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Physician barriers to implementation of hospital-based antimicrobial stewardship programs (ASPs): a global perspective

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Abstract

Purpose of review Antimicrobial resistance (AMR) is a significant global health issue. Hospital-based antimicrobial stewardship programs (ASPs) are an important component of a "One Health" approach for addressing AMR. However, the adaptation and implementation of ASPs in low-resource settings often faces multiple barriers, which need to be identified and addressed to ensure program effectiveness.
Recent findings Barriers to ASPs adoption have been identified at the health system and hospital levels, within the organization and interpersonal relationships in wards and departments, and at the individual level of knowledge and perceptions of physicians and other health providers regarding AMR and antimicrobial prescribing practices. Utilizing the Consolidated Framework for Implementation Research (CFIR) is one means of providing a model for adapting ASPs to meet local needs and for recognizing and addressing barriers prior to and during program implementation.
Summary Despite challenges, hospital-based ASPs have been successfully introduced in low-resource settings. Key components of successful ASPs include a focus on de-

escalation, development of local prescribing guidelines, inclusion of non-medical training such as communication, and engagement and partnering with a broad coalition of institutional and organizational stakeholders throughout the adaptation, evaluation, implementation, and scale-up processes.

Introduction

The World Health Organization has defined antimicrobial stewardship programs (ASPs) as the " …appropriate use (of antimicrobials) to improve patient outcomes while minimizing the development and spread of resistance" [1]. The eight-country Global Antibiotic Resistance Partnership has put forth six recommendations for improving antibiotic use, which include "[improving] hospital infection control and antibiotic stewardship" and the education of health professionals on "sustainable antibiotic use" [page 106] [2]. Multiple governmental and professional organizations including the U.S. Centers for Disease Control and Prevention and the European Society of Clinical Microbiology and Infectious Disease have also emphasized hospital-based stewardship as an essential component in addressing the challenges associated with antimicrobial resistance (AMR) [3, 4].

Evidence suggests that ASPs can help to reduce the use of antibiotics within hospital settings. A systematic review of 221 global ASPs studies indicates that enabling (e.g., training, education) and restrictive (e.g., formulary restrictions, expert approval) interventions increase adherence to prescribing policies within hospitals. In addition, stewardship programs reduce the duration for which antibiotics are prescribed, the length of hospital stays, and health expenditures, and improve patient outcomes [5, 6, 7••]. In the United States, approximately 50% of inpatients receive antibiotics, and overall an estimated 30% of antibiotic use has been determined to be unnecessary. Yet less than 50% of U.S. hospitals have established ASPs that meet the Centers for Disease Control and Prevention core elements, with smaller hospitals and those in certain regions of the United States less likely to have adequate programming and/or policies [8]. At the global level there is significant variation both within countries and between regions. Overall, the European region has the highest percentage of hospitals with ASPs, and Africa the lowest.

There is a wide array of stewardship programs available. However, mechanisms and toolkits are needed to take into account local health systems' needs and resources, and socioeconomic, cultural, and behavioral factors that can affect program efficacy, adaptability, adoptability, scale-up, and sustainability [9, 10]. A key element of such processes must include early and ongoing engagement of national policy leaders, health administrators, health providers, and local communities. ASPs need to be developed or adapted to fit within existing health infrastructures and to meet locally defined needs related to antimicrobial use and resistance [11].

Implementation Science and Antimicrobial Stewardship Programs (ASPs)

The National Institutes of Health Fogarty International Center defines implementation science as the "study of methods to promote the integration of research findings and evidence into health care policy and practice to achieve their potential public health impact" [12]. A major challenge over the past few decades has been in identifying successful approaches for the implementation of evidence-based hospital, clinic, and community-based programs in order to serve a more encompassing group of the original study population and/or in new socioeconomic and cultural settings [13]. Prior to and during program

implementation, unique barriers make the goal of scale-up and sustainability more difficult to achieve [14]. In order to facilitate implementation, barriers must be identified as early as possible, including integration of implementation research within program pilots and outcome evaluation studies (e.g., randomized control trials, non-randomized studies).

The Consolidated Framework for Implementation Research (CFIR) was developed from multiple models used to understand factors associated with the level of success of health science program implementation [15]. The CFIR domains include (1) the outer setting, (2) the inner setting, (3) the individuals involved in the program, and (4) the intervention and processes of program implementation. The CFIR is based on a holistic approach highlighting the dynamic nature of implementation and the interconnectedness of constructs within and between domains.

In terms of identifying barriers for physicians in relation to ASPs, these domains equate to (1) the organization of the larger health system/hospital, and how the health system/hospital is connected to external institutions and organizations ("outer setting"); (2) the internal structure and interpersonal characteristics of the specific wards or departments where the intervention is implemented ("inner setting"); (3) the prescribers, administrators, and other health staff ("individuals involved"); and (4) the specific type of stewardship program and its characteristics ("the intervention), and the planning, engagement, execution, and reflection/evaluation processes during implementation. Utilizing these domains, a broad range of barriers and facilitators can be identified that can affect ASPs implementation within and across specific hospitals and/or sociocultural settings.

Outer Settings

In higher-income settings including Australia, the United Kingdom, and Europe, institutional-level barriers include competing demands on resources, a lack of cooperative strategies to support ASPs, the need for more physicians in leadership and policy decision-making roles, and poorly established networks both between hospitals and health systems and between countries within regions with similar disease epidemiology (e.g., European Union) [16–18]. In low- and middle-income countries, ASPs are often a lower priority than other health needs, and surveillance and other evidence of the impact of resistance on population health are limited. Without such data, policymakers and health administrators are less likely to direct resources toward policies and programs to address AMR [19, 20, 21••]. In studies from Malaysia, Central India, and Thailand, data indicate that physicians experience pressure to buy and use specific products from pharmaceutical companies, which can create situations in which broad-spectrum antibiotics are overused [22–24]. Across high-, middle-, and low-income countries, many hospitals are understaffed and lack infectious disease experts and adequate microbiology facilities. However, data suggest that in lower-resource health facilities, ASPs for administrators and health care providers can be successfully adapted and implemented within the restrictions of these settings, for example, through education and training of non-specialists as stewardship champions [25–27].

Inner Settings

Within wards and departments where ASPs are implemented, a number of factors can affect program effectiveness and sustainability. Hierarchical structures within the ward/department may create challenges in terms of providing reviews or making recommendations about prescribing practices. One study in the United Kingdom suggests that infectious disease physicians may be reluctant to provide expertise if doing so affects their relationship with peers [16]. In a hospital in Central India, data indicate that it is common practice among physicians not to utilize laboratories for diagnoses [22]. And in Iran, senior physicians do not model a good "safety culture" (e.g., in terms of hand hygiene practices), thereby setting up an environment where infection control is not a priority [20].

Individual Factors

At the global level, physicians and other health providers lack the knowledge necessary to optimize antibiotic use. This results from insufficient access to training and educational opportunities regarding AMR and prescribing practices. In general, there is a demand for such training across health professions [19, 20, 28]. However, in Norway and the United Kingdom, some physicians expressed concern about ASPs in terms of a sense of ownership over prescribing decisions and their trust in "experiential learning" compared with evidence-based practices [17, 29]. In the United States and Australia, interns and residents had less basic knowledge than senior physicians [30, 31]. In a study in Cambodia, some physicians were uncertain about which antibiotics should be used for common infections, and they were more likely to prescribe broad-spectrum antibiotics and had limited knowledge about adjustments for patients with renal impairment [32]. Data from several countries indicate that physicians underestimate rates of AMR within their own hospitals, nationally, and globally, and underestimate the impact of their own prescribing practices on resistance [33, 34••, 35]. In studies in India and Thailand, physicians were resistant to programs and policies that included restrictions on antimicrobial use [19, 36]. In both Peru and Laos, approximately a quarter of respondents did not perceive prescribing unneeded antibiotics as causing harm, and also expressed concern about the quality of medications within their hospital settings [33, 35].

Interventions and Program Implementation

While there are varying needs across regions, countries, and specific hospital settings, there are some general components of ASPs which are key to increasing the likelihood of positive change. These include an emphasis on de-escalation in terms of dosage, duration, the use of narrow-spectrum antibiotics whenever possible, and limiting prophylactic use [16]. Non-medical skills including communication can facilitate introduction of ASPs [37]. Local guidelines are also perceived as a key element to aid physicians in optimizing antibiotic use [30, 33, 34••, 35]. The development of such guidelines should be a collaborative process between national health policymakers and administrators, hospital administrators and staff, and

consulting partners with expertise in infectious disease, infection control, and antimicrobial stewardship [28]. ASPs adaptation and implementation should also be collaborative and inclusive of "respected" leaders [25, 38]. The establishment of scientific advisory boards comprising a broad range of international, national, and local stakeholders is one means of increasing alliances. A mixed-methods approach can provide essential information regarding barriers and facilitators with regard to program implementation and sustainability, and mechanisms to address those barriers within new socioeconomic settings [39].

Conclusions

AMR is a major global health threat, as an increasing number of pathogens are becoming resistant, and few antimicrobials are in the development pipeline. AMR contributes to higher disease mortality and morbidity, and significant social and economic burden at the individual, household, community, and national levels [40, 41]. The impact of AMR disproportionately affects health outcomes in low- and middle-income countries, and low-resource settings face significant challenges in addressing AMR and the implementation of ASPs [42, 43]. Implementation science is usually associated with the adoption and scale-up of evidence-based programs. However, in order to move forward more rapidly from the identification of such programs to broader adaptation, implementation, and dissemination, the utilization of a framework such as CFIR can provide a structure for identifying and addressing these barriers [10, 44]. The World Health Organization has advocated the use of collaborative implementation research in combination with health system strengthening and institutional capacity building to support expansion of interventions in regions most burdened by infectious disease [45]. Antimicrobial stewardship programs must be an integral part of these efforts to ensure a future where treatments for infectious diseases are effective and accessible on a global scale.

Compliance with ethical standards

Conflict of Interest
Linda Kaljee, Tyler Prentiss, and Marcus Zervos declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent
This article does not contain any studies with human or animal subjects performed by any of the authors.

Publisher's Note

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Papers of particular interest, published recently, have been highlighted as:

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