

# Behavioral change of pharmacists by online evidence-based medicine-style education programs

Syuichi Aoshima BS<sup>1,2</sup> | Hidenori Kuwabara PhD<sup>2,3</sup> | Masahiro Yamamoto MS<sup>2,4</sup>

<sup>1</sup>Nakano Hospital, Tochigishi, Tochigiken, Japan

<sup>2</sup>Association for Appropriate Healthcare Decision-making and Practice, Higashihiroshima-shi, Hiroshima, Japan

<sup>3</sup>Senogawa Hospital, Hiroshima-shi, Hiroshima, Japan

<sup>4</sup>Yanase pharmacy Co., Ltd., Toyota-shi, Aichi, Japan

## Correspondence

Syuichi Aoshima, Nakano Hospital, Tochigishi, Tochigiken, Japan.

Email: syuichiao@gmail.com

## Abstract

**Background:** Although e-learning evidence-based medicine (EBM) courses have proven useful in improving the knowledge and skills of residents, it was still unclear for pharmacists in non-English-speaking countries. Thus, we investigated the behavioral change of Japanese pharmacists who participated in an EBM-style e-learning educational program available online.

**Methods:** This EBM-style e-learning program, the Japanese Journal Club for Clinical Pharmacists, was operated by three pharmacists through Skype. It comprised an online questionnaire administered to the program viewers. Two frequencies, the opportunity to be aware of EBM practices and that of reading an article, were compared before and after viewing the broadcast. Frequencies were classified into five categories: "almost every day," "1–2 times a week," "1–2 times a month," "1–2 times a year," and "not at all." The changes before and after viewing the broadcast were evaluated using a Wilcoxon signed-rank test.

**Results:** The announcement of the questionnaire survey on the web was conducted during the journal club on August 24 and September 7, 2014. The maximum number of simultaneous audiences at the time was 113 persons. Among them, we analyzed data from 36 people who answered the questionnaire. Among these, "1–2 times a week" and "almost every day" were increased, whereas "not at all" was greatly reduced. Indeed, a significant difference was observed in overall change of each frequency before and after viewing the broadcast ( $P < .001$ ).

**Conclusion:** EBM-style learning programs may play an important role in the postgraduate clinical education of pharmacists.

## KEYWORDS

clinical education, Evidence-based Medicine, journal club, pharmaceutical education, pharmacist

## 1 | INTRODUCTION

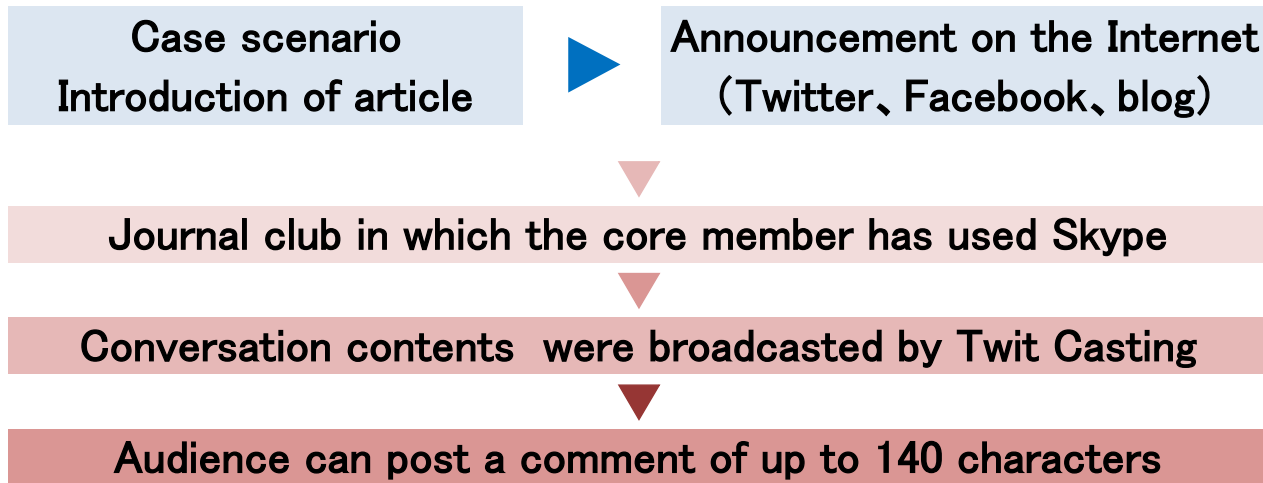
Evidence-based medicine (EBM) is a clinical behavioral guideline that comprises five steps: (i) formulation of a question; (ii) tracking down the best evidence with which to answer that question; (iii) critically appraising that evidence for its validity and applicability; (iv) integrating the critical appraisal with clinical expertise and with the patient's unique biology, values, and circumstances; and (v) evaluation of the

aforementioned four steps. EBM is a useful tool not only to suggest solutions to clinicians for issues that have no right answers but also for their continued learning advances in medicine.<sup>1</sup>

In recent years, opportunities to learn via EBM-related methodologies are increasing, even in pharmaceutical education. However, Japanese pharmacy students are rarely aware of such methodologies and do not learn to practice EBM.<sup>2,3</sup> Consequently, the opportunities to learn to use EBM for clinical decision making in real patients

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**FIGURE 1** Overview of the Japanese Journal Club for Clinical Pharmacists (JJCLIP)

seem to be a variant of both quality and quantity of programs in this country.

We initiated an educational program based on evidence-based medicine (EBM), the Japanese Journal Club for Clinical Pharmacists (JJCLIP), which educates pharmacists regarding recent advances in their field via a web conference organized to read and discuss articles.

This free e-learning program enables pharmacists to acquire knowledge regarding recent EBM practices via critical experience of papers. It also enables us to evaluate how we can use this evidence in clinical practice for treating patients.

A previous study reported that approximately 75% of medical residents in the United States could not understand or interpret the biostatistics and results presented in medical literature.<sup>4</sup> Therefore, EBM-style education programs can help medical professionals to expand their knowledge regarding clinical statistics, as well as widen clinical behavior choices.

Although e-learning EBM courses have been reported to be useful in improving the knowledge and skills of medical residents,<sup>5</sup> the effectiveness of such programs for postgraduate clinical education among pharmacists from non-English-speaking countries remains unclear because most studies on EBM education have been intended for medical students and residents. Thus, this study was conducted to examine the influence of EBM-style e-learning programs on the behavior and attitude of clinical pharmacists in Japan.

## 2 | METHODS

JJCLIP was led by three pharmacists, Hidenori Kuwabara, Masahiro Yamamoto, and Syuichi Aoshima using Skype, the free internet communication service provided by Microsoft Co., Ltd.

Prior to the day of the journal club, social networking services (SNS) including Twitter (an information service where one can post short posts called “Tweets” within 140 characters provided by Twitter Co., Ltd.) and Facebook (SNS provided by Facebook Co., Ltd) were

used to announce the details of a virtual case scenario, an original worksheet to read articles, and key points for preparation. This was primarily conducted through formulation of a clinical question about a case, critical appraisal of the paper that matches that question in accordance with the worksheet, and discussion of how to adapt the results from the article to the case. The contents of the Skype conversations among the core members were broadcasted via Twit Casting, an internet service provided by Moi Co., Ltd., where one can view live videos through a smartphone or a personal computer (PC) terminal (Figure 1).

The broadcasting service enabled the audience to state their opinion within 140 characters during the holding time using their PC terminals or smartphones. This facilitates a more active participation in the discussion. The progression of the journal club broadcast was based on the contents of the posted comments, and afterward, a comprehensive summary of the learning points was posted online for the participants to review through Facebook or via the blogs of core members.

Specifically, based on the case scenario, the journal club was started with considering formulation of a clinical question, which is the step 1 of EBM. Next, we critically examined the article related to the theme of the scenario using the worksheet. Finally, we discussed the application of the results of the paper to the case with viewers together. We explained statistical and epidemiological contents as necessary so that participants who read a paper for the first time sufficiently understand them.

### 2.1 | Study participants

The announcement of the questionnaire survey on the web was conducted during the journal club on August 24 and September 7, 2014. The maximum number of simultaneous audiences at the time was 113 persons.

An online questionnaire was created targeting viewers about the contents of the journal club that was held from September 2013 to August 2014 using Survey Monkey (the online survey service provided

**TABLE 1** Baseline characteristics of participants

Total number of questionnaires	36
Age, mean (year)	34
Working category (%)	
Community pharmacists	15 (42)
Hospital pharmacists	16 (44)
Others	5 (14)
Number of viewing times (mean/total)	7/12

by Survey Monkey Co., Ltd). This approach is statistically viable, because just one PC terminal can be used just once to answer the questionnaire, and the user had to input an authentication code, provided to the audience during the broadcast. Questionnaires with an incorrect authentication code, or without any input, were excluded from the analysis.

## 2.2 | Primary outcomes and statistical analysis

The primary outcomes were frequency of reading articles and the frequency of opportunities to be aware of EBM practices, which were compared before, and after, viewing the broadcast. Each frequency was categorized into five stages: "almost every day," "once or twice a week," "once or twice a month," "once or twice a year," and "not at all." A Wilcoxon signed-rank test was then used to evaluate changes in these frequencies. In addition, secondary outcomes were the opportunity of EBM education, divided into three stages: "substantial," "neither," and "not substantial," and the difficulty in the contents broadcasted by JJCLIP, divided into five stages: "esoteric," "somewhat difficult," "normal," "somewhat easy," and "easy."

**TABLE 2** Frequency of reading articles

Frequency	Before learning	After learning	Difference	P-value
Almost every day	1/36 (2.8%)	3/36 (8.3%)	5.6%	P<.001
Once or twice/week	2/36 (5.6%)	10/36 (27.8%)	22.2%	
Once or twice/month	7/36 (19.4%)	18/36 (50.0%)	30.6%	
Once or twice/year	7/36 (19.4%)	3/36 (8.3%)	-11.1%	
Not at all	19/36 (52.8%)	2/36 (5.6%)	-47.2%	

P value, Wilcoxon signed-rank test.

**TABLE 3** Frequency of opportunities to be aware of EBM practices

Frequency	Before learning	After learning	Difference	P-value
Almost every day	0/36 (0.0%)	3/36 (8.3%)	8.3%	P<.001
Once or twice/week	1/36 (2.8%)	2/36 (5.6%) <sup>a</sup>	2.8%	
Once or twice/month	7/36 (19.4%)	15/36 (41.7%) <sup>a</sup>	22.3%	
Once or twice/year	4/36 (11.1%)	7/36 (19.4%) <sup>a</sup>	8.3%	
Not at all	24/36 (66.7%)	9/36 (25.0%) <sup>a</sup>	-41.7%	

P value, Wilcoxon signed-rank test.

<sup>a</sup>Data lost as one person was excluded from the population, a "not at all".

## 3 | RESULTS

We received completed surveys to the online questionnaire from 37 people from August 24 to September 9, 2014. One survey with no authentication code was excluded, and thus, 36 surveys were analyzed. Background information of the respondents is summarized in Table 1.

### 3.1 | Primary outcomes

#### 3.1.1 | Frequency of reading articles

The frequency of reading articles increased from two to ten people in the category of "one to two times a week," and from one to three people in the category of "almost every day" before, and after, the broadcast, respectively. On the other hand, the number of participants in the category of "not at all" was reduced markedly. Overall changes in this outcome were statistically significant ( $P<.001$ , Table 2).

#### 3.1.2 | Frequency of opportunities to be aware of EBM practices

Changes in the frequency of opportunities to be aware of EBM practices increased from one to two people in the category of "one to two times a week," and from zero to three people in the category of "almost every day" before, and after, the broadcast, respectively. The number of participants in the category of "not at all" decreased remarkably from 24 to nine people. Overall changes in this outcome were statistically significant ( $P<.001$ , Table 3).

By analyzing our data stratified into pharmacists working at pharmacies and hospitals, significant changes were also obtained in each

**TABLE 4** Difficulty in broadcasted contents

	Esoteric	Somewhat difficult	Normal	Somewhat easy	Easy
Number	1	17	14	4	0
Proportion	2.8%	47.2%	38.9%	11.1%	0.00%

job category in both the frequency of reading papers ( $P < .05$ , respectively) and opportunities to be aware of the practice of EBM ( $P < .05$ , respectively).

## 3.2 | Secondary outcomes

### 3.2.1 | Difficulty in broadcasted contents

The difficulty in broadcasted contents seemed great because half of the respondents (18/36) answered “esoteric” or “somewhat difficult.” (Table 4).

### 3.2.2 | Opportunity for pharmacists to receive EBM education in postgraduate clinical education

Ten (28%) of the 36 participants responded that EBM education in the postgraduate clinical education for pharmacists was “substantial,” 23 (64%) answered that it was “not substantial,” and three participants responded that it was “neither.”

## 4 | DISCUSSION

To the best of our knowledge, this is the first study to examine the behavioral change of participants of online continuing EBM-style clinical education programs that target clinical pharmacists in Japan.

The generalizability of these results must be discussed in light of our use of an online survey method. In particular, study participants may have been biased to be high interested to learn EBM: Hence, this selection bias could also bring certain limitations. Moreover, the frequency of reading articles and the consciousness to gain awareness of EBM practices as primary outcomes are based on self-reports and not on a survey based on a strict record.

In this study, we only examined behavioral change of viewers and did not quantitatively examine the learning outcomes by JJCLIP. As our further task, in order to examine the effectiveness of JJCLIP, it is possible to create a score-evaluated learning check sheet and investigate how the scores of viewers change according to the frequency of learning EBM.

Twenty-five percent of subjects answered that there was no opportunity to be aware of EBM practice even after viewing broadcasts. This may mean that it is difficult for pharmacists to actually work while conscious of EBM practice, even if they learned the EBM methodology. The opportunity may be small for pharmacists to work on EBM practice in the first place. It could be necessary to improve the

workplace environment of pharmacists so that they could be more actively practicing EBM.

However, although almost half of the participants felt that the broadcasted contents were relatively esoteric, primary outcomes could have been considerably altered. Thus, a particularly valuable suggestion could be that the number of responses to the category “not at all” was markedly reduced for both outcomes.

At least, with regard to future postgraduate clinical education of pharmacists, an important implication is that such programs could provide a possibility of improving the learning style and clinical behavior of pharmacists.

In addition, our results showed that there is little opportunity for Japanese pharmacists to receive education on EBM, although the study participants had relatively high willingness to learn EBM and could easily gather information using the Internet.

In such current situation, JJCLIP certainly played a crucial role in improving circumstances. Moreover, it is very meaningful that such education programs might transform the clinical behavior and learning attitude of pharmacists.

The use of EBM e-learning education programs as conventional lecture-based courses for residents have been reported to be effective in improving their knowledge of recent practices.<sup>6–8</sup> Therefore, EBM-style learning programs such as “JJCLIP” conducted as part of postgraduate clinical education for pharmacists can be expected to play a vital role.

## CONFLICT OF INTEREST

The authors have stated explicitly that there are no conflicts of interest in connection with this article.

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