



RESEARCH ARTICLE

A REVIEW ARTICLE ON ROLE OF HEALTH CARE PROFESSIONALS AND HEALTHCARE PROMOTERS ON PREVENTING ANTIBIOTIC RESISTANCE

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ABSTRACT

Antibiotic resistance is a significant public health problem that jeopardises our ability to effectively treat infectious diseases. Preventing antibiotic resistance requires a comprehensive and concerted effort. Strategies such as the development of new antibiotics, antibiotic stewardship programs, and the use of alternative treatments can help to prevent and control antibiotic resistance. Health care providers and healthcare promoters are essential in preventing antibiotic resistance by informing the public about the proper use of antibiotics, promoting good hygiene practices, and encouraging the development of substitute treatments for infectious diseases. Education and communication campaigns are effective in changing behavior and reducing the use of antibiotics. Health promoters and healthcare professionals have different roles and parameters in healthcare delivery. While health promoters focus on promoting community health and wellness, healthcare professionals focus on providing quality healthcare services to patients. The role of healthcare workers and the healthcare system in preventing antibiotic resistance is examined in this review paper, along with current methods and fresh chances for education and intervention. The paper examines the effects of healthcare promotion on infections that are resistant to antibiotics and the potential for upcoming tactics to lower the risk of resistance.

Key words: Antibiotic resistance, Health care professionals, Healthcare promoters, Global Antimicrobial Surveillance System (GLASS), Centers for Disease Control and Prevention (CDC), World Health organization (WHO).

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INTRODUCTION

Numerous tactics must be employed in order to halt the spread of antibiotic resistance, a significant public health issue on a global scale. It is difficult to treat illnesses using standard antibiotic regimens when the bacteria that cause infections do not respond to therapies intended to eradicate them. The number of fatal diseases has increased, as has the death rate. Antimicrobial resistance (AMR) kills about 700,000 people annually, and by 2050, it's expected to kill over 10 million.¹ The misuse and overuse of antibiotics contribute to the emergence of bacterial, fungal, and viral strains with resistance to them.² According to the World Health Organization (WHO), AMR is one of the top 10 global public health threats facing humanity today.³ The development of new antibiotics has slowed in recent years and there is an urgent need to maintain the effectiveness of existing drugs. Antimicrobial stewardship programs were established to promote responsible antibiotic use, but these programs require the support and commitment of health advocates to effectively change behaviour and reduce AMR. One of the key strategies to reduce this phenomenon is to ensure rational and optimal use of antibiotics.

Antibiotic resistance

What is antibiotic resistance?

Antibiotic resistance refers to the ability of bacteria to resist the effects of antibiotics that are commonly used to treat bacterial infections.⁴ This resistance occurs when bacteria evolve and adapt through genetic mutations or the transfer of resistance genes from one bacterium to another.⁵ Antibiotic resistance is a significant challenge in modern medicine, as it limits the effectiveness of antibiotics and can lead to the development of more severe and difficult-to-treat infections.⁶

Causes of Antibiotic resistances

Antimicrobial resistance is a complex and multifactorial problem, with multiple factors contributing to its emergence and spread. One cause of antibiotic resistance is the overuse and misuse of antibiotics in humans and animals.⁴ When antibiotics are used for nonbacterial infections or are improperly prescribed, they can increase the likelihood of resistance developing.⁵ Numerous studies have examined the prevalence and causes of antimicrobial resistance. For example, a 2017 study found that antibiotic resistance was present in more than 60% of bacterial infections worldwide, with high levels of resistance in countries such as India, Vietnam and Kenya.⁷ Another study

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suggests that poor antibiotic management in hospitals and a lack of public awareness may contribute to the development of resistance.⁸ Antimicrobial resistance is a serious public health threat and urgent action is needed to address it. Developing new antibiotics and alternative treatments and improving antibiotic management practices are key to combating antibiotic resistance.⁶

1. **Overuse and misuse of antibiotics:** One of the main causes of antibiotic resistance is overuse and misuse of antibiotics, both in humans and animals.⁹ Overuse can occur when antibiotics are unnecessarily prescribed for viral infections that do not respond to antibiotics, or when antibiotics are prescribed for conditions that can be treated with alternative treatments. Misuse can occur when antibiotics are not taken as directed or when they are used incorrectly, e.g., if the drug is stopped before completing a full course of treatment.
2. **Antibiotic use in agriculture:** The use of antibiotics in livestock farming is another important factor contributing to antimicrobial resistance.¹⁰ Antibiotics are widely used to promote growth in livestock and prevent disease, but this can lead to the development of antibiotic-resistant bacteria that can be transmitted to humans through food.
3. **Poor infection control:** Poor infection control practices in healthcare settings can also contribute to the spread of antibiotic-resistant bacteria.¹¹ For example, inadequate cleaning and disinfection of equipment and surfaces can lead to the transmission of bacteria between patients.
4. **Shortage of new antibiotics:** The development of new antibiotics has not kept pace with the emergence of antibiotic-resistant bacteria, resulting in a lack of effective treatments for some infections.¹²
5. **Global Travel and Trade:** The globalization of travel and trade has also contributed to the spread of antibiotic-resistant bacteria.¹³ Bacteria can move easily between countries and continents, making it difficult to stop the spread of resistance.

Consequences: The consequences of antibiotic resistance are far-reaching, including longer hospital stays, increased healthcare costs and higher mortality rates.¹⁴ In addition, the development of new antibiotics has slowed, and existing antibiotics are becoming less effective.¹⁵ This situation has led to the emergence of so-called "super bugs"; resistant to many antibiotics and pose a serious risk to public health.¹⁶

Who are the healthcare professionals?

Healthcare professionals are the backbone of the healthcare system. They take care of patients, administer medication and help, support and advise people in need. They are the unsung heroes of healthcare, and their work is critical to the health and well-being of people around the world. Healthcare professionals come from a variety of backgrounds and professions. According to the AMA, Healthcare professionals are those who provide medical and nursing care to sick or injured people. This includes physicians, nurses, physician assistants, pharmacists and other allied health professionals working in hospitals, clinics and other healthcare facilities. They focus on healing and treating disease and injury.¹⁷

The Role of Physicians in Preventing Antimicrobial Resistance: Antimicrobial Resistance is one of the greatest threats to global health today. To combat this growing problem, healthcare professionals, including physicians, play a key role in preventing antibiotic resistance. This article discusses the role of physicians in preventing antibiotic resistance and the strategies they can use.

1. **Patient education:** Doctors can educate patients about the importance of taking antibiotics only when needed and as directed. A US study found that doctors who provided patients with educational material about antibiotic resistance prescribed significantly fewer antibiotics.¹⁸
2. **Appropriate antibiotic prescribing:** Physicians should only prescribe antibiotics when needed and select the appropriate

antibiotic for a particular infection. A survey in Australia found that 90% of antimicrobial prescribed by GP's were used when not needed.¹⁹ Doctors' unnecessary prescribing of antibiotics to treat diseases such as viral infections contribute to the development of antibiotic resistance. Improvement of doctors' Prescribing practice is key to reducing antibiotic resistance.

3. **Adherence to guidelines:** Physicians should follow evidence-based guidelines when prescribing antibiotics. The guidelines aim to optimize the use of antibiotics while minimizing the risk of resistance. A European study showed that the use of e-prescribing systems with decision support capabilities can improve antibiotic prescribing accuracy.²⁰
4. **Growth of bacteria:** Doctors can also prevent antibiotic resistance by growing bacteria before prescribing antibiotics. A bacterial culture can help identify the specific type of bacteria causing the infection and the most effective antibiotic. Working together can improve prescribing quality and reduce overuse of antibiotics.
5. **Monitoring Antimicrobial Resistance Trends:** Physicians can monitor antimicrobial resistance trends in their communities to identify new strains of drug-resistant bacteria. Surveillance can help prescribe antibiotics and reduce the risk of resistance.
6. **Practice infection prevention and control:** Clinicians can prevent the spread of antibiotic-resistant infections through infection prevention and control measures such as hand hygiene, isolation precautions, and cleanliness of the environment. A study conducted at a tertiary hospital in China found that improved infection control practices resulted in a significant reduction in the incidence of antibiotic-resistant bacteria.²¹
7. **Vaccination Promotion:** Physicians can promote vaccination to prevent infections commonly treated with antibiotics. Vaccines can reduce the need for antibiotics and the development of antibiotic resistance.
8. **Involving patients in shared decision-making:** Physicians can involve patients in shared decision-making about their healthcare. Involving patients in their treatment can lead to better outcomes and less antibiotic resistance.
9. **Continuing Education:** Physicians should participate in continuing education programs to keep abreast of the latest antibiotic prescribing guidelines, antibiotic resistance trends, and infection prevention and control measures. A Swedish study found that doctors who were trained in the importance of reducing antibiotic use in livestock were more likely to recommend antibiotics to their patients.²²

The role of nurses in preventing antibiotic resistance

Nurses play a key role in preventing antibiotic resistance. There are a number of ways caregivers can help reduce the spread of antibiotic-resistant infections.

1. **Improving responsible antibiotic stewardship:** Responsible antibiotic stewardship is the implementation of measures to ensure the correct use of antibiotics to prevent the emergence of resistance. Nurses can contribute to antibiotic stewardship by promoting responsible antibiotic use, improving hand hygiene, and following infection prevention and control protocols.²³ A study by Prior et al.²⁴ showed that nurse training is an effective approach to improve antibiotic prescribing practices in hospitals. Nurses need to be aware of their role in preventing antibiotic resistance and can act as patient advocates to combat antibiotic overuse.
2. **Infection Prevention:** Nurses can also help with infection prevention, which can help reduce the need for antibiotic treatment. Prevention strategies can include regular hand hygiene, maintaining a clean environment, and use of personal protective equipment.²⁵ Nurses can also educate patients and their families about good hygiene practices, which are essential to prevent the spread of infection.

3. **Reducing the Spread of Resistant Infections:** Nurses play a key role in reducing the spread of antibiotic-resistant infections by following strict infection prevention and control measures. This may include isolating patients with resistant infections, disinfecting equipment and surfaces, and complying with PPE requirements.²⁶ Caregivers should be aware of the symptoms of antibiotic-resistant infections, such as: Persistent fever and ineffective treatment, and report them to the appropriate authorities.
4. **Patient empowerment:** Nurses can also empower patients by educating them about the dangers of antibiotic resistance and the importance of antibiotic stewardship. Patient education may include explaining the differences between bacterial and viral infections and why antibiotics are not always necessary. Nurses can also advise on alternative treatments such as supportive care and symptom management.²⁷

The pharmacist's role in preventing antimicrobial resistance

There is growing interest in the role of pharmacists in preventing antimicrobial resistance. As experts in the field of medicine, pharmacists can help address this global challenge by using their knowledge and expertise in the field. Pharmacists can play a key role in preventing antibiotic resistance by engaging in the following areas:

1. **Antibiotic Stewardship Programs:** Pharmacists can participate in Antibiotic Stewardship Programs (ASP) to optimize the use of antibiotics in healthcare settings. Asps are structured programs that promote the appropriate choice, dosage, and duration of antibiotics to improve treatment outcomes, minimize side effects, and reduce the emergence of resistance.²⁸ Several studies have shown a positive effect of pharmacists. Commitment to ASF, including reduced antimicrobial use, better prescribing practices, and cost savings.^{29,30}
2. **Patient education:** Pharmacists can educate patients on the proper use of antibiotics, including the importance of comprehensive treatment, avoiding unnecessary antibiotic intake for viral infections, and recognizing symptoms of adverse drug reactions.³¹ Research has shown that pharmacist-led patient education interventions can improve patient outcomes. Knowledge, attitudes and behaviors related to antibiotic use.^{32,33}
3. **Raising antimicrobial resistance:** Pharmacists can act as advocates for raising antimicrobial resistance by promoting public education campaigns and working with healthcare professionals to develop guidelines for antibiotic use.³⁴ In addition, pharmacists can provide feedback and data to healthcare professionals to identify patterns of abuse or resistance in their practice.³⁵

Challenges for Pharmacists:

Despite their potential contributions, pharmacists face several challenges in their efforts to prevent antibiotic resistance. These include a lack of awareness among patients and healthcare providers of the importance of rational use of antibiotics, time pressure for comprehensive patient education, and insufficient resources or incentives for pharmacists participating in ASF.³⁶ Additionally, pharmacists may face challenges when implementing ASP, such as: overcoming resistance from physicians or other stakeholders and lack of access to accurate and timely microbiological diagnostic data.²⁸

What is health promotion?

Health promotion is defined as the process of enabling people to better control and improve their own health.³⁷ The World Health Organization (WHO) defines health promotion as the development of individual, social and policy interventions that support society's health efforts. Health promotion involves designing policies, systems and practices that support health, including interventions to improve patients' knowledge, skills and behavior. Health promotion therefore aims to improve quality of life, increase life expectancy and reduce morbidity, with an emphasis on primary, secondary and tertiary prevention.³⁸ promoters play a key role in preventing antibiotic

resistance by raising awareness of the risks of antibiotic overuse and abuse and promoting alternative strategies to prevent and treat infectious diseases.

Who are Health Promoters?

Health promoters are people who work to promote health and prevent disease in communities, groups, and individuals through education, advocacy, and other health promotion activities. They often work in public health facilities such as B. in local health centers, schools and government agencies. Health promoters focus on preventing disease and promoting healthy behaviors and lifestyles.³⁹

Role of health promoters

As part of the Global Action Plan on Antimicrobial Resistance, health promoters can promote the prevention and control of infectious diseases, including good hygiene practices and the appropriate use of antibiotics. They are responsible for educating patients and their families, raising community awareness, and assisting healthcare professionals to properly diagnose, treat, and cure infectious diseases. Public education programs conducted by health promoters should include:

1. Promoting awareness of the benefits and risks of antibiotic overuse, including the development of antibiotic resistance
2. Promoting health literacy and care,
3. The implementation of infection control
4. Encourage appropriate use of antibiotics and adherence to evidence-based infectious disease management guidelines.

To ensure effective interventions, health promoters need knowledge of appropriate antibiotic use, infection prevention strategies and infection management, with a particular focus on convincing evidence-based clinical interventions. They can also develop materials and resources to provide educational interventions on antibiotic resistance, including online educational tools, forums, and campaigns to increase community engagement.

Education of Health Promoters: Education is essential for health promoters to understand infectious disease epidemiology, antibiotic resistance, antimicrobial responsibility, and communication strategies needed to promote antimicrobial responsibility.⁴⁰ They need consistent academic programs, ongoing professional development, and access to evidence-based resources on AMR. The training will enable them to develop effective communication strategies in the fight against AMR.

Educational Interventions for Health Promoters: Educational interventions can help health promoters develop the most effective communication strategies to raise awareness of the risks of antibiotic resistance and encourage the public to develop effective prevention strategies. Educational interventions may include:

1. Awareness campaigns for health promoters, patients and policymakers on the best way to combat antibiotic overuse and consumption.
2. Workshops and professional development for health professionals to provide them with up-to-date knowledge on the effective use of antibiotics. Healthcare professionals need to understand the basics and learn evidence-based strategies to prevent and treat antibiotic resistance.
3. Encourage the use of antibiotic stewardship programs by healthcare facilities to reduce rates of drug resistance and improve clinical outcomes.
4. Development and application of guidelines and protocols for appropriate treatment of infections with appropriate antibiotic prescribing based on best practices established by evidence-based guidelines.
5. Create a forum for health promoters to connect with health professionals and patients. This meeting will contribute to sharing evidence-based best practices and developing a

common understanding of the risks and benefits of antibiotic use.

environmental remediation in preventing the spread of antimicrobial resistance.

The global impact of antimicrobial resistance

The global impact of antimicrobial resistance has a significant impact on human health and is recognized as one of the most critical public health problems worldwide. Infections caused by drug-resistant bacteria require longer hospital stays, resulting in higher healthcare costs and increased morbidity and mortality rates. Inadequate supply of new antibiotics due to regulatory hurdles and reduced private investment has made the situation worse. Without immediate action to address the crisis, an estimated 10 million people worldwide could die from antibiotic resistance by 2050, according to a report by the Centers for Disease Research and Policy, with health care costs and in lost productivity.⁴¹

Effect of health promotion on antimicrobial resistance

Several studies have examined the effect of health promotion on the prevention of antimicrobial resistance. A systematic review of educational interventions to improve antibiotic prescribing found that the majority of interventions were effective in reducing antibiotic use.⁴² A study of antibiotic prescribing in primary care found that a physician-led intervention that included education and feedback on antibiotic prescribing practices resulted in a 12% reduction in antibiotic prescribing.⁴³ Awareness and communication campaigns have also proven effective in promoting responsible use of antibiotics. A study of a public awareness campaign in Sweden found that the campaign was effective in reducing antibiotic use for respiratory infections.⁴⁴ Another study found that a targeted educational campaign aimed at parents of young children was effective in reducing antibiotic use for viral infections in children.⁴⁵ The role of health promotion in preventing AMR is increasingly recognized, and there are opportunities for new approaches and interventions to reduce the impact of antimicrobial resistance. Health promoters can use social media and digital channels to communicate and engage with the public on issues related to antibiotics and infection prevention. They can also work with healthcare professionals to develop tailored interventions to improve prescribing practices and reduce the number of antibiotic-resistant infections.

Importance of infection control measures in preventing antibiotic resistance

Hand hygiene is the cornerstone of infection prevention and control measures. According to the Centers for Disease Control and Prevention (CDC), hand hygiene prevents transmission of up to 80% of infections. Washing hands regularly with soap and water for at least 20 seconds and frequent use of alcohol-based hand sanitizers can help reduce the spread of antibiotic-resistant bacteria.⁴⁶ A study by Bockmühl et al. in a German hospital showed that hand hygiene practices reduced the transmission of methicillin-resistant *Staphylococcus aureus* (MRSA) infections by 55%.⁴⁷ This study highlights the significant impact that hand hygiene can have in reducing the spread of antibiotic-resistant infections. Isolation precautions are another essential infection control measure. Patients with antibiotic-resistant infections, or those at high risk of getting such infections, should be isolated to prevent transmission to other patients and healthcare workers. Using personal protective equipment (PPE) such as gloves, gowns, and masks can further reduce the risk of transmission. A study by et al. found that implementation of isolation precautions reduced transmission of Enterobacteriaceae (CPE) infections in a Canadian hospital.⁴⁸ Environmental hygiene is also essential for infection control. Hospital environments can harbor antibiotic-resistant bacteria, so keeping them clean and disinfected is important. Cleaning and disinfecting hospital surfaces and equipment can reduce the spread of antibiotic-resistant infections. A study by Rutali et al. found that a combination of cleaning and disinfection reduced the transmission of vancomycin-resistant (ARE) infections in a US hospital.⁴⁹ This study demonstrates the importance of

Strategies to prevent antibiotic resistance

1. One strategy to prevent antibiotic resistance is the development of new antibiotics. Developing new antibiotics is a slow and expensive process, and there are concerns that any new drug will quickly become resistant to the bacteria.
2. Another strategy is the implementation of antibiotic stewardship programs aimed at promoting the appropriate use of antibiotics. The Centers for Disease Control and Prevention (CDC) recommends the use of antimicrobial stewardship programs in all healthcare settings (CDC, 2021).
3. The use of alternative treatments is also a strategy to prevent antibiotic resistance. Alternative treatments include probiotics, bacteriophage, and natural remedies. However, the effectiveness of alternative treatments varies, and more research is needed to determine their potential role in preventing antibiotic resistance.
4. In addition, infection prevention and control measures need to be improved to reduce the spread of resistant bacteria. This includes good hand hygiene, the use of personal protective equipment and the implementation of infectious disease control measures in healthcare settings.

Impact of antimicrobial resistance on global health:

Antimicrobial resistance is not a new phenomenon; They have been around since the introduction of antibiotics in the 1940s, but the increasing prevalence of antibiotic-resistant bacteria in recent years is of great concern. The estimated number of deaths due to antibiotic resistance worldwide is around 700,000 annually.⁵⁰ The WHO has identified antimicrobial resistance as a priority health problem that needs to be addressed urgently.⁵¹ The emergence of antibiotic-resistant bacteria makes it difficult for medical staff to treat bacterial infections, leading to longer hospital stays, higher healthcare costs, and increased mortality.⁵² The risk of antibiotic resistance is not limited to high-income countries. The problem is more severe in low- and middle-income countries, where infectious diseases are widespread. The lack of a regulatory framework, access to over-the-counter antibiotics, and poor healthcare infrastructure contribute to the emergence and spread of antibiotic resistance.⁵³ In addition, the overuse of antibiotics in agriculture, animal husbandry and aquaculture exacerbates the situation by encouraging the development of antibiotic-resistant bacteria.⁵⁴ The global impact of antimicrobial resistance cannot be overstated. Infectious diseases that were once treatable with antibiotics are becoming deadly again. For example, tuberculosis, once thought to be under control, is making a comeback thanks to resistance to antibiotics, and once-curable malaria has also become resistant to common drugs.⁵⁵ In addition, antibiotic resistance has drastically reduced the effectiveness of cancer treatment, resulting in reduced survival.⁵⁵

Given the global nature of the problem, international cooperation and collaboration are essential to address antibiotic resistance. The WHO has taken the lead in addressing antibiotic resistance by launching the Global Antimicrobial Surveillance System (GLASS) in 2015. The GLASS is a global network of laboratories that collect data on antibiotic-resistant bacteria and share it with the WHO to monitor trends and develop appropriate policy responses.⁵⁶ Moreover, the WHO has developed a global action plan on antibiotic resistance, which emphasizes the need for a multisectional approach involving various stakeholders, including health, agriculture, environment, and finance sectors.⁵⁷ The action plan outlines five strategic objectives, namely, improving awareness and understanding of antibiotic resistance, strengthening surveillance and research, reducing the incidence of infection, optimizing the use of antibiotics, and ensuring sustainable investment in countering antibiotic resistance. Many countries have also taken national measures to combat antimicrobial resistance. For example, the United States created the National Plan of Action to Control Antibiotic-Resistant Bacteria, which outlines a

comprehensive approach to addressing this problem.⁵⁸ The plan includes actions to improve antibiotic stewardship, improve infection prevention and control, improve surveillance and research, and develop new vaccines and medicines.

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