questionnaire after the crude drug practice are considered to support the validity of this education method. However, there is a report that the greatest variability in student attention arises from differences among teachers and not from the teaching format itself [13]. Therefore, it is necessary to improve not only the educational content, but also the quality of instruction.

There are some limitations in this study. In the EBL course, the students were divided into nine small groups and completed the training in three weeks, because the number of Kampo instructors was limited. Even though the crude drugs in cut form seemed to be dry, about 10% of the mass is moisture; therefore, crude drugs with high hygroscopicity were dried sufficiently in a desiccator and then made into powders in this training [9, 14]. However, since the characteristics of each crude drug are directly related to their freshness, their qualities of scent and flavor may have been reduced in the last training session, which was conducted two weeks after the first session. It is necessary to use fresh and high-quality crude drugs in each training to make it easier for learners to distinguish them.

Almost all medical students who attended the Kampo-sommelier practice seemed to enjoy it positively. Since Kampo-sommelier practice is relatively easy to prepare, this active learning method should be evaluated further in collaboration with other universities by examining the number and kind of crude drugs and improving the quality control of the training in the future.

CONCLUSIONS

This Kampo-sommelier practice, in which learners distinguished 10 major crude drugs constituting Kampo formulae in terms of their flavor, scent, color, and shape with a sense of game-playing among teams is a useful, active method to enhance the effectiveness of learning about Kampo medicine within a short time.

COMPETING INTERESTS

The authors declare no competing financial or non-financial interests in this study; however, the Department of Kampo Medicine, and TK, Department of Community Health received grants from Tsumura, a Japanese manufacturer of Kampo medicine.

AUTHORS' CONTRIBUTIONS

MA conceived the study and TK wrote the manuscript. All authors participated in the data collection, data analysis, and interpretation of data. MA, YN, and KK revised the manuscript. All authors read and approved the final manuscript.

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