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Reducing oral broad-spectrum antibiotics use at an outpatient setting: an antimicrobial stewardship project

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Short Report

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Abstract

Background

Japan consumes a relatively high percentage of oral broad-spectrum antibiotics, especially in the outpatient setting. Therefore, Japanese national action plan was established to reduce the use of total antimicrobials and oral broad-spectrum antibiotics by 2020. We aimed to evaluate our antibiotic stewardship program in accordance with the Japanese national action plan at our ambulatory clinic.

Methods

First, we assessed the baseline utilization rates of both total and broad-spectrum antibiotics at our clinic from April 2018 to March 2019. After implementing interventions, we collected data from April 2019 to October 2020, and compared the data with the baseline data for evaluation of outcomes.

Results

Total oral antibiotic uses significantly declined by 64%, and the use of macrolides, cephalosporins, and fluoroquinolones decreased by 75%, 62%, and 45%, respectively ($p < 0.001$).

Conclusions

We successfully reduced the use of total antimicrobials and oral broad-spectrum antibiotics except fluoroquinolones in accordance with the national target.

Introduction

Antimicrobial resistance (AMR) has been accelerated by inappropriate antibiotic use in medicine and food production. The absence of immediate global action could lead to increased disease burden as well as tremendous healthcare costs.[1] In Japan, oral antibiotics account for more than 90% of total antibiotic consumption. Compared with EU countries, Japan has a higher rate of oral broad-spectrum antibiotics such as third-generation cephalosporins, macrolides and fluoroquinolones and a lower rate of penicillin.[2] Most of those prescriptions occur in the outpatient setting. [3,4] An urgent response is needed to correct the rampant and frequent use of antibiotics in primary care and prevent drug resistance. Furthermore, antibiotics were among the most common drug groups associated with adverse drug events (ADEs) in the outpatient setting. [5]

The national action plan for AMR of the Ministry of Health, Labor and Welfare (MHLW) aimed to reduce total antimicrobial use to two-thirds and the use of oral cephalosporin, quinolones and macrolides to one-half by 2020.[1] However, it has focused mainly on the outpatient units of hospitals. The

establishment of the same plan will promote antimicrobial stewardship in ambulatory care. Therefore, we aimed to assess the utilization rates of both total and broad-spectrum antibiotics in the outpatient setting, establish interventions to reduce inappropriate use in accordance with the Japanese national action plan, and evaluate the outcomes of the interventions.

Methods

First, our project team, with the infection control physician as the leader, encouraged the outpatient administration and medical billing departments to consider the context and problems regarding antimicrobial resistance and the importance of the antibiotic stewardship program. We then examined the utilization rates of both total and broad-spectrum antibiotics at our outpatient department from April 2018 to March 2019. We presented the findings to the chief physician, the physician leader and the pharmacist of the outpatient department and planned interventions. Our strategies included the following: 1) physician education in accordance with the “Guide to Proper Use of Antimicrobial Drugs”, developed by the MHLW; 2) removing azithromycin from the default setting on prescription for upper respiratory tract infection; and 3) distributing patient education pamphlets explaining the unnecessary use of antibiotics for the common cold and acute pharyngitis, which we have failed to implement owing to a shift to telemedicine services for those with symptoms of respiratory tract infection as a measure against COVID-19 transmission.

Ethical consideration

The research was the secondary data analysis of the anonymized databases, and therefore, it does not require patients' consent; and the approval of an ethics committee.

Data analysis

We collected antibiotic prescription data from April 2019 to October 2020 and compared the baseline utilization rate with the rates within two timeframes: first, from the start of the online reservation system until the start of the antibiotic stewardship intervention (April 2019 to January 2020), and second, from the start of the antibiotic stewardship intervention (February 2020 to October 2020). We separated the timeframe for the online reservation system because it prevented unnecessary clinic visits for the common cold. The detailed calculation of the antibiotic utilization rate is described in Table 1. We used R software V. 3.4.1 for data analysis.

Table 1
Calculation of the antibiotic utilization rate

1)	**We first converted the dosage in grams for each antibiotic** **For example, the dosage of 120 tablets of azithromycin 250 mg was calculated as** **250*120 = 30,000 mg = 30 grams**
2)	Using the ATC code of each antibiotic from WHO ATC/DDD system, we converted the dosage in grams into defined daily dose (DDDs). Azithromycin's ATC code is J01FA10 and DDD is 0.3 gram. Therefore, **Utilization rate in DDDs ⇒ 30/0.3 = 100DDD**
3)	Finally, we calculated the DDDs for 1000 outpatient visits per day (DID). Let's say there were 2000 outpatient visits. **Utilization rate in DID ⇒ {(100 DDD/number of outpatient visits) *1000}/365 days = 50/365 = 0.137 DID**

Results

We observed the same trend as the national data in the primary care setting, which is the consumption of a higher percentage of broad-spectrum antibiotics, such as third-generation macrolides, third-generation cephalosporins and fluoroquinolones (see Fig. 1). Figure 2 shows that the utilization rate of antibiotics decreased significantly within the two time-frames, regardless of the number of outpatient visits. Total antibiotic use was reduced by 35% after the establishment of the reservation system and by 64% after the intervention ($p < 0.001$). All antibiotic use significantly decreased after the establishment of the online reservation system (see Fig. 3). In particular, use of azithromycin dramatically declined after being removed from the default setting on prescriptions for upper respiratory tract infection. Macrolide, third-generation cephalosporin and fluoroquinolone utilization rates were reduced by 75%, 62% and 45%, respectively ($p < 0.001$).

Discussions

In the baseline antibiotic use assessment, we observed the same trend as the national data, which was the consumption of a higher percentage of broad-spectrum antibiotics, such as third-generation macrolides, third-generation cephalosporins and fluoroquinolones. After interventions, the use of oral antibiotics has declined dramatically. We have achieved our goals of reducing total oral antibiotic use by two-thirds and the use of macrolides and cephalosporin by half, except for fluoroquinolones. However, online reservation systems and factors contributed by the COVID-19 pandemic, such as telemedicine, might have affected the outcomes, in addition to the measures we have taken. Significantly reduced prescription of antibiotics in the outpatient setting was also reported from the assessment of the National Database of Health Insurance Claims and Specific Health Check-ups of Japan (NDB) after implementing the National Action Plan in Japan.[6] That study also addressed the COVID-19 pandemic as

the possible influencing factor and caution for a rebound after the pandemic. Therefore, we need to continually monitor the antibiotic use to ensure a robust antimicrobial stewardship program.

Conclusions

We have reduced the antibiotic utilization rate, which has a great impact on patients as well as public medical expenses. This project provided insights that we can start simple, compact and effective improvement projects that truly bring great changes to the workplace.

Declarations

Acknowledgements

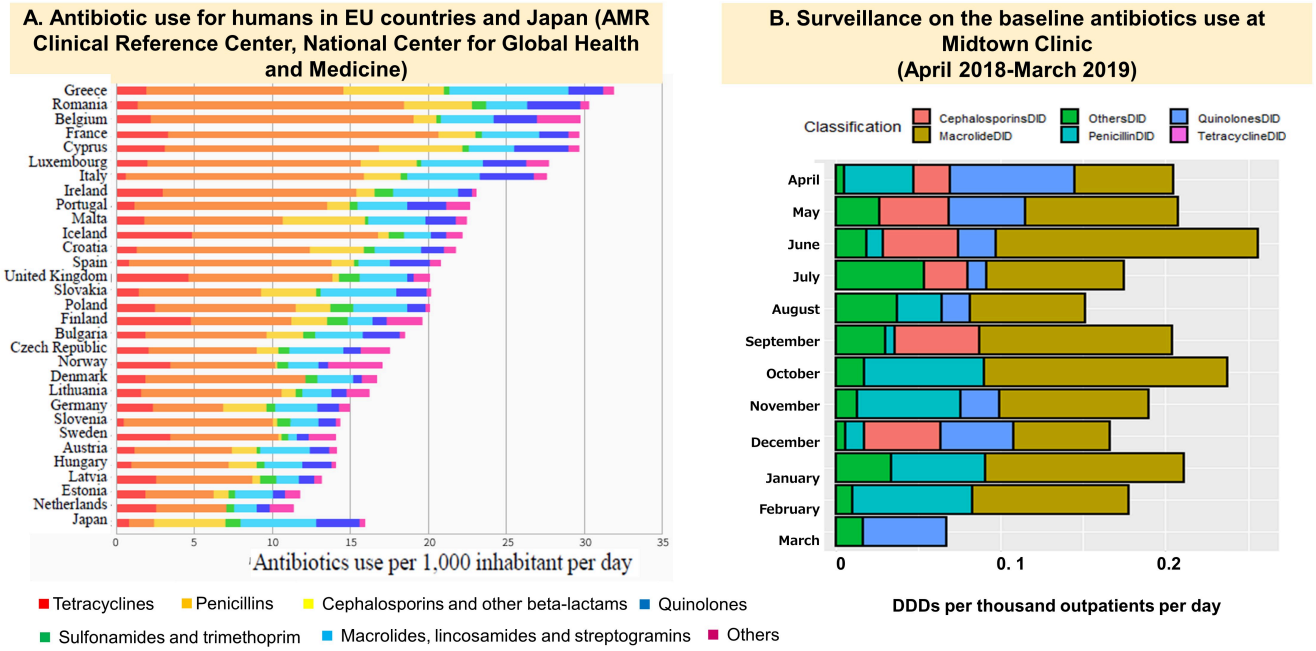
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Figures

Figure 1. Comparison of baseline antibiotics use at Midtown Clinic with the national Data

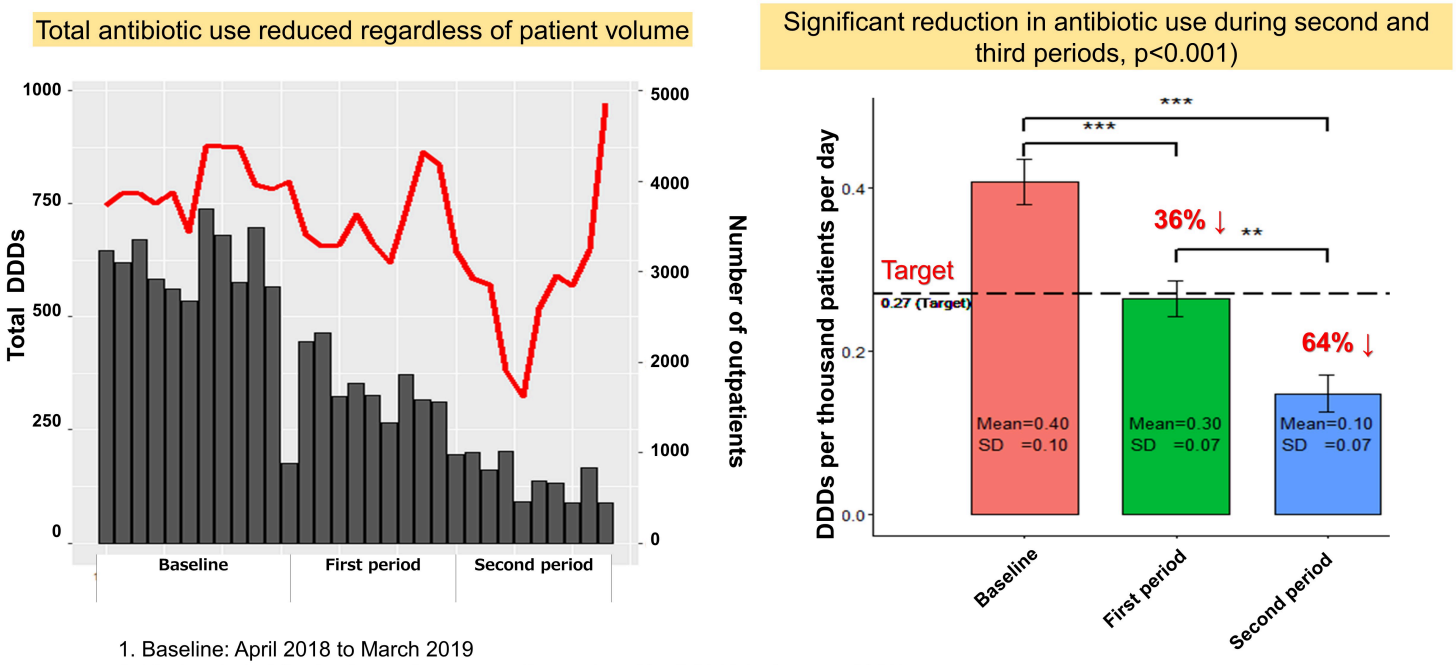


The surveillance on the baseline antibiotics use at Midtown Clinic showed the same trend as the national Data

Figure 1

The surveillance on the baseline antibiotics use at Midtown Clinic showed the same trend as the national Data

Figure 2. Trends of antibiotic use in in comparison with baseline



1. Baseline: April 2018 to March 2019
2. First period : After implementing reservation system (April 2019 to January 2020)
3. Second period : After implementing antimicrobial stewardship program (February 2020 to October 2020)

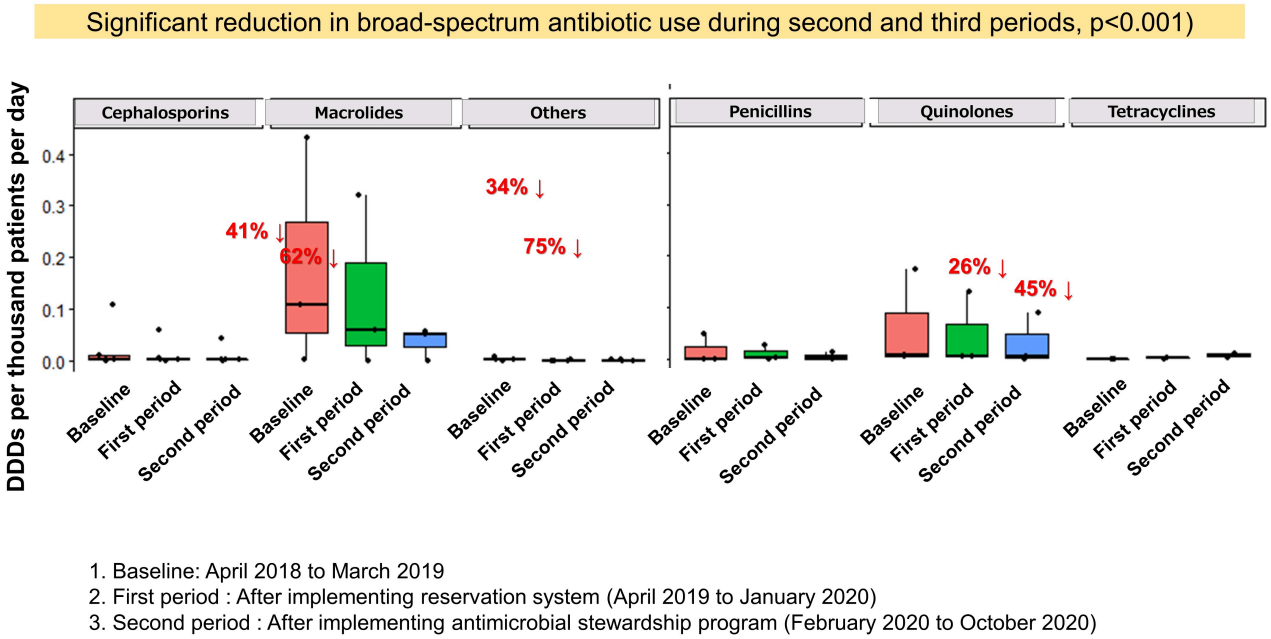
Figure 2

Baseline: April 2018 to March 2019

First period : After implementing reservation system (April 2019 to January 2020)

Second period : After implementing antimicrobial stewardship program (February 2020 to October 2020)

Figure 3. Trends of broad-spectrum antibiotic use in in comparison with baseline



1. Baseline: April 2018 to March 2019
2. First period : After implementing reservation system (April 2019 to January 2020)
3. Second period : After implementing antimicrobial stewardship program (February 2020 to October 2020)

Figure 3

Baseline: April 2018 to March 2019

First period : After implementing reservation system (April 2019 to January 2020)

Second period : After implementing antimicrobial stewardship program (February 2020 to October 2020)

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