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# Improvement Plan for the Korean Nationwide Surveillance of Antimicrobial Resistance Program

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In recent years, the sudden increase in the prevalence of antimicrobial-resistant bacteria and the emergence of multidrug-resistant bacteria have become serious worldwide problems. Therefore, in 2000, the World Health Organization (WHO) declared antimicrobial resistance to be an international danger, and has been working with its member nations to promote the appropriate use of antimicrobials as a solution to the antimicrobial resistance threat [1]. The recent emergence of New Delhi metallo-β-lactamase carbapenem-resistant Enterobacteriaceae has motivated us to increase our alertness to antimicrobial-resistant organisms [2]. Thus, surveillance of healthcare-associated infection has been enhanced. Surveillance for antimicrobial resistance is being executed mainly in European countries and in the U.S. In Korea, with the enactment of the Infectious Disease Control and Prevention Act in December 2010, infectious diseases caused by 6 types of multidrug-resistant bacteria—vancomycin-resistant *Staphylococcus aureus*, vancomycin-resistant *Enterococcus*, methicillin-resistant *S. aureus*, multidrug-resistant *Pseudomonas aeruginosa*, multidrug-resistant *Acinetobacter baumannii*, and carbapenem-resistant Enterobacteriaceae—were legally designated for sentinel surveillance [3].

The prevalence of antimicrobial resistance in bacteria varies substantially from country to country and according to the date of the analysis and the hospital characteristics, because it is influenced significantly by the use of antimicrobial drugs and the degree of success of efforts to control the spread of resistant bacteria. The purposes of an antimicrobial resistance surveillance system (ARSS) are as follows: (1) to detect antimicrobial susceptibility patterns; (2) to monitor the identity, transmission, and expression of antimicrobial-resistance genes; (3) to provide important information on the development of bacterial resistance mechanisms in different regions; and (4) to allow changes in antimicrobial prescription practices and participation of infection control professionals.

Well-designed antimicrobial resistance surveillance systems are needed when fighting bacterial resistance. The parameters of an ideal ARSS are as follows: global geography, year-on-year longevity, multiple species selection, centralized methods and test sites, large sample size, monitoring for many antimicrobial drugs, incorporation of epidemiology, and frequent data distribution [4]. Implementation of an ARSS requires 4 components: administrative commitments, system organization (participant, expert, and coordinator), financial support

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(from government agencies and the pharmaceutical industry), and data analysis and reporting systems (online and offline). The scope of ARSS networks is divided into global, continental, and nationwide. The global representative ARSSs are the Alexander Project, MYSTIC Program, SENTRY Program, PROTEKT System, and WHO Program. The European ARSS (EARSS; EARS-Net) is the surveillance system implemented in Europe, and the ARSSs available in the U.S. are the National Nosocomial Infections Surveillance, Intensive Care Antimicrobial Resistance Epidemiology, National Antimicrobial Resistance Monitoring System, International Surveillance Program for Emerging Antimicrobial Resistance, and Surveillance for Emerging Antimicrobial Resistance Connected to healthcare. In Korea, the nationwide ARSSs are the Korean Nationwide Surveillance of Antimicrobial Resistance (KONSAR), Korean Nosocomial Infections Surveillance System, and Korean Antimicrobial Resistance Monitoring System.

Since 1997, the KONSAR program has been collecting data on antimicrobial-resistant bacteria from participating laboratories [5], and has therefore played an integral role in informing interested parties about the current state and severity of domestic antimicrobial resistance in bacteria by analyzing and reporting bacterial antimicrobial susceptibility data. However, the KONSAR program releases all its laboratory data to research papers or newsletters only after analysis; therefore, a web-based system that can analyze data in real time is needed [6]. To create such a system, a knowledge-based rule check system capable of detecting errors by setting the exact data variables as the definition of the specimen, the species identification method, and the antimicrobial susceptibility test methods must be defined. Furthermore, various analysis functions such as data comparison between entire hospitals and participating laboratories, and between peer groups, must be made possible on the internet.

According to a recent KONSAR report [7], susceptibility to antimicrobials, including colistin, was analyzed without dividing *Acinetobacter* spp. into *A. baumannii* and non-*baumannii Acinetobacter*. This is a problem that has yet to be resolved. At the government level, $bla_{OXA-23}$-like or IS*Aba1*-activated $bla_{OXA-51}$-like gene tests for detecting carbapenem-resistant *A. baumannii* need to be supported. For manufacturers that supply identification kits and for clinical microbiology laboratories, the development of testing methods that can accurately identify *A. baumannii* is also needed.

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