調 査 研 究

Effect of shared learning of disaster medicine on medical and pharmacy students

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Abstract   To learn an importance of team collaboration on disaster medicine is one of key issues in the education for undergraduate students. In the joint curriculum of 4-year students of medical and pharmacy schools at Kindai University, which was organized by interprofessional faculty of both schools, small group discussion class as an educational program was organized. The students were welcomed to answer the questions in the questionnaire survey. At the beginning and end of the program, the students were asked structured questions. They were also asked to make free comments at the end of class. We compared pre and post score in the structured questions and conducted sentiment analysis in contextual mining of the free comments of the students.

Of 253 students, 222 students consented to be enrolled in this survey. They emphasized the importance of team collaboration after the class compared to before the class (P＜0.001). Of the free comments, 189 were considered positive to the program by sentiment analysis of text mining. The positive expression such as "way of thinking," "opinion," "opportunity," and "exchange" were related to willingness of students for the program. Of the comments, 91 were considered negative. The words related to negative expressions included such words as "time," "long," "group," and "many." In these expressions, students indicated the redundancy in the plenary session of class.

The shared learning of disaster medicine with a discussion type program was effective in getting the sense of interprofessional collaboration in disaster medicine on both medical and pharmacy students.

I.　Introduction

Development and enhancement of the curriculum for disaster medicine has been a world-wide issue in undergraduate education for health care professionals.[1–3] In the curriculum for disaster medicine, learning interprofessional collaboration is a core objective of the education rather than mastering the individual techniques or methods for di-

saster medicine. However, overcrowded undergraduate curriculum of schools for health care professionals have made it difficult to incorporate the program of interprofessional education for disaster medicine into the current curriculum systems. In Kindai University, we organized an interprofessional faculty between medical school and pharmacy school and have been promoting a learning curriculum crossing the two professional schools.

In 2015 the education program focused on disaster medicine has started. This program has been supported by a project, Problem-Solving Oriented Training Program for Advanced Medical Personnel (organized by A.H.) from the Ministry of Education, Culture, Sports, Science and Technology of Japan. From 2018, this program has been offered as a common required subject in both medical and pharmacy schools. To elucidate the effect of shared learning of disaster medicine on medical and pharmacy students, a questionnaire survey was carried out in this program for

participating students. Their awareness and willingness to devote disaster medicine and interprofessional collaboration in their future careers were evaluated by the survey.

II. Methods

1 Participants

Four-year undergraduate medical students in six-year system who agreed to answer the self-administered questionnaire were enrolled in this study. In this educational program participants were grouped to the mixed teams of medical and pharmacy students and discussed on the issues concerning with disaster medicine (**Table 1**). The ethics committee of Kindai University confirmed that this study did not need ethical review considering the voluntary participation and anonymity of students.

2 Measures and Analyses

The questionnaire was consisted of two parts. In the first part, the students were asked to score their own perception on a 5 point Likert scale using fill-in-the-bubble sheets. The rating scales were from 1 to 5 to signify Strongly Disagree, Disagree, Neither Agree Nor Disagree, Agree, or Strongly Agree, respectively. The differences in answer patterns were compared with beginning and end of the program using by Wilcoxon signed-rank test. The statistical significance was set at $P<0.05$. The statistical analyses were conducted using the SPSS ver 25 (IBM Japan, Ltd., Tokyo, Japan).

In the second part of the questionnaire, students wrote the free comments about this educational program. These free comments were analyzed by text mining using SPSS Text Analytics for Surveys ver 4.0.1 (IBM Japan, Ltd., Tokyo, Japan). For the natural language processing, we used Nazuki Emotion Analyzer Library ver 1.5 (NTT Data Inc, Tokyo, Japan) to conduct sentiment analysis.[4] In this process we included words that occurred fifteen or more times to categorical analyses. As for the categorical analysis following text analysis, correspondence analysis using the syntax developed

Table 1 Titles list of team discussion

Team number	Title of team discussion students chose
1	Evacuation center management
2	Disaster in metropolis
3	Care in and out of hospital
4	The role of logistics in disaster management
5	Coordination in disaster management and response
6	Learn from Red Cross
7	Coordination in disaster management
8	Nursing care in disaster
9	Supply of prescription drug in disaster time
10	SNS in disaster
11	DMAT and healthcare providers
12	Medical records in disaster
13	Media strategy
14	Role of healthcare providers in disaster
15	Team collaboration for coming big earthquake
16	False rumors in disaster time
17	Media and information in disaster time
18	Before DMAT comes
19	Kobe earthquake and Great East Japan earthquake
20	Problems of DMAT in Japan
21	Physician-pharmacist collaboration
22	Problems of DMAT in Japan
23	What will happen in Nankai Trough earthquake
24	Role of pharmacists in disaster
25	Recent three major earthquakes in Japan
26	Computerization of data on medication notebook
27	Triage

by Leiden SPSS Group (Correspondence ver 1.1 Leiden University, The Netherlands) was conducted.

III. Results

Of the 253 students who participated in the class, 222 students consented to be enrolled in this survey and answered all of the questions listed in **Table 2** and provided free comments (recovery rate 87.7%).

In all structured questions concerning the students' perception of the program, there were significant differences between pre-score (at the beginning of the program) and post- score (at the end of the program) (**Table 2**). In the details of **Table 2**, students cultivated interest and recognition of importance of disaster medicine more in the end of the program than in the beginning (P＜0.001 for **Table 2**, No. 1 and **Table 2**, No. 2). Students also changed attitude

positively for participation in team discussion during the class (P＜0.001 for **Table 2**, No. 3). In the end of class, many students showed preference to discussion type class than didactic lecture type class (P＜0.001 for **Table 2**, No. 4). In the question of **Table 2**, No. 4, 163 students ranked up their answers in the end of the class. Through the class, students' confidence for the knowledge level of disaster medicine enhanced (P＜0.001 for **Table 2**, No. 5 and **Table 2**, No. 6). In the question of **Table 2**, No. 5, 167 students ranked up their answers. Not only knowledge level but attitude for team collaboration were promoted during the class (P＜0.05 for **Table 2**, No. 7 and P＜0.001 for **Table 2**, No. 8). Students' interests made them the future involvement in the disaster medicine (P＜0.001 for **Table 2**, No. 9). In all the questions except the question of **Table 2**, No. 9, answer patterns were similar in medical and phar-

Table 2　Answer scores from students

No	Question	Number of students in each answer score						significance pre vs post
		1[a]	2[b]	3[c]	4[d]	5[e]	total	
1	I am interested in disaster medicine							
	pre-score	17	37	90	66	12	222	P＜0.001
	post-score	1	13	58	118	32	222	
2	Disaster medicine is important							
	pre-score	8	19	55	106	34	222	P＜0.001
	post-score	2	6	36	113	65	222	
3	I actively participate in team discussion							
	pre-score	12	61	91	54	4	222	P＜0.001
	post-score	5	13	62	100	42	222	
4	I like to learn through discussion more than through didactic lecture							
	pre-score	46	72	61	30	13	222	P＜0.001
	post-score	4	16	64	96	42	222	
5	I know about disaster medicine							
	pre-score	10	52	102	54	4	222	P＜0.001
	post-score	1	2	26	127	66	222	
6	I can point out current problems of disaster medicine							
	pre-score	10	61	113	36	2	222	P＜0.001
	post-score	1	13	89	105	14	222	
7	I know how the students of other department think							
	pre-score	7	19	45	120	31	222	P＜0.05
	post-score	3	7	51	120	40	221	
8	I understand the importance of team collaboration in disaster medicine							
	pre-score	1	15	85	105	16	222	P＜0.001
	post-score	1	2	26	127	66	222	
9	I want to be involved in disaster medicine in the future							
	pre-score	6	16	93	87	20	222	P＜0.001
	post-score	1	14	61	109	37	222	

a: Strongly disagree, b:Disagree, c:Neither Agree Nor Disagree, d: Agree, e: Strongly Agree
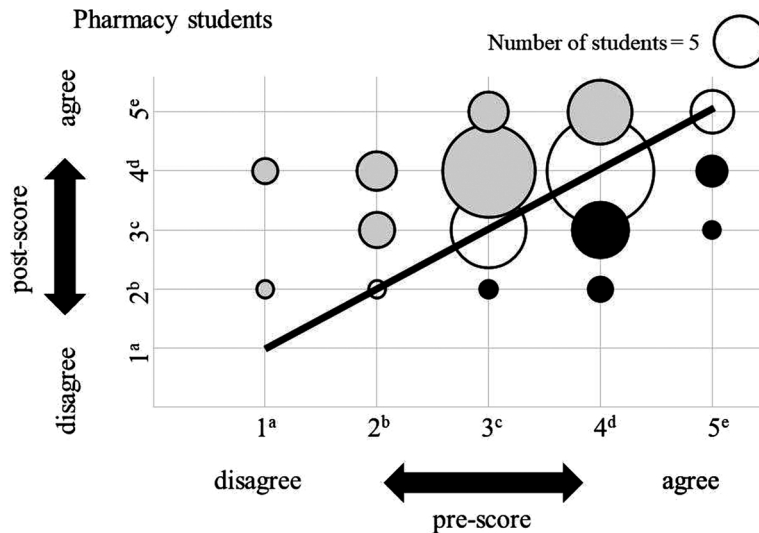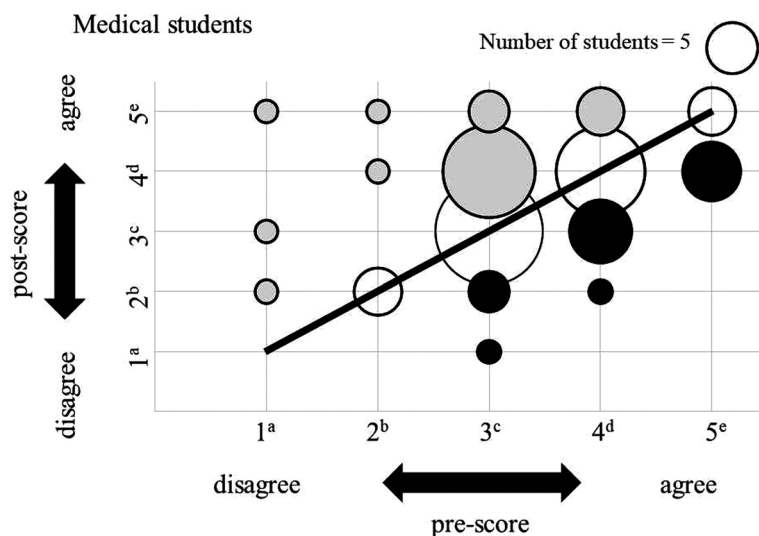
Pharmacy students

Figure 1   The comparison of the answer for the question of "I want to be involved in disaster medicine in the future" between pre-score and post-score. Students that ranked up their answer are shown by grey circles. Students that ranked downed their answer are shown by black circles. White circles show the students that did not change the answer through the class. In pharmacy students their answers were ranked up significantly (P＜0.001)
a: Strongly Disagree, b: Disagree, c: Neither Agree Nor Disagree, d: Agree, e: Strongly Agree

Medical students

Figure 2   The comparison of the answer for the question of "I want to be involved in disaster medicine in the future" between pre-score and post-score. Students that ranked up their answer are shown by grey circles. Students that ranked downed their answer are shown by black circles. White circles show the students that did not change the answer through the class. In medical students significant change were not shown
a: Strongly Disagree, b: Disagree, c: Neither Agree Nor Disagree, d: Agree, e: Strongly Agree

macy students. In the question of **Table 2**, No. 9, while pharmacy students ranked up their answer significantly in the end of class (**Figure 1**), significant change was not shown in medical students through the class (**Figure 2**).

With text mining of the students' free comments, 15 kinds of words were included. The total count of these

words was 651. The most frequently appeared word was "students of other department," which appeared 115 times. This word appeared in the free comments from both medical and pharmacy students, and its word frequency was not different between the two schools of students. Of 15 kinds of key words, only two words those were "three
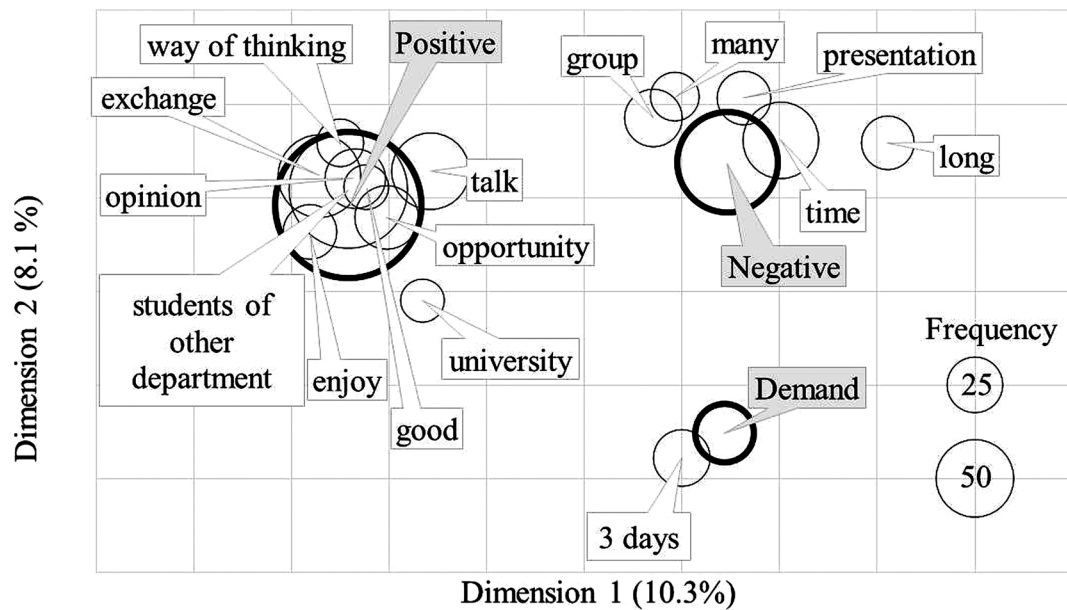
Figure 3　The result of text mining of students' free comments was shown following correspondence analysis. The size of the circle indicates frequency in appearance of each keyword. The distance of keywords to one another defines the relationship between the keywords; the nearer the word distance, the closer of the relationship

days" (P＜0.05) and "talk" (P＜0.01) appeared differently between medical and pharmacy students. While "talk" was more frequently used by pharmacy students, "three days" was more frequently used by medical students.

With correspondence analyses, an inertia of dimension 1 and 2 were only 0.103 and 0.081, respectively (**Figure 3**). Therefore only relationship of among words were available for explanation of overall picture of **Figure 3**. Of the expressions of students, 189 were considered positive. Many kinds of word were closely linked to positive expression such as "way of thinking," "opinion," "opportunity," and "exchange" (**Figure 3**). The number of expressions that were considered negative was 91. The words related to negative expressions included such words as "time," "long," "group," and "many". The frequency of positive and negative expressions were not different between medical and pharmacy students. Expression of demand from students was 33. The phrase of "Three days" was related with the demand because the class venue was in the campus included the pharmacy school and rather distant from the medical school.

IV.　Discussion

Development of the undergraduate educational program for disaster medicine has been getting more important,

facing the increase in threat of various disasters such as natural climate extremes in recent decades.[1] It has been emphasized from the view point of medical education that the curriculum must cover the current and anticipated needs of society.[5] Therefore not only is training for disaster time essential, but so is the need to cultivate awareness and interest of students for disaster medicine because students might face an unpredictable situation in their future. Interprofessional collaboration is one of most important essentials, particularly in disaster care. Considering these current needs for undergraduate disaster curriculum, interprofessional faculty set the learning outcome of the program to make students aware of disaster medicine and to know the importance of interprofessional collaboration.

With the rating scale questionnaire we found that the program increased students' interest in disaster medicine and promoted their motivation to participation of team discussion. This would be also related to the enhancement of their confidence for the knowledge level of disaster medicine. It might be noted that not only interests and knowledge level of disaster medicine of students enhanced but recognition of importance of team collaboration also enhanced in students. Jose et al.[6] organized and developed an interdisciplinary course including four departments (nursing, pharmacy, allied health, and medicine). They

reported promising results via pre-course and post-course evaluations, showing improvement in student team participation values, although their program was oriented to skill training. In comparison with the beginning and the end of the class, the effect of the program on the students' willingness to be involved with disaster medicine in the future was clear among the students, although the enthusiasm for future involvement were different between medical and pharmacy students.

The free comments of students were potentially more informative compared with the structured questionnaire. Particularly, sentiment analysis based on text mining is effective to evaluate the emotional information of people. In the field of education related to health care, sentiment analysis has been used and recognized informative in public health education such as for cigarette education campaigns[7] and for diabetic care.[8] Because the field of disaster care is closely related to public perception and mental health, sentiment analysis has been applied to disaster-related issues.[9,10] This approach also has been reported in medical education, including undergraduate education, as a tool to evaluate the educational program and environment.[11]

In our results, most of the students' expressions were considered positive, however, we must note that the number of negative expressions was about half of the number of positive comments. Although our biplot of **Figure 3** enables us to visualize the tendency of the students' perception, unfortunately, an accumulation of contribution rate of inertia in two dimensions was low, suggesting that the interpretation of axis was difficult. Nevertheless, the size of the circle that shows word frequency and the distance among words that shows the relationships are demonstrative for us. We found "many," "group," "time," and "long" were closely related to the negative expression of students. Interprofessional faculty knew that the number of students and groups were excessive in this program. In addition, schedule management was not appropriate, particularly in presentation of group products. In these expressions, students indicated the redundancy in the plenary session of the joint large class.

In limitation, our study could not elucidate the objective change and knowledge acquisition concerning disaster medicine. We also could not evaluate long-term outcome of students. We could not include students of other health care professions such as nursing, rehabilitation, and dental school. However it might be noted that our program is compulsory for medical and pharmacy school. We believe that every physician and pharmacist would understand the importance of interprofessional collaboration in disaster medicine as it is essential for their undergraduate education.

We conclude that the shared learning of disaster medicine with a discussion-type program was effective in raising interest in disaster medicine and in getting the sense of interprofessional collaboration in disaster medicine in students.

Acknowledgments

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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医学部と薬学部の災害医療に関する合同学習の効果

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要旨　災害医療におけるチーム医療の重要性を知ることは、医療系の卒前教育での課題の一つである。近畿大学医学部薬学部の両学部4年生の連携カリキュラムの中で、災害医療に関するディスカッション授業を行い学生に対してアンケート調査した。授業の前後で選択式の質問に対する回答を比較し、自由コメントについては、感性分析でテキストマイニングした。253 名のうち222 名が調査に協力した。授業前に比較して、チーム医療の重要性を強調した学生が授業後には有意に増加した（P＜0.001）。自由コメントでは、189 の表現がポジティブとみなされ、考え方、意見、機会、交流といったキーワードが結びついていた。一方、91 の表現がネガティブとみなされ、時間、長い、グループ、多いといった授業の全体セッションの進行が冗長であることを指摘していた。学生が災害医療におけるチーム医療の重要性を認識するために、医薬の連携授業は効果があると考える。

キーワード：災害医療、教育、チーム医療、カリキュラム、学生