HOSPITAL MANAGEMENT STRATEGIES IN PREVENTING ANTIBIOTIC RESISTANCE

By
Ivan Master Worung[1]*, Joko Pitoyo[2], Purwadhi Purwadhi[3], Yani Restiani Widjaja[4]
[1,2,3,4] Master of Management, ARS University Indonesia
Email: [1]drivan788@gmail.com, [2]jokopitoyodr@gmail.com, [3]purwadhi@ars.ac.id,
[4]yani.yrw@ars.ac.id

Abstract: **Introduction** *Antibiotic resistance is a challenge in health services in Indonesia. Data in 2019 by The World Health Organization (WHO) showed that around 4.95 million deaths were related to antibiotic resistance. Control of Antimicrobial Resistance in 2020-2024 based on the Vision of the National Action Plan (RAN) is a healthy Indonesia and free from the impact of antimicrobial resistance.* **Methods** *Literature Review conducted through articles published in the last 5 years. A review was conducted on articles related to management strategies in preventing antibiotic resistance. Articles taken as sources use English and Indonesian that are accredited by SCOPUS or accredited by SINTA.* **Finding Results** *Hospital strategy management to address antibiotic resistance such as development and implementation of antibiotic use policies, education and training, monitoring and evaluation of antibiotic use, infection control and prevention, appropriate use of diagnostic tests, infection and disease management, application of technology, and collaboration with external parties.* **Conclusion** *Antibiotic resistance in Indonesia and globally has become a problem that needs attention to prevent the occurrence of increasingly widespread antibiotic resistance. A good strategy will prevent antibiotic resistance from becoming more controlled so that it can have an impact on hospital services and also have a good impact on patients being treated.*

INTRODUCTION

Antibiotic resistance is a challenge in health services in Indonesia, where antibiotics are used too often and without clear and controlled usage rules. This is in line with the challenges of Hospitals (RS) in regulating the rational use of antibiotics so that they are effective in their use and cost efficient. Effective use of antibiotics means prescribing according to medical indications, with the appropriate dose, regular duration of drug administration, and the appropriate duration of antibiotic use. Efficient means giving

antibiotics according to patient needs and at an affordable price. Previous studies have explained that inappropriate antibiotic prescribing is one of the causes of antibiotic resistance. Anugrahsari, Wahyutomo & Darmadjaja. D (2022).

Data in 2019 by The World Health Organization (WHO) showed that around 4.95 million deaths were related to antibiotic resistance. This was conveyed by WHO as one of the health problems that pose a threat to global health. Cases of death due to antibiotic resistance are cases of lower respiratory tract infections. In Indonesia, out of 20 hospitals that were monitored for antibiotic use, there was an increase in the percentage of antibiotic resistance in Escherichia coli (E. coli) and Klebsiella pneumoniae (K. pneumoniae) bacteria. Antibiotics that experience resistance include carbapenems, furoquinolones and third-generation cephalosporins. Siahaan. S. et al (2023).

In Indonesia, a study was conducted by Antimicrobial Resistence in Indonesia (AMRIN-study) located at Dr. Soetomo General Hospital, Surabaya and Dr. Kariadi General Hospital, Semarang. From this study, it was reported that in the children's section who were treated for 5 days or more, there were 90.00% patients with empirical therapy. At Dr. Soetomo General Hospital, it was reported that 45.00-76.00 and 56.00%-76.00% at Dr. Kariadi General Hospital used antibiotics without any indication. The results of the study conducted at both hospitals found multi-resistant bacteria such as ESBL-producing bacteria and MRSA. At Prof. Dr. R.D Kandou Manado found cases treated in the ICU as many as 71.40% of patients with Pneumonia, 8.50% urosepsis, 8.50% laparotomy, 2.80% each with cholangitis, A cute Respiratory DistressSyndrome (ARDS), decubitus ulcers, and encephalopathy. Anugrahsari, Wahyutomo & Darmadjaja. D (2022).

In a study conducted by Vera Mulyawantie, et al at RSD Gunung Jati Cirebon before and after the implementation of the Implementation of Antimicrobial Resistance Control (PPRA) showed an increase in the effectiveness and efficiency of antibiotic use. The effectiveness of the Defined Daily Dose (DDD) decreased from 65.17 grams to 46.02 grams and the efficiency in the study was that good monitoring provided cost savings on the use of irrational antibiotic costs. Mulyawantie, Ramadaniati, Sarnianto, & Hidayat (2023).

Control of Antimicrobial Resistance in 2020-2024 based on the Vision of the National Action Plan (RAN) is a healthy Indonesia and free from the impact of antimicrobial resistance. There are strategic objectives, namely increasing awareness and understanding of controlling antimicrobial resistance through effective communication, education, and training, Increasing knowledge and scientific evidence through surveillance and research, Reducing the incidence of infection through sanitation, hygiene, and infection prevention and control measures, optimizing the use of antimicrobials in humans, animals, and fish, building investment to find new treatment methods, diagnostic methods, and vaccines in an effort to reduce the development of antimicrobial resistance problems and building integrated governance and coordination in order to control antimicrobial resistance. Anugrahsari, Wahyutomo & Darmadjaja. D (2022).

Referring to the data that has been done previously, this discussion will describe the hospital management strategy in preventing antibiotic resistance, so that it can increase the effectiveness and efficiency of antibiotic use in hospitals.

METHODS

The method used is a qualitative approach with a systematic literature review. The application of this systematic literature review takes scientific articles that have been published in the last 5 years. A review was conducted on articles related to management strategies in preventing antibiotic resistance. Articles taken as sources use English and Indonesian that are SCOPUS accredited or SINTA accredited. The inclusion criteria for this paper are: 1) Journal articles published in 2019-2024; 2) Articles with observational studies (including cohort, cross-sectional, and case-control designs) or articles with randomized control trials.

RESULTS

Antibiotic resistance is a serious problem that can threaten the effectiveness of infection treatment and increase patient morbidity and mortality. Hospital management in preventing antibiotic resistance requires a comprehensive and coordinated approach. Here are some key strategies that can be implemented by hospital management to address this problem:

1. Development and Implementation of Antibiotic Use Policy

Antibiotic Stewardship Program (ASP) is the development and implementation of an antibiotic management program to maintain antibiotic use and also reduce the possibility of adverse drug reactions (ADRs) and antibiotic resistance. The implementation of ASP has been carried out by several countries and has been proven to be effective in increasing the effectiveness of antibiotic use. In 2022, Quiros et.al implemented ASP in Medical Surgical Intensive Care Units (MS-ICU) in Latin America. The assessment was carried out to see the impact on the use of antimicrobial prescriptions and the use of antimicrobials in patients treated in MS-ICU. In the same year, a study was also conducted by Hayes showing that the promotion of policies and the development of structured ASPs were very important for both long-term care and outpatient care. In 2022, Pallares et.al also found the implementation of ASP, and observed all antibiotic use. After the ASP was implemented, the use of ertapenem and meropenem began to decline in the ward care room. In the intensive care unit, there was a decrease in the use of ceftriaxone, cefepime, piperacillin/tazobactam, meropenem and vancomycin. And after the implementation of ASP, resistance to meropenem was found to be reversed in Pseudomonas aeruginosa. The same thing happened to Staphylococcus aureus which was resistant to oxacillin, Eschericia coli to ceftriaxone became good. Pratama & Darmawan (2023).

2. Education and Training

Training for Medical Personnel by providing ongoing training on appropriate antibiotic use and antibiotic resistance to doctors, nurses, and other medical staff. Reasons for the importance of education and training for medical personnel:

a. To maintain knowledge of current practices and guidelines for antimicrobial use.
b. Clinical education raises awareness of the local, regional, and global threat of AMR.
c. Attention to ongoing clinical training is an important aspect of patient safety in health care delivery.

A variety of educational materials can be used to address different learning styles of physicians. Involved physicians are needed, who are interested in maintaining current clinical education, for their own knowledge and to encourage colleagues. Strong leadership is needed to support prioritization and to ensure protected time for physicians to engage in

continuing education and professional development. Leadership can also help by incentivizing human resources to maintain current clinical knowledge. In addition, organizing awareness campaigns is important for patients about the risks of antibiotic misuse. World Health Organization (2021).

3. Monitoring and Evaluation of Antibiotic Use

Improper use of antibiotics can lead to antibiotic resistance, which is a global health problem. Therefore, monitoring and evaluating antibiotic use is important to reduce the risk of resistance and increase the effectiveness of therapy. The purpose of monitoring is to identify patterns of antibiotic use, assess the effectiveness of therapy and detect resistance. Monitoring and evaluating antibiotic use can maintain the effectiveness of treatment and prevent antibiotic resistance. Collaboration between various parties is needed to increase awareness and understanding of the proper use of antibiotics. Monitoring can also show trends in increasing or decreasing antibiotic use, as well as identifying areas where use is inappropriate. This evaluation can also lead to educational interventions for health workers and patients. Centers for Disease Control and Prevention (2021).

4. Infection Control and Prevention

Infection Control is an effort to prevent the spread of infection in a hospital, clinic, or other healthcare setting. It involves a variety of strategies and actions designed to protect patients, staff, and visitors. Infection control measures include:

a. Handwashing: Proper handwashing is the most effective way to prevent infection. Use soap and water or an alcohol-based hand sanitizer.

b. Use of Personal Protective Equipment (PPE): Wearing masks, gloves, and face shields to reduce the risk of transmission.

c. Sterilization and Disinfection: Sterilizing medical devices and disinfecting surfaces to kill pathogens.

d. Vaccination: Providing vaccinations to healthcare workers and patients to prevent infection.

e. Patient Isolation: Isolating infected patients to prevent the spread of disease. Centers for Disease Control and Prevention (2022).

5. Appropriate Use of Diagnostic Tests

Microbiological examination for antibiotic resistance is an important process in diagnosing infections and determining appropriate therapy. Common methods used in this examination include:

a. Disk Diffusion Test (Kirby-Bauer): Measures the effectiveness of antibiotics by placing antibiotic disks on agar media that have been inoculated with the pathogen. The zone of inhibition is measured to determine sensitivity or resistance.

b. Minimum Inhibitory Concentration (MIC) Test: Measures the minimum concentration of antibiotic required to inhibit the growth of microorganisms. This test is often performed using the dilution method.

c. E-Test: A combination of disk diffusion and MIC tests, where strips with a gradient of antibiotic concentrations are used to determine the MIC quantitatively.

d. Molecular Microbiology: Techniques such as PCR (Polymerase Chain Reaction) are used to detect specific resistance genes, providing more in-depth information about the mechanism of resistance.

e. Antimicrobial Profile: Using a panel of antibiotics to identify resistance patterns in microbial isolates, which is important for epidemiology and infection control. World Health Organization (2020).

6. Infection and Disease Management
   a. Infection Prevention
      - Vaccination: Ensuring appropriate and timely vaccination to prevent infectious diseases.
      - Hand Hygiene: Good hand washing practices to reduce the spread of microbes.
      - Use of Personal Protective Equipment (PPE): In high-risk situations, use PPE to protect yourself from infection.
   b. Early Detection
      - Screening: Conducting routine screening to detect infections or diseases early.
      - Laboratory Diagnosis: Using diagnostic tests to identify the pathogen causing the infection.
   c. Treatment
      - Antibiotics and Antivirals: Using appropriate medications based on the type of infection.
      - Symptom Management: Providing supportive care to reduce symptoms and improve patient comfort.
   d. Patient Education
      - Health Education: Educating patients about how to prevent infections and the importance of following recommended treatments.
      - Follow-up: Scheduling follow-up visits to monitor recovery.
   e. Protocol Adherence Infection Control Protocol: Following guidelines established by a health care organization to control the spread of infection in a hospital or community setting. Mayo Clinic Staff (2022).

7. Application of Technology

Development of new antibiotics using biotechnology and bioinformatics techniques to discover and develop new antibiotics that are effective against resistant bacteria. The use of genomic technology also applies genome sequencing to understand the mechanisms of bacterial resistance and identify new targets for antibiotic therapy. And for resistance monitoring using a health information system to monitor and analyze antibiotic resistance patterns in real time in hospitals and communities.

Education and Training by utilizing digital platforms to educate medical personnel and the public about the wise use of antibiotics and the risk of resistance. In addition, with the development of the use of Artificial Intelligence and Machine Learning applying artificial intelligence to analyze clinical and microbiological data, assisting in the selection of more appropriate antibiotics, and producing innovations in drug formulation by developing formulations that can increase the bioavailability and effectiveness of antibiotics, so that lower doses can be used. Friedman. N. D (2020).

8. Collaboration with External Parties

Collaboration with external parties such as partnerships with university researchers for the development of new antibiotics and studies on resistance. Collaboration with the

pharmaceutical industry to develop and market new antibiotics and diagnostic technologies. Collaboration can also be done with health organizations for educational programs and awareness campaigns about wise antibiotics. Join with the "Global Antimicrobial Resistance and Use Surveillance System" (GLASS) for global monitoring and reporting of antibiotic resistance. Heddini. A (2019).

CONCLUSION

Antibiotic resistance in Indonesia and globally has become a problem that needs attention to prevent the occurrence of increasingly widespread antibiotic resistance. Hospital management strategies need to be developed to prevent antibiotic resistance such as the development and implementation of antibiotic use policies, education and training, monitoring and evaluation of antibiotic use, infection control and prevention, use of appropriate diagnostic tests, management of infections and diseases, application of technology, and collaboration with external parties. A good strategy will prevent antibiotic resistance from becoming more controlled so that it can have an impact on hospital services and also a good impact on patients being treated.

DAFTAR PUSTAKA

[1] Anugrahsari. S., Wahyutomo. R., Darmadjaja. D. (2022). Implementasi Program Pengendalian Resistensi Antimikroba Dalam Standar Nasional Akreditasi Rumah Sakit. *The Journal of Hospital Accreditation,* Vol 04, Edisi 2, hal 53-58

[2] Siahaan. S., Rukmini. R., Roosihermiatie. B., Andarwati. P., Handayani. S.R., Turigan. I.U., Rosita. T., Rustika. R., Usman. Y., Kristiana. L. (2023). The effort to Rationalize Antibiotic Use in Indonesian Hospital: Practice and Its Implication. *Journal of Tropical Medicine*. https://doi.org/10.1155/2023/7701712

[3] Mulyawantie. V., Ramadaniati. U.H., Sarnianto. P., Hidayat. T (2023). Evaluasi Pelaksanaan Pengendalian Resistensi Antimikroba Dalam Meningkatkan Kualitas Penggunaan Antibiotik Pada Pasien Rawat Inap Pneumonia Anak. *Jurnal Keperawatan Profesional*. Vol 4, No 2, Hal 173-181.

[4] Pratama. A.F.M., Darmawan. S.E (2023). Kebijakan Implementasi Program Antimicrobial Stewardship. *Jurnal Cahaya Mandalika.* 3(1), Hal 85-111. https://ojs.cahayamandalika.com/index.php/jcm/article/view/1569

[5] World Health Organization (WHO). (2021). "Antimicrobial Stewardship Intervention: a Practical Guide"

[6] Centers for Disease Control and Prevention (CDC). (2021). "Antibiotic Resistance Threats in the United States, 2019"

[7] Centers for Disease Control and Prevention (CDC). (2022). "Guidelines for Infection Control in Dental Health-Care Settings".

[8] World Health Organization (WHO). (2020). "Global Antimicrobial Resistance and Use Surveillance System (GLASS): Report 2020".

[9] Mayo Clinic Staff. (2022). *Infectious Disease Management*. *Mayo Clinic Proceedings*, 97(3), 529-545. DOI:10.1016/j.mayocp.2021.12.002

[10] Friedman, N. D., et al. (2020). "The Threat of Antimicrobial Resistance in Healthcare Settings." *Journal of Hospital Medicine*, 15(3), 137-144. DOI: 10.12788/jhm.3300

[11] Heddini, A., et al. (2019). "Antimicrobial Resistance: The Role of Collaboration." *Lancet

Infectious Diseases, 19(4), 364-365. DOI: 10.1016/S1473-3099(19)30044-6

THIS PAGE IS INTENTIONALLY BLANK