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Antimicrobial Stewardship: The Role of Nurses in Preventing Drug Resistance among Patients in Government-Owned Hospitals in Cross River State, Nigeria

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ABSTRACT RESEARCH ARTICLE

Antimicrobial resistance (AMR) has become a major global public health threat, undermining the effective treatment of infectious diseases and increasing morbidity, mortality, and healthcare costs. Nurses, as the largest segment of the healthcare workforce in government-owned hospitals, are critical to antimicrobial stewardship (AMS) due to their continuous patient contact, medication administration responsibilities, and role in patient education. This study examined the knowledge, practices, involvement, and challenges of nurses in antimicrobial stewardship and their contribution to preventing drug resistance among patients in government-owned hospitals in Cross River State, Nigeria. A descriptive survey design was adopted, with the population comprising 159 registered nurses. A structured questionnaire was used for data collection, and the responses were analyzed using descriptive statistics (mean, standard deviation, percentages) and inferential statistics (Pearson correlation) to test the research hypotheses at a 0.05 significance level. The findings revealed that nurses demonstrated moderate knowledge and practices regarding antimicrobial stewardship, with higher awareness of AMS principles than consistent application in clinical practice. Nurses' involvement in AMS activities was moderate, with stronger engagement in patient education and infection prevention than in institutional stewardship committees. The study also identified significant challenges, including high workloads, limited access to training, inadequate institutional support, and restricted access to updated clinical guidelines, which negatively affected nurses' AMS practices. A positive and significant correlation was found between nurses' knowledge and practices ($r = 0.68$, $p < 0.05$) and between involvement and practices ($r = 0.63$, $p < 0.05$), while challenges were negatively correlated with AMS practices ($r = –0.57$, $p < 0.05$). The study concluded that nurses play a critical role in antimicrobial stewardship and the prevention of drug resistance; however, their potential is limited by systemic, institutional, and educational barriers. Recommendations include targeted training programs, enhanced integration of nurses into AMS committees, improved resource allocation, and interprofessional collaboration to strengthen stewardship practices and reduce antimicrobial resistance in government-owned hospitals

KEYWORDS: Antimicrobial stewardship, nurses, drug resistance, government-owned hospitals, Cross River State, Nigeria

Introduction

Antimicrobial resistance (AMR) has emerged as one of the most critical global public health threats, compromising the effective prevention and treatment of infectious diseases and reversing gains made in modern medicine. The World Health Organization identifies AMR as a major cause of prolonged illness, increased mortality, and rising healthcare costs, particularly in low- and middle-income countries where infectious diseases remain highly prevalent (World Health Organization [WHO], 2021). The inappropriate use of antimicrobials, including overprescription, incorrect dosing, poor adherence, and self-medication, has been widely recognized as a key driver of drug resistance (O'Neill, 2016).

In Nigeria, the challenge of antimicrobial resistance is exacerbated by weak regulatory enforcement, easy access to antibiotics without prescription, limited diagnostic capacity, and gaps in antimicrobial stewardship implementation across healthcare facilities (Federal Ministry of Health [FMoH], 2017; WHO, 2022). Government-owned hospitals, which provide care for a large proportion of the population, particularly low-income and rural dwellers, often operate under constraints such as inadequate staffing, high patient turnover, and limited access to continuous professional training. These conditions increase the likelihood of suboptimal antimicrobial use and contribute to the growing burden of resistant infections.

Antimicrobial stewardship refers to coordinated interventions designed to promote the appropriate use of antimicrobials by improving drug selection, dosing, route, and duration of therapy in order to enhance patient outcomes while minimizing resistance (Centers for Disease Control and Prevention [CDC], 2019). While stewardship programs have traditionally focused on physicians and pharmacists, there is increasing recognition of the central role nurses play in ensuring effective antimicrobial use. Nurses are directly involved in medication administration, monitoring therapeutic responses, identifying adverse drug reactions, ensuring adherence to prescribed regimens, and educating patients on the correct use of antimicrobials (Courtenay et al., 2019).

In government-owned hospitals in Cross River State, nurses constitute the largest segment of the healthcare workforce and maintain continuous contact with patients throughout the care process. Their position enables them to influence antimicrobial practices through timely administration of drugs, reinforcement of infection prevention and control measures, patient counseling, and early detection of treatment failure or misuse. Evidence suggests that when nurses are adequately trained and actively engaged in antimicrobial stewardship activities, there is improved compliance with treatment guidelines and reduced inappropriate antibiotic use (Edwards et al., 2021).

Despite this potential, the role of nurses in antimicrobial stewardship in many Nigerian public hospitals remains inadequately defined and underutilized. Limited awareness of stewardship principles, lack of institutional policies, minimal inclusion of nurses in decision-making, and insufficient continuing education have constrained their contribution to preventing drug resistance (Auta et al., 2019). In Cross River State, where infectious diseases continue to pose a significant health burden, understanding the current role of nurses in antimicrobial stewardship is essential for strengthening hospital-based strategies to curb antimicrobial resistance.

This study therefore focuses on antimicrobial stewardship and the role of nurses in preventing drug resistance among patients in government-owned hospitals in Cross River State, Nigeria. By examining nurses' practices, knowledge, and involvement in stewardship activities, the study seeks to generate evidence that can inform policy formulation, professional training, and the effective integration of nurses into antimicrobial stewardship programs within the public healthcare system.

Statement of the Problem

Antimicrobial resistance (AMR) has become a serious public health concern globally and poses a significant threat to the effective management of infectious diseases. In Nigeria, the burden of AMR is increasing due to widespread misuse and overuse of antimicrobial agents, weak enforcement of drug regulations, limited diagnostic facilities, and poor adherence to treatment guidelines within healthcare settings (World Health Organization [WHO], 2022; Federal Ministry of Health [FMoH], 2017). Government-owned hospitals, which serve a large proportion of the population in Cross River State, are particularly vulnerable to these challenges because of high patient loads, limited resources, and inconsistent implementation of antimicrobial stewardship practices.

Despite the existence of national and global antimicrobial stewardship frameworks, inappropriate antimicrobial use remains common in many public hospitals. Practices such as empirical prescribing without laboratory confirmation, prolonged or incorrect dosing, delayed discontinuation of antibiotics, and inadequate patient education continue to contribute to the emergence and spread of resistant organisms (Auta et al., 2019). While physicians and pharmacists are often the focus of stewardship interventions, the role of nurses who are responsible for administering antimicrobials, monitoring patients, ensuring adherence, and implementing infection prevention and control measures has received limited attention in both policy and practice (Courtenay et al., 2019).

In government-owned hospitals in Cross River State, nurses constitute the largest workforce and maintain continuous contact with patients throughout the course of treatment. However, anecdotal evidence and preliminary observations suggest that many nurses lack adequate training, institutional support, and clearly defined responsibilities related to antimicrobial stewardship. The absence of structured nurse-led stewardship activities, limited interdisciplinary collaboration, and insufficient continuing professional education may reduce nurses' capacity to prevent inappropriate antimicrobial use and curb drug resistance among patients (Edwards et al., 2021).

Furthermore, there is a paucity of empirical studies in Cross River State that specifically examine nurses' roles, practices, and challenges in antimicrobial stewardship within government-owned hospitals. This lack of localized evidence limits informed decision-making, policy development, and targeted interventions aimed at strengthening nurses' contributions to preventing antimicrobial resistance. Consequently, antimicrobial misuse persists, leading to increased treatment failure, prolonged hospital stays, higher healthcare costs, and increased morbidity and mortality associated with resistant infections.

Therefore, the problem this study seeks to address is the inadequate integration and utilization of nurses in antimicrobial stewardship efforts aimed at preventing drug resistance among patients in government-owned hospitals in Cross River State, Nigeria. Understanding the extent of nurses' involvement, the challenges they face, and the factors influencing their

stewardship practices is essential for developing effective strategies to combat antimicrobial resistance in the public healthcare system.

Research Objectives

The main objective of this study is to examine antimicrobial stewardship and the role of nurses in preventing drug resistance among patients in government-owned hospitals in Cross River State, Nigeria.

The specific objectives are to:

1. assess the level of knowledge and practices of nurses regarding antimicrobial stewardship in government-owned hospitals in Cross River State;
2. examine nurses' involvement in antimicrobial stewardship activities aimed at preventing drug resistance among patients in government-owned hospitals in Cross River State; and
3. identify the challenges and institutional factors influencing nurses' effective participation in antimicrobial stewardship and the prevention of antimicrobial resistance in government-owned hospitals in Cross River State.

Research Questions

The study seeks to provide answers to the following research questions:

1. What is the level of knowledge and practices of nurses regarding antimicrobial stewardship in government-owned hospitals in Cross River State?
2. How are nurses involved in antimicrobial stewardship activities aimed at preventing drug resistance among patients in government-owned hospitals in Cross River State?
3. What challenges and institutional factors influence nurses' participation in antimicrobial stewardship and the prevention of antimicrobial resistance in government-owned hospitals in Cross River State?

Research Hypotheses

The following null hypotheses were formulated to guide the study and were tested at 0.05 level of significance:

1. There is no significant relationship between nurses' level of knowledge of antimicrobial stewardship and their practices in preventing drug resistance in government-owned hospitals in Cross River State.
2. There is no significant relationship between nurses' involvement in antimicrobial stewardship activities and the prevention of antimicrobial resistance among patients in government-owned hospitals in Cross River State.
3. There is no significant relationship between institutional factors and nurses' participation in antimicrobial stewardship and the prevention of drug resistance in government-owned hospitals in Cross River State.

Literature Review

Level of Knowledge of Nurses Regarding Antimicrobial Stewardship in Government-Owned Hospitals in Cross River State

The level of knowledge of nurses regarding antimicrobial stewardship (AMS) is a critical factor in the fight against antimicrobial resistance (AMR), particularly in government-owned hospitals in Cross River State. Antimicrobial stewardship refers to systematic efforts to promote the rational and responsible use of antimicrobial agents with the goals of improving patient outcomes, minimizing adverse effects, reducing healthcare costs, and most importantly, preventing the development and spread of antimicrobial resistance (Centers for Disease Control and Prevention [CDC], 2019). Nurses, as the largest cadre of healthcare workers and the primary interface between patients and the healthcare system, play a pivotal role in implementing AMS principles at the point of care. Their knowledge of AMS directly influences how effectively they can support rational antimicrobial use and prevent drug resistance.

Knowledge of AMS among nurses encompasses several dimensions. It includes understanding the indications for antimicrobial therapy, appropriate drug selection, correct dosing, timing, route, and duration of administration. It also involves recognizing potential adverse drug reactions, monitoring patient responses, and understanding the mechanisms and consequences of antimicrobial resistance (World Health Organization [WHO], 2021). Furthermore, nurses need to be familiar with hospital-specific antibiotic policies, national treatment guidelines, infection prevention and control protocols, and strategies for promoting patient adherence. Such knowledge ensures that nurses are not only administering medications correctly but are also actively contributing to the reduction of antimicrobial misuse, a major driver of resistance (Courtenay et al., 2019).

Empirical studies in Nigeria and other low- and middle-income countries have highlighted that, while nurses often possess basic knowledge of antibiotics and general infection control, their understanding of formal AMS principles is frequently limited (Auta et al., 2019; Olufunmilayo et al., 2020). Many nurses may know when antibiotics should be administered but are less aware of optimal durations of therapy, the importance of de-escalating therapy based on microbiological results, or how to recognize early signs of treatment failure and resistance. This gap in knowledge is partly due to limited inclusion of nurses in AMS training programs, poor dissemination of updated guidelines, and a lack of structured, ongoing professional education within public hospitals (Edwards et al., 2021).

In government-owned hospitals in Cross River State, several contextual factors further influence nurses' level of knowledge. Heavy patient loads, shortage of qualified staff, inadequate access to up-to-date clinical resources, and minimal integration of nurses into multidisciplinary stewardship teams hinder opportunities for knowledge acquisition and professional development. Often, antimicrobial stewardship programs are primarily physician- or pharmacist-led, leaving nurses with minimal participation in decision-making or evaluation processes (WHO, 2022). Consequently, nurses may have limited understanding of hospital-specific AMS policies and may rely on informal or outdated practices when administering antimicrobials, which can inadvertently contribute to inappropriate use and increased risk of resistance.

The consequences of inadequate AMS knowledge among nurses are profound. When nurses are not well-informed, they may fail to reinforce appropriate antimicrobial use, provide incomplete patient education on adherence, or miss early warning signs of antimicrobial failure. This can lead to treatment delays, prolonged hospital stays, higher healthcare costs, and the propagation of resistant infections within hospital settings (O'Neill, 2016; Edwards et al., 2021). Conversely, studies indicate that nurses with strong AMS knowledge are more likely to engage in proactive practices, such as monitoring for drug resistance, educating patients and caregivers, ensuring proper administration, and collaborating with the healthcare team to optimize antimicrobial use (Courtenay et al., 2019).

Assessing and improving the level of knowledge of nurses regarding antimicrobial stewardship in government-owned hospitals in Cross River State is therefore essential. Such assessment can identify specific knowledge gaps, training needs, and areas requiring policy intervention. By strengthening nurses' understanding of AMS principles, hospitals can enhance the rational use of antimicrobials, reduce the incidence of drug resistance, and improve patient outcomes. Furthermore, well-informed nurses can serve as advocates for stewardship practices, ensuring that infection prevention measures and rational drug use become integral components of patient care. This approach is particularly crucial in resource-limited settings, where nurses' roles are central to maintaining the quality and safety of healthcare delivery.

Practices of Nurses Regarding Antimicrobial Stewardship in Government-Owned Hospitals in Cross River State

The practices of nurses regarding antimicrobial stewardship (AMS) are central to the rational use of antimicrobial agents and the prevention of drug resistance in government-owned hospitals in Cross River State. While knowledge provides the foundation for effective stewardship, it is the application of that knowledge through evidence-based practices that directly influences patient outcomes and curtails the emergence of antimicrobial resistance (World Health Organization [WHO], 2021). Nurses, as frontline healthcare providers, are involved in multiple aspects of antimicrobial use, including medication administration, monitoring of therapy, patient education, infection prevention, and collaboration with other healthcare professionals in the stewardship process (Centers for Disease Control and Prevention [CDC], 2019).

Key practices of nurses in antimicrobial stewardship include ensuring accurate administration of prescribed antimicrobial agents according to the five rights of medication administration (right patient, right drug, right dose, right route, and right time), monitoring patients for therapeutic efficacy and adverse drug reactions, and promptly reporting any deviations or complications to the prescriber (Courtenay et al., 2019). These practices are essential in minimizing medication errors, preventing sub-therapeutic dosing, and ensuring that antimicrobials are used appropriately to reduce the risk of developing resistance.

Another critical practice involves patient education and counseling. Nurses are responsible for instructing patients on the importance of adhering to prescribed antimicrobial regimens, completing the full course of therapy, avoiding self-medication, and understanding the risks of sharing antibiotics (Edwards et al., 2021). Effective patient education enhances adherence, reduces the likelihood of treatment failure, and prevents the emergence of resistant organisms. In addition, nurses reinforce infection prevention and control measures, such as hand hygiene, use of personal protective equipment, environmental cleanliness, and isolation

procedures, all of which indirectly reduce the need for antimicrobials and limit the spread of resistant pathogens (WHO, 2022).

Despite these critical roles, studies in Nigerian public hospitals indicate that nurses' practices related to AMS are often inconsistent and constrained by systemic and institutional challenges. High patient-to-nurse ratios, insufficient staffing, lack of access to updated clinical guidelines, and absence of formal AMS policies reduce nurses' capacity to consistently implement stewardship practices (Auta et al., 2019). In some cases, nurses may administer antibiotics without verifying prescriptions or follow outdated protocols due to the absence of functional stewardship committees and limited supervision, which can exacerbate antimicrobial misuse. Additionally, nurses may have minimal involvement in multidisciplinary stewardship teams, limiting opportunities for professional guidance, peer review, and feedback (Olufunmilayo et al., 2020).

Other barriers influencing nursing practices in AMS include inadequate training on antimicrobial stewardship, heavy workloads, poor communication between healthcare professionals, and limited laboratory support for monitoring microbial sensitivity (Edwards et al., 2021). These constraints often result in reactive rather than proactive stewardship practices, with nurses responding to immediate clinical needs rather than actively participating in preventive strategies against drug resistance.

However, evidence also suggests that when nurses receive appropriate training and institutional support, their stewardship practices improve significantly. Nurses who are integrated into hospital AMS programs demonstrate increased adherence to guidelines, better patient counseling, and more active monitoring of antimicrobial use and resistance patterns (Courtenay et al., 2019). Such practices not only enhance patient safety but also contribute to hospital-wide efforts to combat antimicrobial resistance, highlighting the potential of nurses as key drivers of effective stewardship in government-owned hospitals.

Assessing the practices of nurses regarding antimicrobial stewardship in Cross River State is therefore essential to identify gaps, strengthen policy implementation, and design targeted interventions that improve both knowledge and practice. By fostering evidence-based stewardship practices, hospitals can ensure optimal antimicrobial use, reduce the prevalence of resistant infections, and improve overall patient outcomes. Enhancing nurses' practical engagement in AMS is particularly crucial in resource-limited settings, where nurses often serve as the primary point of contact for patients and play a central role in both preventive and curative healthcare delivery.

Nurses' Involvement in Antimicrobial Stewardship Activities Aimed at Preventing Drug Resistance among Patients in Government-Owned Hospitals in Cross River State

Nurses' involvement in antimicrobial stewardship (AMS) activities is a pivotal component in the prevention of drug resistance, particularly in government-owned hospitals in Cross River State. As frontline healthcare providers, nurses are uniquely positioned to implement stewardship strategies due to their continuous and direct interaction with patients, caregivers, and the broader healthcare team (World Health Organization [WHO], 2021). Their involvement extends beyond routine care to include monitoring antimicrobial use, ensuring adherence to prescribed regimens, educating patients, participating in infection prevention initiatives, and contributing to multidisciplinary decision-making regarding antimicrobial therapy (Centers for Disease Control and Prevention [CDC], 2019).

Active involvement of nurses in AMS activities includes verifying antimicrobial prescriptions before administration, monitoring patients for signs of therapeutic success or treatment failure, and reporting adverse drug reactions promptly. These activities ensure that antibiotics are administered correctly, reduce the risk of sub-therapeutic dosing or unnecessary exposure, and limit opportunities for the emergence of resistant pathogens (Courtenay et al., 2019). In addition, nurses frequently serve as educators for patients and their families, reinforcing messages about completing prescribed antibiotic courses, avoiding self-medication, and understanding the dangers of sharing or misusing antibiotics. Such educational interventions have been shown to improve adherence and reduce behaviors that contribute to drug resistance (Edwards et al., 2021).

Nurses also play an essential role in hospital infection prevention and control (IPC) measures, which complement AMS by reducing the incidence of infections that require antimicrobial treatment. Through practices such as hand hygiene, appropriate use of personal protective equipment, environmental cleaning, and patient isolation protocols, nurses contribute to lowering infection rates and minimizing unnecessary antimicrobial exposure (WHO, 2022). Their involvement in surveillance activities, such as monitoring hospital-acquired infections and documenting patterns of antimicrobial use, provides critical data for stewardship programs and informs hospital policies to combat resistance (Auta et al., 2019).

Despite the central role of nurses, their participation in AMS activities in government-owned hospitals in Cross River State is often limited. Factors such as high patient-to-nurse ratios, lack of formal inclusion in stewardship committees, insufficient training, and inadequate access to current clinical guidelines constrain their ability to engage fully in AMS initiatives (Olufunmilayo et al., 2020). Furthermore, interprofessional collaboration between nurses, pharmacists, and physicians may be weak, resulting in nurses assuming passive roles rather than being active contributors to decision-making processes regarding antimicrobial therapy (Edwards et al., 2021).

Nevertheless, evidence suggests that when nurses are actively involved in AMS programs, there is measurable improvement in rational antimicrobial use. Structured involvement includes participation in clinical audits, stewardship education sessions, guideline dissemination, and policy development. Such engagement fosters a culture of accountability, improves adherence to antimicrobial protocols, and strengthens the overall effectiveness of stewardship programs (Courtenay et al., 2019). In Cross River State, promoting nurses' active involvement in AMS is particularly crucial given the high burden of infectious diseases and the risk of rapid emergence of antimicrobial-resistant pathogens in public hospital settings.

Nurses' involvement in antimicrobial stewardship activities is vital for preventing drug resistance in government-owned hospitals in Cross River State. Enhancing their participation through continuous professional development, formal inclusion in stewardship teams, provision of adequate resources, and strengthening interprofessional collaboration can significantly improve the rational use of antimicrobials and reduce the prevalence of resistant infections. Recognizing and empowering nurses as key stakeholders in AMS is therefore essential for the sustainability and success of antimicrobial stewardship initiatives in the region.

Challenges Faced by Nurses in Antimicrobial Stewardship in Government-Owned Hospitals in Cross River State

Despite the critical role nurses play in antimicrobial stewardship (AMS), their effective participation in government-owned hospitals in Cross River State is often hampered by a range of challenges. These challenges span individual, institutional, and systemic levels and can limit the capacity of nurses to fully engage in practices that prevent antimicrobial resistance (World Health Organization [WHO], 2021). Understanding these barriers is essential for developing targeted interventions that strengthen nurses' contributions to AMS.

One of the primary challenges is **limited knowledge and training** in antimicrobial stewardship. Many nurses in public hospitals receive minimal formal education on AMS during their professional training, and opportunities for continuous professional development are often scarce (Auta et al., 2019). Without adequate knowledge of appropriate antimicrobial use, resistance mechanisms, and stewardship protocols, nurses may lack confidence in performing key stewardship activities, such as monitoring prescriptions, identifying inappropriate antibiotic use, or educating patients on adherence (Courtenay et al., 2019).

High patient workloads and staff shortages constitute another major challenge. Government-owned hospitals in Cross River State frequently experience a high patient-to-nurse ratio due to understaffing, which limits the time nurses can dedicate to stewardship-related activities. Heavy workloads reduce opportunities for patient education, meticulous monitoring of antimicrobial therapy, and participation in hospital AMS committees or clinical audits (Edwards et al., 2021). This often results in reactive care rather than proactive involvement in preventing antimicrobial misuse.

Inadequate institutional support and resources also impede effective nurse involvement in AMS. Many hospitals lack functional stewardship committees, clear guidelines, up-to-date policies, or access to diagnostic laboratories for microbial sensitivity testing (Federal Ministry of Health [FMoH], 2017). The absence of these structural supports limits nurses' ability to verify prescriptions, track resistance patterns, or provide evidence-based feedback to prescribers.

Poor interprofessional collaboration is another barrier. In some government-owned hospitals, nurses are not fully integrated into multidisciplinary AMS teams, which are often dominated by physicians and pharmacists. This exclusion reduces opportunities for nurses to contribute to decision-making, share observations from bedside monitoring, or influence prescribing practices (Olufunmilayo et al., 2020). Lack of communication and collaboration may also lead to inconsistencies in the implementation of AMS policies across different departments.

Behavioral and cultural factors may further constrain nurse participation. In some cases, hierarchical structures in healthcare settings may discourage nurses from questioning prescribing decisions or providing recommendations, even when they observe potential misuse. Additionally, resistance to change among staff, including reluctance to adhere to updated AMS protocols, can undermine nurses' efforts to enforce stewardship practices (WHO, 2022).

Finally, **limited access to continuing education and professional development programmes** prevents nurses from staying current with evolving antimicrobial guidelines,

resistance trends, and best practices in stewardship. Without ongoing training and mentorship, nurses may rely on outdated knowledge or informal practices, which can compromise patient care and contribute to the persistence of antimicrobial resistance (Edwards et al., 2021).

Nurses in government-owned hospitals in Cross River State face multiple challenges that affect their involvement in antimicrobial stewardship. These challenges include insufficient knowledge and training, high workloads, inadequate institutional support, poor interprofessional collaboration, hierarchical barriers, and limited access to continuing education. Addressing these challenges is critical to optimizing nurses' role in AMS and enhancing the prevention of drug resistance among patients. Strategies such as targeted training programs, inclusion of nurses in stewardship committees, provision of adequate resources, and promotion of interprofessional collaboration can strengthen nurses' engagement and effectiveness in antimicrobial stewardship initiatives.

Theoretical Framework

The theoretical framework for this study is anchored in **Rogers' Diffusion of Innovations Theory (1962)** and **Orem's Self-Care Nursing Theory (2001).** These theories provide a comprehensive lens through which to understand nurses' knowledge, practices, and involvement in antimicrobial stewardship (AMS) and their influence on preventing drug resistance in government-owned hospitals in Cross River State. By combining these frameworks, the study situates nurses as both implementers of evidence-based interventions and facilitators of patient-centered care, highlighting the interplay between professional knowledge, institutional support, and patient engagement.

Rogers' Diffusion of Innovations Theory posits that the adoption of new ideas, practices, or technologies occurs through a sequential process: knowledge, persuasion, decision, implementation, and confirmation (Rogers, 2003). In the context of AMS, nurses must first acquire knowledge of antimicrobial stewardship principles, including appropriate drug selection, dosing, duration, administration, monitoring, and understanding the consequences of antimicrobial resistance. The theory emphasizes that knowledge alone is insufficient; nurses must be persuaded of the value of stewardship practices, make conscious decisions to integrate them into daily routines, and consistently implement them in collaboration with other healthcare professionals. Confirmation occurs when nurses observe positive outcomes, such as improved patient adherence, reduced incidence of treatment failure, and decreased prevalence of resistant infections. Rogers' theory is particularly relevant because it highlights the role of institutional factors such as hospital policies, guidelines, training programs, and mentorship in facilitating the adoption of best practices. In government-owned hospitals in Cross River State, these organizational and systemic factors significantly shape nurses' ability to embrace and sustain antimicrobial stewardship activities (Courtenay et al., 2019; WHO, 2021).

Complementing this perspective, **Orem's Self-Care Nursing Theory** focuses on the nurse's role in promoting patients' self-management and adherence to prescribed treatments (Orem, 2001). Effective AMS requires that nurses not only administer medications accurately but also empower patients to take responsibility for their own health by completing antibiotic courses, avoiding self-medication, adhering to infection prevention practices, and reporting adverse reactions. Orem's theory underscores the importance of patient-centered care and education, which are central to preventing antimicrobial misuse and the development of drug

resistance. In practice, nurses act as facilitators of self-care by assessing patient needs, providing health education, and offering ongoing support to ensure compliance with treatment regimens. This approach not only optimizes therapeutic outcomes but also reduces the likelihood of resistant infections, aligning with the broader goals of antimicrobial stewardship (Edwards et al., 2021; WHO, 2022).

The relevance of this combined theoretical framework to the current study lies in its ability to explain the multi-dimensional role of nurses in AMS. It positions nurses as active agents who translate knowledge into practice, influence patient behavior, and interact with institutional systems to achieve sustainable outcomes. By integrating Rogers' focus on innovation adoption with Orem's emphasis on patient self-care, the framework captures the dynamic interplay between nurses' knowledge, practical engagement, and patient-centered interventions. This perspective is particularly pertinent in government-owned hospitals in Cross River State, where resource limitations, high patient loads, and systemic constraints can affect the implementation of stewardship programs. Understanding these dynamics provides insight into how nurses can be effectively empowered, supported, and trained to reduce antimicrobial misuse and resistance.

Furthermore, this theoretical foundation guides the formulation of the study's objectives, research questions, and hypotheses. It justifies the focus on assessing nurses' knowledge, evaluating their stewardship practices, examining their involvement in AMS activities, and identifying challenges that hinder their effectiveness. The framework also underscores the importance of interventions at both the institutional and patient levels, reinforcing the idea that sustainable antimicrobial stewardship requires coordinated action across professional practice, organizational support, and patient engagement.

The combined application of Rogers' Diffusion of Innovations Theory and Orem's Self-Care Nursing Theory provides a robust conceptual basis for exploring the role of nurses in antimicrobial stewardship. It highlights the critical interplay between knowledge acquisition, adoption of evidence-based practices, active involvement in stewardship activities, and facilitation of patient self-care, all of which are essential for preventing drug resistance in government-owned hospitals in Cross River State. By situating nurses within this dual theoretical lens, the study emphasizes their centrality in combating antimicrobial resistance and informs strategies to enhance their knowledge, practice, and engagement in stewardship initiatives.

Empirical Review

Empirical review involves examining previous studies, research findings, and documented evidence related to antimicrobial stewardship (AMS) and the role of nurses in preventing drug resistance. This section provides an overview of studies conducted both internationally and within Nigeria, highlighting the findings, gaps, and relevance to government-owned hospitals in Cross River State.

Several international studies have emphasized the critical role of nurses in antimicrobial stewardship. Courtenay et al. (2019) conducted a study in the United Kingdom assessing nurses' involvement in AMS programs and reported that nurses contribute significantly to rational antimicrobial use through medication administration, patient education, monitoring therapy, and infection control practices. Similarly, Edwards et al. (2021) highlighted that nurses' proactive participation in AMS, including counseling patients on completing

antibiotic courses and monitoring treatment responses, led to improved adherence and a reduction in antimicrobial resistance within hospital settings. These studies demonstrate that nurses' involvement in stewardship activities positively influences patient outcomes and the rational use of antimicrobials.

In low- and middle-income countries, including Nigeria, the scenario is more challenging due to resource constraints, high patient loads, and limited access to updated clinical guidelines. Auta et al. (2019) conducted a nationwide survey on antimicrobial use among healthcare professionals in Nigeria and found that while nurses were aware of the concept of AMS, gaps existed in their practical implementation. Many nurses lacked formal training on stewardship principles and were often excluded from antimicrobial decision-making, resulting in inconsistent practices and limited contributions to reducing antimicrobial resistance. Olufunmilayo et al. (2020) corroborated this finding in a study conducted in public hospitals in Lagos State, reporting that nurses' knowledge of AMS was moderate, but their active involvement in stewardship activities was minimal due to institutional barriers and inadequate support.

Other studies have highlighted the challenges that hinder effective nurse participation in AMS. For example, high patient-to-nurse ratios, shortage of staff, inadequate laboratory diagnostic support, and lack of functional stewardship committees were identified as significant barriers in Nigerian government hospitals (Edwards et al., 2021; WHO, 2022). These constraints often result in reactive rather than proactive stewardship practices, where nurses are unable to consistently monitor antimicrobial use, provide patient counseling, or contribute to clinical decision-making.

In Cross River State, specific empirical evidence on nurses' role in AMS remains limited. However, similar studies conducted in other Nigerian states, such as Lagos, Enugu, and Kaduna, suggest that nurses' involvement in antimicrobial stewardship is often constrained by a combination of knowledge gaps, inadequate training, and institutional factors (Auta et al., 2019; Olufunmilayo et al., 2020). These findings indicate a need for research that specifically addresses the practices, knowledge, involvement, and challenges of nurses in AMS within government-owned hospitals in Cross River State.

International evidence further suggests that when nurses are adequately trained and integrated into AMS programs, there is a measurable reduction in inappropriate antimicrobial use. Studies in the United States and Europe have shown that nurse-led interventions, such as patient education, monitoring adherence, and participation in stewardship rounds, significantly reduce the incidence of drug-resistant infections and improve compliance with antimicrobial guidelines (Courtenay et al., 2019; Edwards et al., 2021). These findings provide a benchmark for best practices and highlight the potential impact of empowering nurses in Nigerian public hospitals.

The empirical literature underscores the importance of nurses in antimicrobial stewardship and the prevention of drug resistance. While international studies demonstrate the effectiveness of nurse-led stewardship initiatives, studies in Nigeria reveal significant knowledge gaps, limited involvement, and systemic barriers. The scarcity of localized empirical studies in Cross River State creates a gap in understanding nurses' role in AMS in this region. Therefore, this study seeks to fill this gap by examining the knowledge, practices, involvement, and challenges of nurses in government-owned hospitals in Cross River State,

thereby providing evidence-based recommendations for strengthening antimicrobial stewardship programs and combating drug resistance.

Research Methodology

This study employed a methodology designed to systematically examine the role of nurses in antimicrobial stewardship (AMS) and their contribution to preventing drug resistance among patients in government-owned hospitals in Cross River State, Nigeria. The methodology outlines the research design, population, sampling technique, instruments, validity and reliability measures, data collection procedures, and methods of data analysis, ensuring that the study generates reliable and meaningful results. A **descriptive survey research design** was adopted for this study. The descriptive survey design is appropriate for research that seeks to collect detailed information about participants' knowledge, ractices, involvement, and challenges in relation to a particular phenomenon (Babbie, 2016). This design enables the researcher to quantify patterns and relationships while exploring the perspectives and experiences of participants, making it suitable for assessing the current state of nurses' engagement in antimicrobial stewardship and its impact on preventing drug resistance. The population of the study consisted of **all registered nurses working in government-owned hospitals in Cross River State**, who are directly involved in patient care and the administration of antimicrobial agents. According to records from the Cross River State Ministry of Health (2023), the total population of eligible nurses in the selected hospitals is **159**. These nurses are drawn from general hospitals, specialist hospitals, and comprehensive health centres, and their direct involvement in patient care positions them as the most appropriate respondents for understanding antimicrobial stewardship practices within the state. Given the relatively small population, a **census approach** was employed, where all 159 nurses were targeted for participation in the study. Using a census ensures comprehensive coverage of the population, minimizes sampling bias, and enhances the generalizability of the study findings. To maintain analytical rigor, a **stratified framework** was applied during data analysis to account for proportional representation from different hospital types, ensuring that variations in facility characteristics were considered when interpreting results. Data were collected using a **structured questionnaire** developed by the researcher. The questionnaire consisted of four main sections. Section A captured the demographic characteristics of respondents, including age, gender, educational qualification, years of experience, and department of practice. Section B assessed nurses' **knowledge** of antimicrobial stewardship, including awareness of antimicrobial resistance, adherence to guidelines, and infection prevention protocols. Section C examined nurses' **practices**, including medication administration, monitoring of therapy, patient education, and infection control measures. Section D explored nurses' **involvement** in AMS activities and the challenges encountered in implementing stewardship practices. Likert-type scales ranging from "Strongly Agree" to "Strongly Disagree" were used to capture respondents' attitudes and self-reported behaviors. The questionnaire was informed by an extensive review of existing literature and previously validated instruments in AMS research (Auta et al., 2019; Courtenay et al., 2019; Edwards et al., 2021). To ensure **validity**, the questionnaire was subjected to **face and content validation** by three nursing education specialists and two public health experts. These experts evaluated the instrument for clarity, relevance, and appropriateness of items. Their feedback led to minor revisions in wording and structure to ensure that the questionnaire effectively captured the constructs of interest. The **reliability** of the instrument was established through a **pilot study** involving 30 nurses from a government hospital not included in the main study. Data from the pilot were analyzed using **Cronbach's alpha**, yielding a reliability coefficient of 0.87, which indicates high internal consistency and reliability of the questionnaire (Gliem

& Gliem, 2003). The procedure for data collection involved obtaining formal permission from the **Cross River State Ministry of Health** and the management of the selected hospitals. Questionnaires were administered to nurses during duty hours, with clear explanations provided regarding the study's objectives and assurances of confidentiality. Participants were allowed sufficient time to complete the questionnaires, which were collected immediately after completion to minimize non-response and missing data. Data collected were analyzed using **Statistical Package for Social Sciences (SPSS) version 25**. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize respondents' demographic characteristics, knowledge, practices, involvement, and challenges in AMS. Inferential statistics, such as **Pearson's correlation coefficient** and **chi-square tests**, were employed to test the study hypotheses at a **0.05 level of significance**, exploring the relationships between nurses' knowledge, practices, involvement, institutional factors, and the prevention of antimicrobial resistance. The results were presented in tables, charts, and narrative form to ensure clarity and ease of interpretation.

Result

Research Question 1: What is the level of knowledge and practices of nurses regarding antimicrobial stewardship in government-owned hospitals in Cross River State?

Table 1: Nurses' Knowledge and Practices of Antimicrobial Stewardship

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree	Mean	SD	Interpretation
I am aware of the concept of antimicrobial stewardship	80 (50.3%)	60 (37.7%)	15 (9.4%)	4 (2.6%)	3.36	0.78	High
I understand the principles of correct antibiotic administration (dose, duration, route)	65 (40.9%)	70 (44.0%)	18 (11.3%)	6 (3.8%)	3.23	0.81	Moderate
I monitor patients for adverse reactions to antibiotics	60 (37.7%)	68 (42.8%)	20 (12.6%)	11 (6.9%)	3.15	0.86	Moderate
I educate patients on completing antibiotic courses	70 (44.0%)	60 (37.7%)	20 (12.6%)	9 (5.7%)	3.21	0.84	Moderate
I follow hospital guidelines on antimicrobial use	55 (34.6%)	68 (42.8%)	25 (15.7%)	11 (6.9%)	3.06	0.89	Moderate
Overall Knowledge	–	–	–	–	**3.20**	**0.83**	**Moderate**

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree	Mean	SD	Interpretation

and Practices Score

Note: n = 159; Mean scores: 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree.

The data in Table 1 show that **most nurses are aware of the concept of antimicrobial stewardship**, with 88% (strongly agree and agree) indicating familiarity with AMS principles. This suggests a reasonably high level of awareness, reflecting exposure to basic infection control and hospital policies. However, the **mean scores for specific knowledge and practice items** such as correct antibiotic administration, monitoring of patients, patient education, and adherence to guidelines range from **3.06 to 3.23**, indicating a **moderate level** overall. This suggests that while nurses generally understand the concept of AMS, there are gaps in translating knowledge into consistent practice.

For example, only 40.9% strongly agreed that they understand the principles of correct antibiotic administration, while 15.1% disagreed or strongly disagreed, indicating that some nurses may lack confidence in this critical area. Similarly, adherence to hospital guidelines and monitoring patients for adverse drug reactions were rated as moderate, highlighting areas where targeted training or reinforcement may be required.

The findings indicate that **nurses in government-owned hospitals in Cross River State have moderate knowledge and practices regarding antimicrobial stewardship**, with strengths in awareness of AMS concepts but weaknesses in the consistent application of stewardship activities. This suggests a need for structured **capacity-building programs, refresher training, and inclusion of nurses in active stewardship roles** to improve practices and enhance patient outcomes.

Research Question 2: What is the level of nurses' involvement in antimicrobial stewardship activities aimed at preventing drug resistance among patients in government-owned hospitals in Cross River State?

Table 2: Nurses' Involvement in Antimicrobial Stewardship Activities

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree	Mean	SD	Interpretation
I actively participate in hospital antimicrobial stewardship committees	25 (15.7%)	45 (28.3%)	60 (37.7%)	29 (18.2%)	2.52	0.98	Low
I monitor antibiotic prescriptions and administration	40 (25.2%)	60 (37.7%)	40 (25.2%)	19 (11.9%)	2.80	0.92	Moderate
I provide patient education on completing prescribed	55 (34.6%)	60 (37.7%)	30 (18.9%)	14 (8.8%)	3.01	0.88	Moderate

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree	Mean	SD	Interpretation
antibiotic courses							
I collaborate with doctors and pharmacists regarding antimicrobial use	30 (18.9%)	50 (31.5%)	50 (31.5%)	29 (18.2%)	2.63	0.95	Low
I participate in infection prevention and control initiatives	65 (40.9%)	55 (34.6%)	25 (15.7%)	14 (8.8%)	3.09	0.87	Moderate
Overall Involvement Score	–	–	–	–	2.81	0.92	Moderate

Note: n = 159; Mean scores: 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree.

The table indicates that nurses' involvement in AMS activities is **moderate overall (mean = 2.81, SD = 0.92)**. While a significant proportion of nurses participate in patient education (72.3% agree/strongly agree) and infection prevention initiatives (75.5% agree/strongly agree), their **participation in formal stewardship committees and collaboration with doctors or pharmacists is low**, with only 44% and 50.4% reporting agreement, respectively.

This suggests that although nurses are actively involved in **direct patient care activities related to AMS,** their involvement in **formal institutional stewardship structures is limited**. The low engagement in committees and collaborative decision-making may limit their influence on antimicrobial policies and practices within hospitals. These findings highlight the need for **strategies that integrate nurses into formal stewardship programmes** to maximize their impact in preventing antimicrobial resistance.

Research Question 3: What are the challenges faced by nurses in implementing antimicrobial stewardship practices in government-owned hospitals in Cross River State?

Table 3: Challenges Faced by Nurses in Implementing Antimicrobial Stewardship

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree	Mean	SD	Interpretation
Heavy patient workload limits my participation in stewardship activities	70 (44.0%)	55 (34.6%)	20 (12.6%)	14 (8.8%)	3.13	0.91	High
Lack of training on antimicrobial stewardship affects my practice	60 (37.7%)	65 (40.9%)	20 (12.6%)	14 (8.8%)	3.07	0.88	High

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree	Mean	SD	Interpretation
Limited institutional support and resources hinder my stewardship activities	55 (34.6%)	60 (37.7%)	25 (15.7%)	19 (11.9%)	3.01	0.91	High
Poor collaboration with doctors and pharmacists affects AMS implementation	50 (31.5%)	55 (34.6%)	30 (18.9%)	24 (15.1%)	2.92	0.95	Moderate
Limited access to updated clinical guidelines and protocols	60 (37.7%)	50 (31.5%)	30 (18.9%)	19 (11.9%)	2.96	0.92	Moderate
Overall Challenges Score	–	–	–	–	3.02	0.91	High

Note: n = 159; Mean scores: 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree.

The data show that nurses face **significant challenges in implementing antimicrobial stewardship**, with an overall mean score of **3.02 (SD = 0.91).** The most prominent challenges include **heavy patient workload, lack of training, and limited institutional support**, all with mean scores above 3.0, indicating high agreement among respondents.

Moderate challenges were reported in **poor interprofessional collaboration** and **limited access to updated guidelines**, suggesting that while these factors are barriers, they are not as severe as workload and training deficiencies. These findings highlight systemic and institutional constraints that limit nurses' ability to fully participate in AMS initiatives. Addressing these challenges through **capacity-building programs, provision of resources, and stronger institutional support** is essential for enhancing the role of nurses in preventing antimicrobial resistance.

Test of Hypotheses

Hypothesis 1: There is no significant relationship between nurses' level of knowledge of antimicrobial stewardship and their practices in preventing drug resistance in government-owned hospitals in Cross River State.

To test this hypothesis, **Pearson's Product-Moment Correlation Coefficient (r)** was used to examine the relationship between nurses' knowledge scores (from Section B of the questionnaire) and their practice scores (from Section C). A **0.05 level of significance** was used to determine statistical significance.

Table 4: Correlation between Nurses' Knowledge and Practices in Antimicrobial Stewardship

Variables	Mean	SD	r	p-value	Interpretation
Knowledge	3.20	0.83	0.68	0.000	Significant Positive Correlation
Practices	3.15	0.82	–	–	–

Note: n = 159; r = Pearson correlation coefficient; p < 0.05 indicates statistical significance.

The results in Table 4 show a **positive correlation (r = 0.68)** between nurses' level of knowledge of antimicrobial stewardship and their practices in preventing drug resistance. The p-value is **0.000**, which is less than the 0.05 significance level, indicating that the relationship is statistically significant.

This finding suggests that **nurses with higher knowledge of antimicrobial stewardship are more likely to engage in appropriate practices**, including correct medication administration, monitoring patients, educating patients on adherence, and implementing infection prevention measures. Conversely, nurses with lower knowledge tend to have less consistent stewardship practices.

The significant positive relationship supports the notion that **knowledge is a critical determinant of practice** in antimicrobial stewardship. It underscores the importance of continuous professional development, training programs, and educational interventions to enhance nurses' knowledge, which, in turn, can improve practices and reduce antimicrobial resistance in government-owned hospitals in Cross River State.

The hypothesis stating that there is no significant relationship between nurses' knowledge and practices is **rejected**, and the alternative is accepted, confirming that **knowledge significantly influences nurses' practices in antimicrobial stewardship.**

Hypothesis 2

There is no significant relationship between nurses' involvement in antimicrobial stewardship activities and the prevention of drug resistance among patients in government-owned hospitals in Cross River State.

To test this hypothesis, **Pearson's correlation coefficient (r)** was calculated between nurses' involvement scores (Section D of the questionnaire) and their overall antimicrobial stewardship practices (Section C). A **0.05 level of significance** was applied.

Table 5: Correlation between Nurses' Involvement in AMS Activities and Their Practices

Variables	Mean	SD	r	p-value	Interpretation
Involvement	2.81	0.92	0.63	0.000	Significant Positive Correlation
Practices	3.15	0.82	–	–	–

Note: n = 159; r = Pearson correlation coefficient; p < 0.05 indicates statistical significance.

The results in Table 5 indicate a **positive correlation (r = 0.63)** between nurses' involvement in antimicrobial stewardship activities and their practices in preventing drug resistance. The p-value (**0.000**) is less than 0.05, confirming that the relationship is statistically significant.

This finding implies that **nurses who are more actively involved in AMS activities such as monitoring prescriptions, educating patients, collaborating with doctors and pharmacists, and participating in infection prevention initiatives demonstrate better stewardship practices**. Nurses with limited involvement are less consistent in applying AMS principles.

Therefore, the null hypothesis is **rejected**, and the alternative is accepted, confirming that **active involvement in AMS significantly influences nurses' ability to prevent antimicrobial resistance in government-owned hospitals in Cross River State.**

Hypothesis 3

There is no significant relationship between challenges faced by nurses and their participation in antimicrobial stewardship and the prevention of drug resistance in government-owned hospitals in Cross River State.

To test this hypothesis, **Pearson's correlation coefficient (r)** was used to examine the relationship between nurses' reported challenges (Section D) and their overall AMS practices (Section C).

Table 6: Correlation between Challenges Faced by Nurses and AMS Practices

Variables	Mean	SD	r	p-value	Interpretation
Challenges	3.02	0.91	-0.57	0.000	Significant Negative Correlation
Practices	3.15	0.82	–	–	–

Note: n = 159; r = Pearson correlation coefficient; p < 0.05 indicates statistical significance.

The results in Table 6 show a **negative correlation (r = -0.57)** between the challenges faced by nurses and their antimicrobial stewardship practices. The p-value (**0.000**) is less than 0.05, indicating that the relationship is statistically significant.

This finding suggests that **as the severity of challenges increases such as heavy workloads, limited training, poor institutional support, inadequate collaboration, and lack of access to guidelines the quality and consistency of nurses' AMS practices decrease**. In other words, nurses experiencing more barriers are less able to effectively implement stewardship activities, which may compromise the prevention of drug resistance.

Consequently, the null hypothesis is **rejected**, and the alternative is accepted, confirming that **challenges faced by nurses significantly and negatively affect their participation in AMS and their ability to prevent antimicrobial resistance.**

Discussion of Findings

The discussion of findings in this study is presented in relation to the research questions and hypotheses, with reference to relevant empirical literature and theoretical frameworks. The study examined the **knowledge, practices, involvement, and challenges of nurses regarding antimicrobial stewardship (AMS)** in government-owned hospitals in Cross River State, Nigeria, and how these factors influence the prevention of drug resistance among patients.

Level of Knowledge and Practices of Nurses Regarding Antimicrobial Stewardship

Research Question 1 explored the level of nurses' knowledge and practices regarding antimicrobial stewardship. The findings indicated that **nurses demonstrated moderate knowledge and practices overall,** with high awareness of the concept of AMS but gaps in consistent application, such as correct antibiotic administration, monitoring for adverse drug reactions, and adherence to hospital guidelines.

These results align with findings from Auta et al. (2019) and Olufunmilayo et al. (2020), who reported that while Nigerian nurses generally understand the concept of antimicrobial resistance, practical implementation of stewardship activities remains limited due to insufficient training and institutional support. Similarly, Courtenay et al. (2019) emphasized that awareness of AMS does not always translate into practice unless reinforced through formal education, policies, and active engagement in stewardship programmes.

Theoretically, the findings support **Rogers' Diffusion of Innovations Theory**, which suggests that knowledge is the first stage of adopting new practices (Rogers, 2003). While nurses in this study are aware of AMS (knowledge stage), their moderate practice levels indicate that **factors such as persuasion, decision-making, and institutional facilitation** may be limiting full implementation. This underscores the need for continuous professional education and practical training programs to bridge the gap between knowledge and practice.

Level of Nurses' Involvement in AMS Activities

Research Question 2 assessed nurses' involvement in AMS activities. Findings revealed that nurses were **moderately involved in patient-centered activities**, such as educating patients and participating in infection prevention, but their engagement in **formal stewardship committees and interdisciplinary collaboration was low.**

This is consistent with international literature showing that nurses often contribute more to direct care and patient education than to policy-making or clinical decision-making within stewardship programs (Edwards et al., 2021; WHO, 2022). The low involvement in institutional committees may limit nurses' ability to influence prescribing behaviors and the overall hospital antimicrobial policy.

From the perspective of **Orem's Self-Care Nursing Theory**, moderate involvement in patient education aligns with nurses facilitating patients' self-care. However, their limited participation in formal institutional processes suggests that nurses are not fully empowered to optimize AMS outcomes at the organizational level. Encouraging greater involvement in

stewardship committees and interdisciplinary rounds could strengthen their impact on reducing antimicrobial resistance.

Challenges Faced by Nurses in Implementing AMS Practices

Research Question 3 and Hypothesis 3 addressed the challenges faced by nurses. The study found that nurses encounter **high workloads, limited training, inadequate institutional support, poor collaboration, and restricted access to updated guidelines**, which significantly hinder their stewardship practices. The negative correlation ($r = -0.57$, $p = 0.000$) between challenges and AMS practices confirms that these barriers reduce the effectiveness of nurses in preventing drug resistance.

These findings mirror results from Edwards et al. (2021) and WHO (2022), who highlighted that resource constraints, staff shortages, and lack of training are major barriers to effective AMS in low- and middle-income countries. Institutional factors and workload pressures act as systemic inhibitors, limiting the translation of knowledge into consistent practice. This emphasizes that interventions aimed at strengthening AMS must not only target individual nurses but also address structural and organizational barriers.

Relationship Between Knowledge, Involvement, and Practices

Hypotheses 1 and 2 were tested to examine the relationships between knowledge, involvement, and AMS practices. A **positive and significant correlation** was found between nurses' knowledge and practices ($r = 0.68$, $p = 0.000$), and between their involvement and practices ($r = 0.63$, $p = 0.000$). These findings indicate that **both knowledge and active participation in stewardship activities are key predictors of effective AMS practices**.

The results are consistent with prior studies (Courtenay et al., 2019; Auta et al., 2019), which emphasize that knowledge alone is insufficient unless nurses are actively engaged in patient care and institutional AMS activities. Integrating **Rogers' Diffusion of Innovations Theory** and **Orem's Self-Care Theory**, these findings suggest that **knowledge (innovation awareness) must be coupled with active implementation (practice) and patient-centered support (self-care facilitation) to achieve optimal outcomes in preventing antimicrobial resistance**.

Conclusion

This study investigated the role of nurses in antimicrobial stewardship (AMS) and their contribution to preventing drug resistance among patients in government-owned hospitals in Cross River State, Nigeria. Specifically, it examined nurses' **knowledge, practices, involvement in AMS activities,** and the **challenges** they face in implementing stewardship programs.

The findings indicate that nurses possess a **moderate level of knowledge and practices** regarding antimicrobial stewardship. While most nurses are aware of the principles of AMS and the risks associated with antimicrobial resistance, gaps remain in the consistent application of these principles, particularly in areas such as correct antibiotic administration, monitoring patients for adverse reactions, and adherence to hospital guidelines.

Furthermore, the study revealed that nurses are **moderately involved in AMS activities**, with active engagement primarily in **patient-centered tasks** such as education and infection prevention. However, participation in **formal institutional stewardship committees and interdisciplinary collaboration** remains low. This limited involvement constrains their ability to influence antimicrobial policies and reinforces the need for greater institutional support.

The study also identified significant **challenges hindering effective AMS practices**, including high workloads, limited training, inadequate institutional support, poor collaboration with doctors and pharmacists, and limited access to updated clinical guidelines. These challenges were found to have a **negative impact** on nurses' ability to implement stewardship practices effectively, underscoring the importance of addressing systemic and organizational barriers.

Analysis of the study hypotheses further revealed that **nurses' knowledge and involvement are positively and significantly related to their antimicrobial stewardship practices**, while the challenges they face are negatively associated with these practices. These findings confirm that **knowledge and active participation are key enablers**, while systemic and institutional challenges are major barriers to effective AMS.

In conclusion, the study demonstrates that **nurses play a critical role in antimicrobial stewardship** and the prevention of drug resistance, particularly through patient education, monitoring, and infection prevention. However, to maximize their impact, there is a need for **targeted training programs, greater integration into institutional stewardship structures, and improved organizational support**. Addressing these gaps will empower nurses to implement AMS practices more effectively, thereby reducing the prevalence of antimicrobial resistance in government-owned hospitals in Cross River State.

Recommendations

Based on the findings and conclusions of this study on nurses' role in antimicrobial stewardship (AMS) in government-owned hospitals in Cross River State, the following recommendations are proposed to enhance the effectiveness of AMS and reduce drug resistance:

1. **Capacity Building and Training Programmes**

   Hospitals and relevant health authorities should organize regular training workshops, seminars, and in-service programmes on antimicrobial stewardship for nurses. These programs should focus on correct antibiotic administration, monitoring for adverse drug reactions, infection prevention protocols, and patient education strategies. Enhancing nurses' knowledge will directly improve their practices and patient outcomes, as the study demonstrated a positive relationship between knowledge and AMS practices.

2. **Integration of Nurses into Institutional AMS Committees**

   Hospital management should actively involve nurses in antimicrobial stewardship committees and interdisciplinary decision-making teams. Greater participation will allow nurses to contribute to policy formulation, guideline development, and

monitoring of antimicrobial use, thereby improving the overall effectiveness of stewardship programmes.

3. **Provision of Adequate Resources and Support**

   The study identified high workload and limited resources as major challenges to effective AMS. Hospital administrators should ensure adequate staffing, access to updated clinical guidelines, diagnostic tools, and supportive infrastructure to enable nurses to implement stewardship practices efficiently. Reducing systemic barriers will increase the quality and consistency of AMS activities.

4. **Promotion of Interprofessional Collaboration**

   Nurses should be encouraged and supported to collaborate closely with doctors, pharmacists, and other healthcare professionals in implementing AMS strategies. Structured team rounds, joint training sessions, and clear communication channels will facilitate shared responsibility in monitoring antimicrobial use and enhancing patient safety.

5. **Patient Education and Engagement**

   Given nurses' strengths in patient-centered activities, hospitals should empower nurses to provide comprehensive education to patients regarding antimicrobial use, including completing prescribed courses, avoiding self-medication, and recognizing adverse effects. Patient engagement complements institutional AMS efforts and helps reduce the risk of drug resistance.

6. **Policy and Monitoring Frameworks**

   The Ministry of Health and hospital management should develop and enforce clear policies and monitoring frameworks to guide antimicrobial stewardship practices. Regular audits, feedback mechanisms, and performance assessments can help identify gaps and ensure compliance, supporting nurses in executing their AMS responsibilities effectively.

These recommendations emphasize education, institutional integration, resource support, interprofessional collaboration, patient engagement, and policy reinforcement. Implementing these measures will empower nurses to fully utilize their knowledge and skills in antimicrobial stewardship, ultimately contributing to the prevention of drug resistance and improved patient outcomes in government-owned hospitals in Cross River State.

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