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Microbiological Improvement by Antimicrobial Stewardship Program and Infection Control in Japan

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Abstract

Antimicrobial stewardship program (ASP) has recently been implemented in clinical settings in Japan. The microbiological effects of an ASP and the related team (AST)/Infection Control Team (ICT) in our tertiary hospital were shown in significant improvement of antibiotic susceptibility of *Pseudomonas aeruginosa*.

Keywords: Antimicrobial stewardship (AS); Infection control team (ICT); Drug-resistant pathogens; *Pseudomonas aeruginosa*.

Introduction

Antimicrobial stewardship (AS) has been defined as an activity that includes appropriate selection, dosing, route and duration of antimicrobial therapy [1,2].

The benefits of AS are improved patient outcomes, reduced-frequency adverse events, improved rates of antibiotic susceptibility to targeted antibiotics and optimization of resource utilization across the continuum of care. The Infectious Diseases Society of America (IDSA), the Society for Healthcare Epidemiology of America (SHEA) and the Pediatric Infectious Diseases Society (PIDS) have strongly suggested that AS program (ASP) are best led by infectious disease physicians with additional stewardship training [1,2].

Recently, in addition to Infection Control Teams (ICT), interdisciplinary AS teams (AST), comprising infectious disease physicians, pharmacists, nurses and microbiological technicians, have begun to be organized at university and/or tertiary hospitals in Japan and the efficacy of the resulting interventions in preventing inappropriate antibiotic use have been reported for Japanese AST [3-5]. In our hospital, a 600-bed tertiary-care university hospital in the city of Sendai in Japan, all adult patients who were (a) hospitalized at our facility from 2010 to 2017, (b) received antibiotic therapy, and (c) for whom an intervention was recommended by our ICT/AST, were eligible for enrolment in this analysis.

The roles of the ICT/AST included a review of antimicrobial orders with respect to the usage, dose, isolated pathogens and sites of infection for all inpatients receiving parenteral antibiotics, and consultation with physicians before the prescription of antibiotics. Cases receiving carbapenems, anti-pseudomonad penicillins, fluoroquinolones, 4th-generation cefems and anti-Methicillin resistant *Staphylococcus aureus* (MRSA) agents were specifically reviewed. When an inappropriate use of antibiotics was found, ICT/AST members made immediate contact with the prescriber over the telephone, via report papers, and/or via electronic messaging on the computer order system. Usually, total 50-100 patients were monitored and finally a half of them were intervened in each month by our ICT/AST.

As the results, antibiotic susceptibility of *Pseudomonas aeruginosa* were significantly improved, and multiple-drug resistant *P. aeruginosa* (MDRP) were become none from 2010 to 2017 (Figure 1). Especially, resistant *P. aeruginosa* for carbapenems including imipenem/cilastatin and meropenem, aztreonam and fluoroquinolones including levofloxacin and ciprofloxacin were significantly decreased.

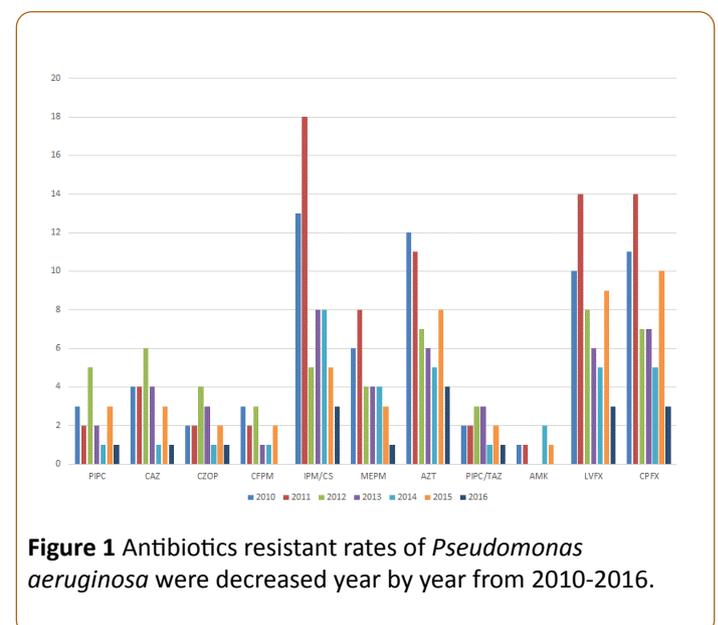


Figure 1 Antibiotics resistant rates of *Pseudomonas aeruginosa* were decreased year by year from 2010-2016.

As we have previously reported, the occurrences of drug-resistant strains including MDRP and related infectious diseases, such as pneumonia and blood stream infection (BSI), were big issues in Japan [6,7].

ICT/AST intervention for pneumonia has been reported to yield a significant decrease (from a median of 10 to 7 days) in the duration of antibiotic therapy and also result in more frequently narrowing of antibiotic spectrum or modification on the basis of susceptibility results [8]. Maeda et al. [4] showed that an AST intervention approach decreases the use of inappropriate therapy and may improve clinical outcomes in BSI patients and previous other studies have reported that clinical intervention by infectious disease specialists also reduces mortality, length of stay (LOS) and medical costs. These results indicate that ICT/AST interventions can decrease inappropriate therapy and also potentially improve clinical and economic outcomes in severe infectious disease, including pneumonia and BSI by *P aeruginosa* [9,10].

Conclusion

Therefore, a multidisciplinary ICT/AST, including microbiologists, is very important for successful interventions and improving drug susceptibility of the pathogenic bacteria [4,11]. Recommendations regarding appropriate therapies require a broad knowledge of infectious diseases. Interdisciplinary teams that are able to facilitate discussion among specialists from various relevant occupational fields may be lead to successful implementation by ICT/AST.

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