ORIGINAL ARTICLE

# Development and efficacy of a clinician-targeted refresher course for treating nonpneumonia respiratory tract infections

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## Abstract

**Background**: In 2017, the Japanese government published an evidence-based manual describing the appropriate use of antibiotics in outpatient settings to tackle the problem of antimicrobial resistance. To fill the evidence-practice gap, we developed a clinician-targeted course aimed at improving clinician skills in the daily clinical practice of treating acute respiratory tract infections (RTIs) based on the manual. The aim of this study was to evaluate the efficacy of the course.

**Methods**: This course consisted of lectures using illness scripts and checklists, as well as interactive communication skills training using role-playing. We performed a vignette-based evaluation of the changes in the knowledge and attitudes of the course participants toward prescribing antibiotics for nonpneumonia RTIs, using pre- and postcourse questionnaires. The questionnaires also included course feedback via the use of a 5-point Likert scale.

**Results**: Thirty-eight clinicians were included in the analyses, and 90% of these participants had graduated ≥20 years ago. We found statistically significant reductions in the intention to prescribe antibiotics for four of the six nonpneumonia RTI vignettes: acute bronchitis (−47.2%; 95% confidence interval [CI] −66.3 to −28.1%), common cold (−16.2%; 95% CI −30.8 to −1.6%), acute pharyngitis (−27.0%; 95% CI −49.0 to −5.0%), and acute rhinosinusitis (−33.3%; 95% CI −53.3 to −13.3%). The course seemed to be satisfactory for experienced doctors who were the relevant target population of such a workshop.

**Conclusions**: The refresher course was helpful for reducing the participants' intensions to prescribe antibiotics for nonpneumonia RTIs.

KEYWORDS

antimicrobial resistance, family medicine, illness scripts, interactive communication skills training, respiratory tract infections, role-play

# 1 | INTRODUCTION

Today, antimicrobial resistance (AMR) is a global threat, and promoting appropriate antibiotic use is one of the critical issues in tackling this threat. In Japan, the National Action Plan on Antimicrobial Resistance was developed during the Ministerial Meeting in April 2016. This plan presented the priorities to be implemented through 2020 in order to promote AMR measures in Japan.[1] The outcome indices for the action plan included a reduction in antimicrobial use per day per 1000 inhabitants in 2020 to two-thirds of the level in 2013 and a reduction in the proportion of antibiotic-resistant bacteria.

One cross-sectional study using insurance claims reported that antibiotics were prescribed in 60% of the visits for nonbacterial upper respiratory infections in Japan in 2005.[2] The peak in the distribution of frequency of antibiotics prescriptions was higher in physician's offices (90%) than in hospital outpatient clinics (40%). According to the Japanese Antimicrobial Consumption Surveillance (JACS) project, oral antibiotics accounted for over 90% of the total consumption in Japan.[3] In addition, the proportion of the use of broad-spectrum antibiotics, such as oral cephalosporin, fluoroquinolone, and macrolide, was greater in Japan, when compared with other countries.[3,4] The appropriate use of antibiotics (reducing inappropriate prescriptions and the inappropriate use of broad-spectrum antibiotics) in outpatient clinics plays a key role in the success of the AMR action plan.

To promote the appropriate use of antibiotics in acute respiratory tract infections (RTIs), as well as acute diarrhea in outpatient settings, the *Manual of antimicrobial stewardship* was published by the Ministry of Health, Labour and Welfare in Japan.[5] The target subjects of the manual were healthy, immunocompetent adult and pediatric (school-aged children and above) patients. However, the publishing guidelines alone appeared to be insufficient for reducing inappropriate antibiotic use, because physician habits, lack of knowledge, and patient behavior have interfered with implementing the guidelines into daily practice.[6] To fill the evidence-practice gap, we developed a clinician-targeted educational refresher course aimed at improving the daily clinical practice of treating acute RTIs by utilizing the manual. This was a pilot study to evaluate the efficacy of this course.

# 2 | MATERIALS AND METHODS

As with a previous study, we performed a vignette-based evaluation of the changes in the participants' knowledge and attitudes toward prescribing antibiotics for acute RTIs using a pre- and posttest design without a control group.[7]

## 2.1 | Study participants and recruitment

The participants were recruited using a Kyoto Medical Association newsletter and the AMR Clinical Reference Center (AMRCRC) homepage. Of the physicians who participated the course, we included the data of those individuals who agreed to participate in this research. Those who did not consent to participate in this research did participate in the educational course, but we excluded them from the analysis.

## 2.2 | Components of the refresher course

This educational course consisted of three parts. Each part lasted approximately 40 minutes, resulting in 120 minutes for the total course.

### 2.2.1 | Part 1: Lecture on the *Manual of antimicrobial stewardship*

Based on the manual, the acute RTIs were classified into four categories: common cold, acute rhinosinusitis, acute pharyngitis, and acute bronchitis, and the indications of antibiotics were explained for each category. The disease classifications were explained in further detail using illness scripts. Approximately 90% of the acute RTIs were viral,[8] but differentiation between viruses and bacteria in daily practice is often difficult. Acute RTIs are usually diagnosed and treated syndromically,[7] and we thought that illness scripts might be useful for reinforcing this syndromic approach. Expert clinicians are expected to store and recall knowledge as diseases, conditions, or syndromes—"illness scripts"—that are associated with problem representations.[9] A clinician's general knowledge of a disease and details of specific patients are incorporated in the form of instantiated illness scripts.[10] We considered not prescribing antibiotics as the default therapeutic decision for managing nonpneumonia RTIs,[7,11] and we explained the antibiotic indications with using the illness scripts. The illness scripts were constructed by consensus among the refresher course development team, which consisted of an infectious disease physician (SY), general and family physicians (NK, HS, TH), and an emergency physician (YY), based on the literature (Appendix S1).

### 2.2.2 | Part 2: Lecture on the acute RTIs medications and potentially fatal diseases mimicking colds

In this part, we explained the evidence-based practice for RTIs, and we focused on antimicrobial use and symptomatic therapy. In addition, we lectured on potentially fatal diseases mimicking the common cold, especially a "killer sore throat." A differential diagnosis checklist can reduce diagnostic errors[12–14]; therefore, we included checklists of common pitfalls and potentially fatal diseases in the textbook as appendixes.

### 2.2.3 | Part 3: Role-playing and lecture on physician-patient communication

The manual also emphasized how physicians communicated with their patients, and it presented examples of effective patient explanations. In this part, the participants learned how to communicate effectively through role-playing and a lecture.[15] First, the lecturers showed a bad

**TABLE 1** Demographic characteristics of the participants

| Characteristics | n = 38 |
| --- | --- |
| Years since graduation, median (interquartile range) | 34 (26-44) |
| Workplace | Clinic 23 (61%) |
| | Hospital 11 (29%) |
| | Others 2 (5%) |
| | No answer 2 (5%) |
| Specialty | Internal medicine 31 (82%) |
| | Obstetrics and Gynecology 2 (5%) |
| | Resident 1 (3%) |
| | No answer 4 (10%) |

example as an "ice breaker," with the roles of a doctor who did not want to give antibiotics and a patient being eager to receive antibiotics, which resulted in a failure to reach an agreement on the antibiotic prescription. Next, the participants played the roles of a doctor who did not want to give antibiotics and a patient who wanted antibiotics. The doctor's role began with "I don't think antibiotics are necessary," and the patient's role began with "Why don't you give me antibiotics?" Then, they performed the roles ad lib. After the conversation, we discussed how they felt throughout the role-playing exercise.

Afterward, we gave a lecture on the importance of exploring the patients' ideas, concerns, and expectations (ICE),[16] appropriate contingency plan information,[17,18] delayed antibiotic prescriptions,[19] and positive and negative recommendations.[18,20,21] After this lecture, the participants role-played again, followed by a discussion about the conversations.

## 2.3 | Questionnaires

We conducted this study with a questionnaire, which included de-identified demographic information and six clinical vignettes of nonpneumonia RTIs, followed by questions about whether they should prescribe antibiotics (yes or no) for each of the six RTI vignettes. A vignette is a simple, written case history of a fictitious patient based on a realistic clinical situation and is accompanied by one or more questions that explore what the doctor would do if an actual patient presented with that condition.[22] Questionnaires were given both before and after the educational course. The vignettes included two common cold cases (vignettes 1 and 3), one acute rhinosinusitis case (vignette 5), one acute pharyngitis case (vignette 4), and two acute bronchitis cases (vignettes 2 and 6) (Appendix S2). These vignettes were created in accordance with the recommendations of the *Japanese Manual of antimicrobial stewardship*.[5] In previous studies, vignettes or scenarios have been used to evaluate the knowledge and attitudes toward the appropriate prescription of antibiotics for nonpneumonia RTIs.[7,23,24]

The questionnaire also included a request for feedback on the course using a 5-point Likert scale. A Likert scale is often used to measure the attitudes, and the responses to a given question or statement are selected from a continuum. Typically, five categories of response are available, ranging, for example, from 1 = "strongly disagree" to 5 = "strongly agree."[25]

## 2.4 | Statistical analysis

We calculated the differences and 95% confidence intervals (CIs) for the proportions of those who answered "yes" for each of the six vignettes before and after the course. Then, we tested the changes using McNemar's test, and we considered a 2-sided *P* value <.05 to be statistically significant. Stata software V.14.2 (StataCorp., College Station, Texas, USA) was used for the statistical analysis.

## 3 | RESULTS

A total of 45 physicians participated in the refresher course, and 40 completed both the pre- and postcourse questionnaires. Two participants did not consent for the use of their data in this research; thus, 38 participants were included in the analyses. Table 1 presents the demographic characteristics of the participants. Ninety percent of the participants had graduated 20 or more years ago, and up to a maximum of 67 years after graduation.

Table 2 shows the pre- and postcourse responses to the six RTI vignettes. We observed statistically significant reductions in the proportion of the attitudes toward prescribing antibiotics in vignette 2 (47.2% absolute reduction), vignette 3 (16.2% absolute reduction), vignette 4 (27.0% absolute reduction), and vignette 5 (33.3% absolute reduction).

Figure 1 presents the feedback on the course from the participants. Most of the participants agreed or strongly agreed that this course would be useful for their future practice, and they wanted to recommend this course to others. The duration and difficulty level of the course seemed to be appropriate, and over 80% of the participants responded that they understood the contents of the course very well.

## 4 | DISCUSSION

We developed a clinician-targeted refresher course for the treatment of nonpneumonia RTIs in clinical practice based on the *Manual of antimicrobial stewardship*. After this course, there were significant reductions in the proportion of the attitudes toward prescribing antibiotics for four of the six nonpneumonia RTI vignettes. However, we did not find significant changes in the remaining vignettes, likely because of low precourse antibiotic prescription responses, which were similar to the previous study.[7] The feedback responses from the participants were generally good.

### 4.1 | Strengths of this study

The publication and distribution of guidelines were not sufficient for reducing the number of antibiotic prescriptions in nonpneumonia

**TABLE 2** Prescription of antibiotics in response to six acute respiratory tract infection vignettes before and after the refresher course

| Vignette | Prescribed antibiotics prequestionnaire (%) | Prescribed antibiotics postquestionnaire (%) | Difference (95% confidence interval), P-value |
|---|---|---|---|
| 1. Common cold | 0 | 2.8 | 2.8% (−5.4 to 10.9), P = 1.0 |
| 2. Acute bronchitis | 58.3 | 11.1 | −47.2% (−66.3 to −28.1), P < .001 |
| 3. Common cold | 18.9 | 2.7 | −16.2% (−30.8 to −1.6), P = .03 |
| 4. Acute pharyngitis | 70.3 | 43.2 | −27.0% (−49.0 to −5.0), P = .02 |
| 5. Acute rhinosinusitis | 50.0 | 16.7 | −33.3% (−53.3 to −13.3), P = .002 |
| 6. Acute bronchitis | 5.6 | 2.8 | −2.8% (−14.9 to 9.4), P = 1.0 |
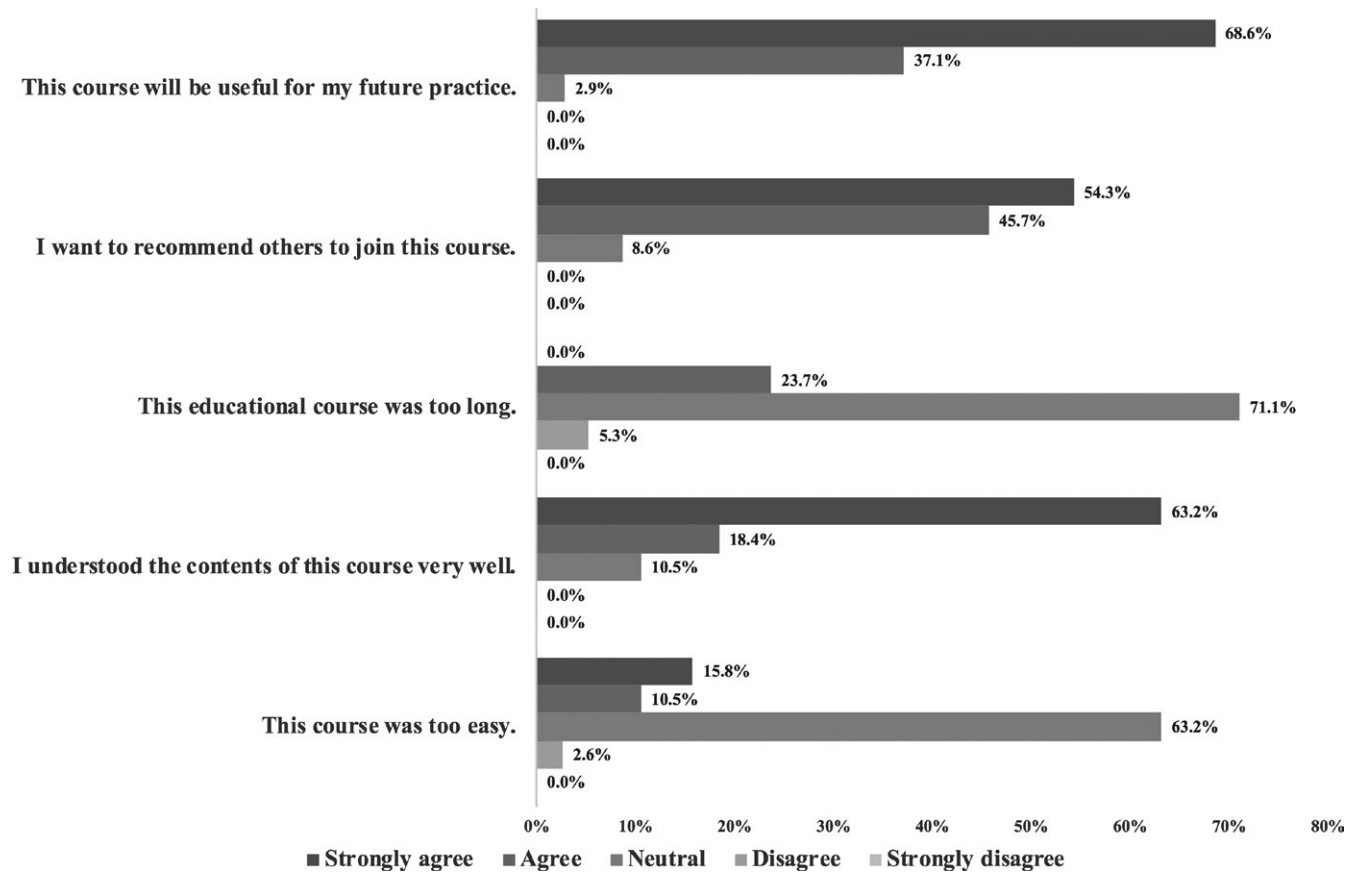


**FIGURE 1** Feedback on the course from the participants

RTIs cases.[6] Systematic reviews have suggested that interactive educational meetings are more effective than didactic lectures and that communication skills training is a promising interventional element.[6,26] One major strength of this study was that we included interactive communication skills training for the clinicians using role-playing in the refresher course. People tend to change their attitudes and possibly their behaviors as a result of playing certain roles.[27,28] Our role-playing exercise began with a doctor saying "I don't think antibiotics are necessary." By playing a physician who does not prescribe antibiotics, the first hurdle in behavioral change might be lowered.

One unique point of this course was the use of "illness scripts" to explain the indications of the appropriate use of antibiotics,[9] which reinforced the syndromic approach of the previous studies

by Magin.[7,11] Moreover, we also devised ways to reduce diagnostic errors using checklists.[12-14]

Another strength of our study was the high number of postgraduate years of the participants. The more years in a doctor's experience, the more likely he/she is to prescribe inappropriate antibiotics for viral RTIs.[29-31] It is noteworthy that this course was both satisfactory and helpful for experienced doctors, who were the relevant target population of such a workshop.

## 4.2 | Limitations of the study

In the present study, several limitations are worth mentioning. First, the number of participants was small because this was a preliminary

course. Therefore, the results need to be validated in a larger cohort. Second, we only observed the short-term changes before and after the course. Third, we only assessed the participants' intensions to prescribe antibiotics appropriately, and it is possible that the results were influenced by the Hawthorn effect.

Further studies are needed to assess the long-term persistence of the changes in the knowledge and attitudes toward appropriately prescribing antibiotics. They are also needed to evaluate the performance indices, such as the changes in the actual antibiotics prescription numbers, proportion of antimicrobial-resistant organisms, and incidence of complications after acute RTIs.

## 5 | CONCLUSIONS

We developed a clinician-targeted refresher course for the practice of treating nonpneumonia RTIs, which consisted of lectures using illness scripts and checklists, and interactive communication skills training using a role-playing. After the course, we found significant reductions in the proportions of the participants' attitudes toward prescribing antibiotics for nonpneumonia RTIs.

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### CONFLICT OF INTEREST

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

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## SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.