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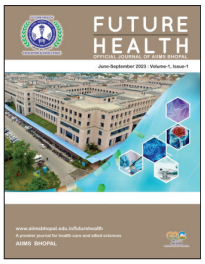

Review Article

Extended and expanded role of nurses in antimicrobial stewardship program: A review

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ABSTRACT

Antimicrobial resistance is a significant healthcare concern in this century, marked by the emergence of multidrug-resistant microorganisms. An antimicrobial stewardship program, while an innovative approach to mitigating the global threat of antimicrobial resistance and its effects on public health, is also an absolute need of the hour. When implemented effectively, such a program, in conjunction with selecting the appropriate drug, determining the correct dosage and route of administration, and integrating with an infection control program, has proven to be an effective method for curbing the rapid emergence and transmission of antimicrobial-resistant pathogens. Partnerships with nurses to strengthen antimicrobial stewardship programs in healthcare have recently gained recognition, especially in the backdrop of increased antimicrobial resistance in developing countries. Traditionally, stewardship activities have involved only prescribers and pharmacists, but including nurses in these efforts has become increasingly important. Highlights of nurse-driven antimicrobial stewardship activities include effective assessment of allergies, meticulous sampling for blood and urine cultures, antibiotic de-escalation, and 24-hour monitoring of patient status. Antibiotic or general ward rounds provide unique opportunities for nurses to influence the indication and duration of antimicrobial treatment. Including nurses in antimicrobial stewardship programs will make the management of antimicrobial therapy robust and empower healthcare institutions to approach the prevention of AMR with truly multi-disciplinary strategies. Antimicrobial stewardship is often redundant and centered around doctors in tertiary care centers. However, active participation by nurses in both healthcare facilities and community settings is crucial for making Antimicrobial stewardship practice (AMSP) a reality. Scalable nursing involvement in antimicrobial stewardship is essential for developing and developed nations to combat AMR effectively.

Keywords: antimicrobial resistance, antimicrobial stewardship, nurse

INTRODUCTION

Antimicrobial resistance is a challenging healthcare concern in this century with the emergence of multidrug-resistant microorganisms. Antimicrobial stewardship program is the need of the hour to neutralize a global threat to public health.[1,2]

The World Health Assembly endorsed the Global Action Plan on Antimicrobial Resistance (AMR) in May 2015. Another significant development was the Political Declaration of the High-Level Meeting of the General Assembly on AMR in September 2017. These actions led to the recognition of AMR as a global threat to public health. Estimates suggest that AMR could be responsible for up to 700,000 deaths annually globally, with 99,000 deaths related to hospital-acquired infections (HAI) occurring in the USA alone, highlighting the magnitude of the problem.[3,4]

The major contributing factors of concern include the widespread and unrelenting use of antibiotics, their availability as over-the-counter drugs, lack of control over their sale, and the uncontrolled spread of antimicrobial-resistant organisms, including those resistant to multiple drugs on a global scale.[5] Additionally, the reluctance of the pharmaceutical industry to develop new antibiotics,[6] along with rapid and accessible international travel, further exacerbates the problem.[7]

The use of antibiotics has reached alarming levels in India, as shown by a recent surveillance study. This study revealed that approximately 40% of patients in the community are on antibiotics, with rates of inappropriate use being even higher.[8,9]

It is quite clear from the available evidence that a stewardship program would be of utmost importance if we were to alleviate the global threat of antimicrobial resistance to public health. Antimicrobial stewardship refers to the vigilant and considerate use of antimicrobial therapy. It is a well-coordinated and specifically designed set of interventions targeted towards improving antimicrobials' usage by promoting responsible selection of appropriate drug regimen, with proper dosage, for an appropriate duration, and suitable route of administration.[10] It aims to rationalize the usage of antibiotics through education, not only catering to health care providers but common people as well, to ensure that they have the necessary knowledge and understanding of the pattern that antimicrobial resistance follows with the ultimate aim of conserving the effectiveness of treatment options that already exist.[11]

An antimicrobial stewardship program, when implemented effectively, with proper drug selection, route of administration, and the duration of therapy, alongside programs dedicated to infection control, shows promising abilities to curb the emergence and transmission of antimicrobial-resistant pathogens.[12]

Despite its promising nature, the advent of AMS (Antimicrobial Stewardship) teams in healthcare institutions remains at an unfortunate, elementary stage across India. Exceptions to this disappointing state, however, include selected public as well as private institutions that have witnessed the positive outcomes of AMS.[13,14]

Despite increased antimicrobial resistance in developing countries, with stewardship activities only involving prescribers and pharmacists, the need for a partnership with the nurses to strengthen the stewardship program has been highlighted.[15] Inclusion of nurses in antimicrobial therapy will empower healthcare institutions to take up the prevention of AMR through truly multi-disciplinary approaches. This importance may be attributed to nurses' widespread involvement in activities directly related to antibiotic usage. Highlights of activities of nurse-driven antimicrobial stewardship involve effective assessment, meticulous sampling for blood and urine culture, antibiotic de-escalation, and 24-hour monitors of patient status.[16,17]

Method and search strategy

Databases such as PubMed, Embase, CINAHL, Web of Science, and Scopus were comprehensively reviewed, and a systematic literature search was conducted. The search strategy involved a combination of keywords and MeSH terms related to antimicrobial stewardship viz "Antimicrobial resistance," "Antimicrobial stewardship," "Nurse role in antimicrobial stewardship," "Antimicrobial stewardship program," and other relevant variations. Boolean operators such as AND and OR effectively combined the keywords and enhanced the search results. The combination of keywords and MeSH terms was consistent across all the databases. The synthesis of the evidence obtained from the selected articles formed the basis of this review. It provided insight into the problem of antimicrobial resistance, the roles of various stakeholders, the role of nurses in stewardship, challenges, and the way forward.

Role of various stockholders

The effectiveness of an antimicrobial stewardship program in health care depends on the collaborative efforts of professionals involved in handling antibiotics at any point in time. It includes clinicians, pharmacists, microbiologists, and nurses. The key policy documents at national and international levels highlight the role of clinicians and pharmacists. Unfortunately, nurse involvement in AS (Antimicrobial Stewardship) has been grossly neglected.[18] As per the current situation, there is an acute lack of recognition of how the contribution of nurses can lead to the reduction of HCAIs (Health Care Associated Infections) and AMR through participation in ASPs (Antimicrobial Stewardship Practices).

The palpable absence of nurses from stewardship efforts becomes a concrete issue from the fact that a multisite study conducted on nurses showed that only 38% of inpatient, clinical nurses were familiar with the phrase "antibiotic stewardship".[19]

Nurses are multifunctional healthcare workers integral to a successful antimicrobial stewardship program. However, formal recognition of the role of staff nurses in the guidelines for implementing and operating antimicrobial stewardship programs has yet to come about, and thus, they are underutilized.

Considering nurses' widespread involvement in activities directly related to antibiotic usage, numerous editorials

have advocated for their formal inclusion in the stewardship program.[20,21] Since then, the antimicrobial stewardship program has been conceptualized as a multidisciplinary approach that calls for nurses' formal inclusion to ensure the smooth implementation of stewardship activities.

In India, nurses are the largest healthcare workforce (34.33 Lakhs nurses v/s 13,08,009 doctors),[22] available 24x7 at the bedside; therefore, they are in a good position to ensure the proper implementation of program activities. Various studies conducted in European and American countries have explored the various roles of nurses that are effective in combating antimicrobial resistance.[23]

Nurses: a potential powerhouse and driver

Nurses balance the roles of antibiotic first responders, central communicators, and coordinators of patient care activities. Olans *et al.* evaluated the stewardship activities of nurses and even analyzed the potential benefits of formal education of nurses about inclusion into ASPs.[24] To mitigate the further emergence of antimicrobial resistance, it is pivotal to optimize the usage of antimicrobials. It may be achieved through the use of specific antibiotics, monitoring and stopping the antibiotics courses at the earliest possible opportunity, and promoting the usage of the intravenous route of administration whenever possible and appropriate.[25,26] Monitoring the decision-making and response about antimicrobial therapy is the key to achieving the goal of antimicrobial stewardship, and nurses are in an ideal and useful position to provide this service through their consistent presence at the bedside.[27]

In the Indian health care system, most of the ASP activities fall in the purview of physician work responsibilities that include monitoring indication and duration for antimicrobial treatment, giving preference to oral therapy in place of intravenous, monitoring for allergic reactions to drugs or other side effects, ensuring that administration of antimicrobials is on time, monitoring therapeutic levels and following up on doses that have been missed. However, due to time constraints and higher workload, these activities may not be carried out consistently and get overlooked. On the contrary, nurses are the key personnel to administer medications and review medication charts; therefore, they can collaborate effectively with stewardship teams and contribute meaningfully to the ASP. Antibiotic or general ward rounds are unique opportunities for the nurses to influence the antimicrobial indication and duration.

Eileen J Carter *et al.*[23] Reported that three nurse-driven antibiotic stewardship practices were perceived favorably, including questioning the requirement of urinary/blood cultures, ensuring that proper culturing techniques are followed, and encouraging the prompt transition of the route of drug administration from intravenous to oral. Rounds taken in the ward can result in cooperative decision-making between nurses and other healthcare colleagues,[28] and although they are not usually directly involved in prescribing, they can influence the decisions of medical as well as other prescribers.[29]

The Indian Nursing Council Code of Conduct for Nurses has specified that nurses are obliged to advocate for their patients and ensure that those in their care have access to effective healthcare, support, and information. Therefore, ensuring that antimicrobials are administered according to the treatment plan and any deviation from the plan is promptly managed may be considered a responsibility of nurses.

The inclusion of nurses in antimicrobial stewardship programs will strengthen the management of antimicrobial therapy and empower healthcare institutions to adopt a truly multidisciplinary approach to preventing AMR.

In the Indian Scenario, junior doctors often make decisions related to antimicrobial therapy.[30] However, the tendency to rotate junior doctors throughout wards affects the mechanism for implementing the ASP activities as there is a loss of essential knowledge regarding the management of antimicrobials for specific patient groups.

On the contrary, nurses are a relatively stable population and can contribute to safeguarding organization memory about antimicrobial management. Organizational memory is the collective load of information that is retrievable and confined within the folds of an organization as well as in the minds of the people belonging to the said organisation.[31]

Postgraduate nursing students are posted in clinical areas throughout the training period, and nursing faculty can assign specific activities related to ASP. Supervision and auditing by the nursing faculty can boost the ASP drive across the organization.

The major areas where nurses' contributions can make a difference against antimicrobial resistance are depicted in Figure 1.

Involvement of the nurses in ASP may prove to be cost-beneficial in developing countries like India as it will eliminate the need to recruit and retain the specialized personnel involved in AMSPs. The multifaceted role of the nurses in AMSPs may serve as the best utilization of the available resources and help in cost containment in resource-limited settings.

Challenges and the way forward

Professional challenges nurses face in the Indian health care system can affect their contribution towards ASP.

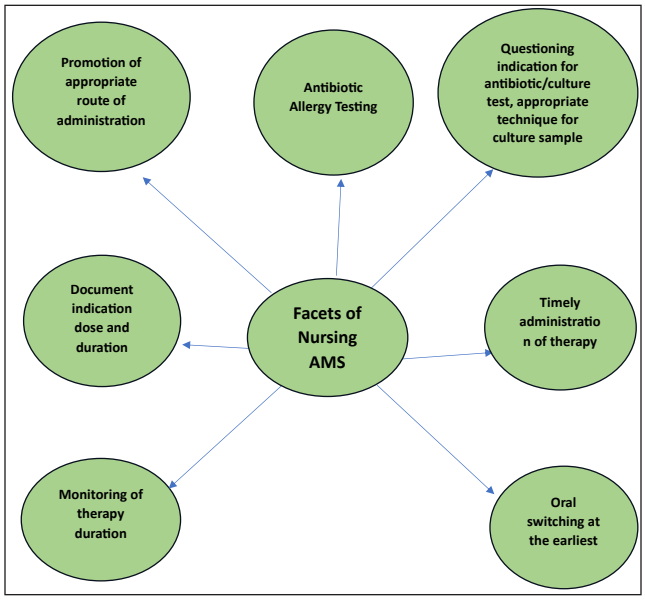

Figure 1: Facets of nursing antimicrobial stewardship (AMS).

The construct of power and knowledge will be key factors in deciding a nurse's ability to discuss antimicrobial management choices. Lack of knowledge and fragile links with positions of power, particularly within the healthcare environments, might likely be some factors dissuading nurses from participating in ASPs.[32] Being an antimicrobial steward, Nurses' collaboration to influence antimicrobial management decisions is further complicated by the etiquette followed in prescribing, which refers to the reluctance of prescribers to alter decisions made by colleagues.[33] It would be a good idea if the term "antimicrobial management" were used instead of "antimicrobial prescribing," which would be more holistic and facilitate the inclusion of nurses in this global drive without much threat of power and hierarchy.

Prescribing antimicrobials is related to a specific area of expertise associated with the practice of medicine and medical treatment, which might also be a factor in making nurses feel eliminated from the decision-making process. To facilitate nurses' involvement, it might be helpful to acknowledge that the management of antimicrobials is necessary to ensure their appropriate usage. Nurses must have adequate knowledge about the antimicrobial stewardship program to contribute effectively.

Thursky *et al.*[34] assessed the effectiveness of the pathway of hospital-wide sepsis. The nurses were prompted to initiate care for patients with two or more than two systemic inflammatory response syndrome criteria or hypotension and infection. The study reported that the patients in the post-implementation group who received appropriate antibiotic therapy were significantly more in number (76.1% vs. 90.1%, $P < 0.05$), and they also had a relatively shorter time to receipt of the first antibiotic (110 vs. 55 minutes, $P<0.05$). Clinical outcomes, including the sepsis-related mortality rate, were also noticeably improved in this group (16.2% vs 5%, $P<0.05$). Similarly, Shelton *et al.*[35] assessed the effectiveness of a bundle of 6-hour interventions for sepsis in a nursing-driven protocol among cancer patients and HCT recipients. The mean time to the first intervention showed significant improvement after protocol implementation (23 vs 291 minutes, $P = 0.029$), and patients that received a first intervention within 20 minutes went up from 29% to 51%.

Various stewardship (AMS) nursing models (Vertical, horizontal, and hybrid) have already been implemented in the UK. Indian policymaking and decisions about nursing roles could draw inspiration from these models to approach a more context-sensitive and pragmatic nursing role.[36]

CONCLUSION

Antibiotic stewardship is an emerging need in healthcare, and nurses have the potential to contribute significantly to this program. Antimicrobial stewardship in its present form is redundant and centered around doctors in tertiary care centers. However, AMSP seems to be a distant reality, with the active participation of nurses in both healthcare facilities and community settings. Scalable nursing antimicrobial stewardship is needed in both developing and developed nations to curtail and combat the menace of AMR.

Ethical approval

Institutional Review Board approval is not required.

Declaration of patient consent

Patient consent is not required as there are no patients in this study.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that no AI-assisted technology was used to assist in the writing of the manuscript, and no images were manipulated using AI.

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