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GLOBAL INFECTION PREVENTION AND MANAGEMENT IN HEALTHCARE

*Infection prevention and control
and antimicrobial stewardship*

VOLUME 2

Editors: Massimo Sartelli, Federico Coccolini, Fausto Catena and Leonardo Pagani

GLOBAL INFECTION PREVENTION AND MANAGEMENT IN HEALTHCARE

Massimo Sartelli
Federico Coccolini
Fausto Catena
Leonardo Pagani
Editors

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The Global Antimicrobial Stewardship Partnership Hub



The AMR Narrative

Voices together for Antimicrobial Resistance



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Volume 2

**Infection prevention and control and
antimicrobial stewardship**

Chapter 92

The role of nurses in antimicrobial stewardship

Enrique Castro-Sánchez

Brunel University London, Antimicrobial Innovations Research Centre & College of Social and Political Science, Uxbridge, England;

Imperial College London, National Institute for Health Research Health Protection Research Unit in Healthcare-Associated Infection and Antimicrobial Resistance, London, England;

University of Balearic Islands, Global Health Unit, Palma, Spain;

Valencia International University, Valencia, Spain.

Introduction

The threat of antibiotic-resistant infections demands urgent attention from health and social care services worldwide because of its significant clinical, economic, human, and environmental costs. The efforts implemented to combat these infections, known as antimicrobial stewardship (AMS) programs, require a multifaceted approach and close collaboration among all health and social care professionals involved in decisions about the use of antimicrobials. Historically, nurses have largely been absent from such initiatives, which represents a missed opportunity to profit from the most abundant workforce cadre to strengthen existing and future AMS initiatives.

This chapter explores existing evidence supporting the need and impact of nursing engagement and leadership in AMS, discussing four key obstacles to increased nursing participation in AMS: fundamental issues, ownership concerns, educational gaps, and leadership challenges. This chapter also includes potential solutions and implications for addressing these barriers.

The nursing workforce: a potential AMS powerhouse

Antibiotic-resistant infections are planetary challenges to human, animal, and environmental well-being. Their global impact requires comprehensive and coordinated responses, with commitment from governments, healthcare system leaders, and private stakeholders. These organizations and agencies should increase funding and promote mechanisms which encourage the involvement of all essential health and social care workers in tackling antibiotic resistance. This approach appears to be logical and desirable, yet its implementation faces a challenge likely to be as difficult as the resistant infections themselves— the current worldwide shortage of 15 million health workers. More concerning, the deficit in human health resources is projected to remain at 10 million by 2030, and given that this workforce shortage is unlikely to be resolved quickly, from a health systems perspective it would be crucial to leveraging all existing workforce cadres as optimally as possible. This optimization should be supported by innovative reassessments of clinical pathways, clinical skills, and competencies, and always focus on value-based, person-centered care.

The O'Neill report highlighted nurses, as the largest health professional group, as a crucial frontline workforce for tackling the escalating AMR crisis. Worldwide, additionally, health systems are sustained by nursing professionals and other roles allied to nursing such as community health workers. Nurses, although in a chronic limited supply, are still much more available than other health care workers such as physicians and pharmacists, in particular in low-and-middle-income countries, where they often support and sometimes lead AMS efforts.

However, nearly a decade later, there are still concerns that the largest cadre of healthcare professionals remains significantly underutilized in AMS efforts and faces multiple barriers to greater AMS engagement, including lack of role clarity, inadequate education, hierarchical cultures limiting their autonomy, and failure to meaningfully involve them in stewardship leadership and decision-making.

The "all-hands-on-deck" approach still requires a much clearer delineation of concrete nursing roles, responsibilities, and activities within the AMS framework. Adding ad hoc tasks to nurses' already overwhelming workload is unlikely to be sustainable or impactful. Evidence of the long-term effectiveness of one-off, decentralized, nurse-driven AMS interventions remains limited. More coordinated programs that systematically integrate nursing involvement and leadership at all levels, from bedside to board, may be required to achieve the full benefits of interprofessional antimicrobial management in both inpatient and ambulatory settings.

The need to broaden participation in AMS programs is not a new concept, with questions about the fit of the traditional physician-pharmacist-microbiologist triad in AMS programs to adequately reflect the realities of current interprofessional care models that embrace shared decision-making and flattened hierarchies. Maximizing the full potential of the nursing profession may require a paradigm shift, rethinking entrenched power dynamics, dismantling outdated hierarchies, and authentically empowering nurses as equal partners in antimicrobial management. With their ubiquitous presence across all care settings, nurses appear uniquely positioned to help operationalize and reinforce core stewardship principles at the point of care.

Activities such as promoting IV-to-oral switch of antimicrobial therapy, ensuring appropriate dosing, and monitoring patients' allergies or clinical responses naturally align with routine and essential nursing work. Initial ideas about the involvement of nurses in AMS focused primarily on clinical areas, perhaps aligning with views on antimicrobial stewardship as a technical task. These clinical activities, including collection of samples for microscopy or culture, patient education and information to relatives, or documentation of allergies, remain a cornerstone of nursing practice and would be universally agreed upon. However, there is much less clarity and certainty about competency frameworks, nursing profiles, and specific posts in AMS for nurses.

However, these reviews offer a useful starting point for ideas on AMS nursing, later updated by other perspectives on nonclinical roles for nurses in stewardship. These other domains would include leadership and contribution to research, not only in their own AMS nursing role but also in evaluating AMS programs, as well as policy development and implementation. It is very likely that the sustained progress in nurse prescribing seen in health systems globally, particularly in LMICs, has also contributed to the greater interest and participation of nurses in AMS. Considering the increasing volume of antimicrobials prescribed by nurses, which in some settings may soon surpass the units prescribed by hospitalists, it is reassuring to see the high quality of this prescribing.

Barriers to nursing engagement in AMS

Health systems interested in promoting the participation of nurses in AMS would usually have to consider and address four crucial barriers. These barriers are not unsurmountable, and could be resolved by framing AMS as a fundamental dimension of high-quality, safety-focused, patient-centered care; reframing AMS as

core nursing practice through the motto "good stewardship is good nursing care, and good nursing care is good stewardship"; developing nurse-specific educational resources; and fostering grassroots networking opportunities.

Foundational barrier. A pre-requisite for nursing engagement in AMS activities is the acknowledgement and recognition among nurses of these activities as legitimate and appropriate for nurses. Such recognition is yet to be universal, although current studies as well as policy developments and professional debates reflect much more willingness of nurses to take part in antibiotic improvement interventions, compared with just a few years ago. As mentioned before, activities such as ensuring appropriate antimicrobial dosing, monitoring the therapeutic response, and discussing whether to discontinue treatment when no longer needed align closely with core nursing responsibilities around medication management, patient assessment, and care coordination.

Why, then, is there apparent reluctance? Part of this collective nursing behavior may be due to the cultural milieu and professional dynamics in certain clinical practice environments. The earlier emphasis on decision-making aspects of antimicrobials –diagnosis, therapeutics, etc.–, hierarchical structures, and rigid demarcations of prescribing authority (especially in hospitals) may have made nurses feel less empowered to engage in roles perceived as "prescribing" territory, and overall deterring nurses from accepting AMS as a central nursing role.

Ownership and branding barriers. There seems to be a disconnect between nurses' reluctance to collaborate in optimal antimicrobial management when asked about it explicitly, particularly when using the stewardship concept, and their actual leadership and involvement in many typical and essential AMS activities. This dichotomy was elegantly highlighted in a 2016 survey of nurses across Africa regarding their involvement in AMS. The depth and breadth of AMS-related activities reported by the participants were striking, ranging from clinical to managerial outputs, participating in policy formation, prescribing antimicrobials, and educating peers and other professionals about AMS.

In many ways, as ensuring optimal antimicrobial use through rigorous clinical assessment, therapeutic monitoring, and effective communication embodies the very essence of excellence in nursing practice, framing AMS as a fundamental dimension of high-quality, safety-focused, patient-centered care should resonate well with how nurses perceive their professional identity and duties (**Table 1**). From this viewpoint, the lack of engagement in key AMS activities such as timely IV-to-oral switch would not simply be an issue of "poor antimicrobial stewardship", but one instead of "poor nursing care" which would fail to uphold the essential principles of evidence-informed practice.

Table 1. Examples of essential clinical nursing actions in antimicrobial stewardship.

Minimize unnecessary prescribing of antimicrobials (<i>by influencing decisions</i>).
Ensure adequate timing of antimicrobial administration.
Adopt necessary infection prevention and control measures.
Obtain biological samples for microscopy, culture, and sensitivity.
Therapeutic drug monitoring, following adequate and/or adjusted dosing.
IV administration only in severely ill, unable to tolerate oral treatment.
Review micro results daily, (<i>to help</i>) de-escalate to narrow-spectrum.
Review intravenous treatment daily, (<i>engage in discussion to</i>) and switch to oral route promptly.
Require single-dose surgical prophylaxis regimens as appropriate.

Educational barrier. The observed reluctance or perceived unwillingness of nurses to engage in AMS activities may be more reflective of education gaps in essential areas than a fundamental resistance to participate in AMS. This distinction is critical, as it shifts the focus from a perceived lack of interest or motivation among nurses to a more structural issue concerning their preparation and training for this role.

Evidence suggests that these gaps are widespread and may hinder the effective participation of nurses in AMS. Surprisingly, the earliest data in the UK on AMS-related education within undergraduate programs revealed significant deficiencies, particularly within nursing education. This research, conducted by Castro-Sánchez *et al.*, highlighted opportunities for improvement across several core domains critical to AMS. These areas include but are not limited to, microbiology, antimicrobial prescribing principles, interpretation of laboratory diagnostics, and general AMS best practices.

Each of these domains is fundamental for understanding the dynamics of infections, the mechanisms and optimal use of antimicrobials, and the interpretation of diagnostic results that guide therapeutic decisions. However, these topics are often inadequately covered in current nursing curricula. The implications of these educational gaps are important. When educational deficits prevent nurses from fully understanding or effectively participating in AMS activities, there is a significant missed opportunity for optimizing antimicrobial use and combating AMR.

Leadership barriers. Finally, there is a clear need for more professional and institutional leadership in AMS nursing. The gap between aspirational statements affirming the role of nurses in AMS found in some institutional policies and programs *versus* the actual limited engagement seen in practice is quite concerning. The nursing voice has historically been marginalized in antimicrobial policy and decision-making arenas at regional, national, and global levels, despite the front-line role of nursing in treatment delivery and infection care, and the presence of nurses across health service levels, settings, and services.

Strategies for improvement

Several initiatives and approaches have been developed to overcome these barriers and optimize nursing presence in AMS, although the adoption and implementation of these and similar initiatives is gradual and uneven across health systems and professional nursing cultures.

Educational Initiatives: Addressing these educational deficits presents both a challenge and an opportunity. The diversity and size of the global nursing workforce mean that any attempt to standardize and enhance AMS-related education must be both adaptable and scalable. Targeted interventions to address the gaps in education identified include several learning resources already developed, including textbooks and manuals commissioned by nursing and transdisciplinary scientific societies (https://www.esno.org/assets/files/AMR_Module_3.pdf), tools such as serious games addressing AMS and prescribing behaviors, and e-learning modules. These resources generally emphasize AMS principles, are interdisciplinary to bring together nursing, pharmacy, and medical students, and incorporate AMS into continuous professional development and training.

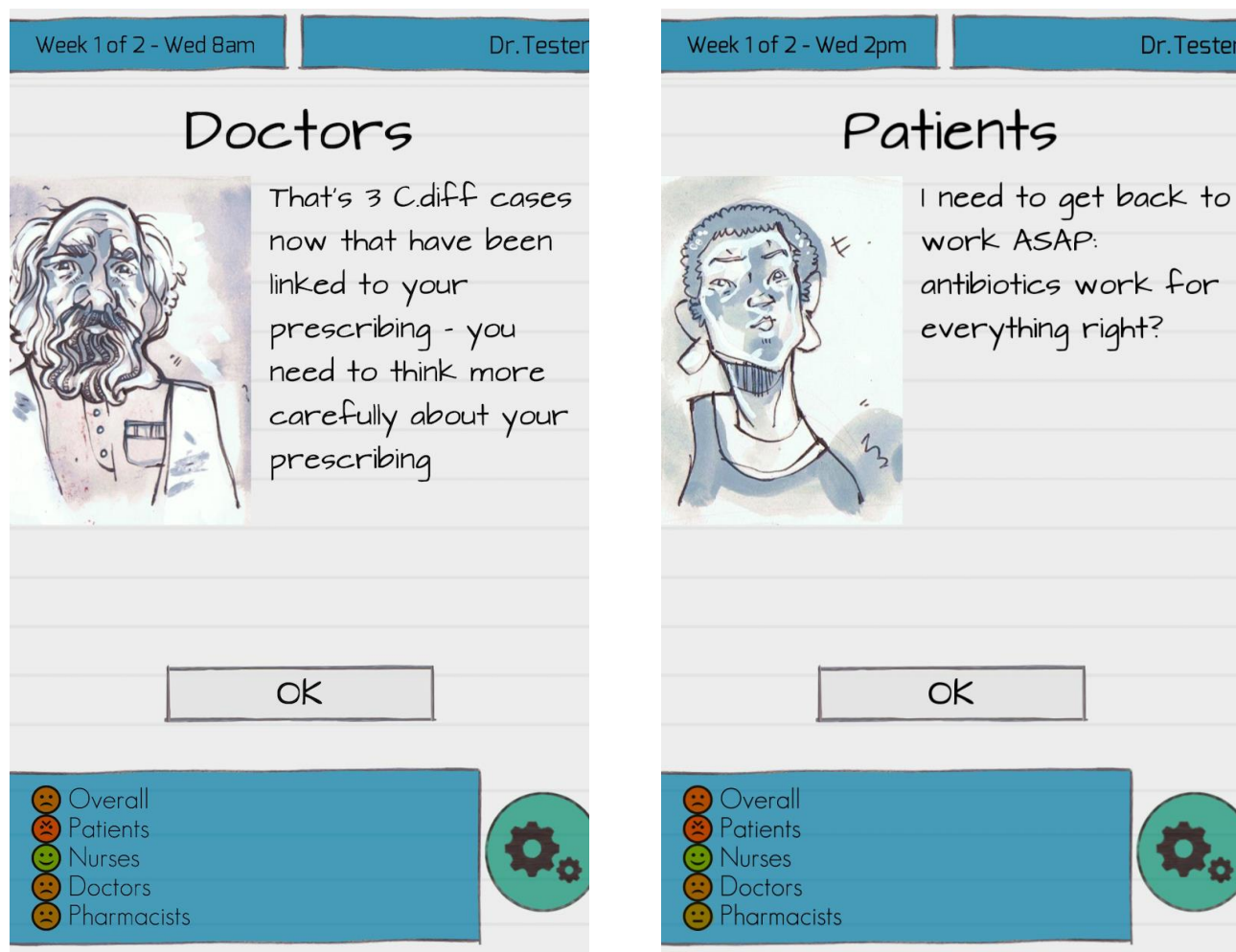
To effectively integrate nurses into AMS activities, educational strategies must also be multi-dimensional. This means not only incorporating the essential scientific knowledge of microbiology and pharmacology but also fostering a culture of critical thinking, decision-making, and inter-professional collaboration. Active learning approaches—such as problem-based learning, simulation training, and case-based discussions—may be more effective in teaching complex topics like AMS than traditional didactic methods. These innovative methods can help nurses develop the competencies needed to critically assess clinical situations, interpret diagnostic results accurately, and make informed decisions about antimicrobial use.

Moreover, efforts to enhance nursing education in AMS should also consider ongoing professional development. Continuous education programs, workshops, and e-learning platforms could provide accessible, flexible, and up-to-date resources for practicing nurses. Such initiatives would not only keep nurses informed about the latest AMS guidelines and evidence-based practices but also empower them to take on leadership roles in AMS, advocating for prudent antimicrobial use and driving quality improvement initiatives within their healthcare settings.

Education programs must however consider the local contexts and resources available, particularly in low- and middle-income countries where the burden of AMR is often highest, yet the resources for education and training may be even more limited. When these educational interventions are implemented, their effect is robust and sustainable. For example, several studies have demonstrated the effectiveness of education interventions in changing nursing practice and improving outcomes related to AMS. The systematic review by Olans *et al.* found that educational programs increased nurses' knowledge, confidence, and engagement in AMS activities. Specifically, interventions that combined didactic teaching with interactive components like case studies and role-playing were most effective, with multimodal education programs including online modules, in-person workshops, and clinical mentoring significantly improving nurses' adherence to AMS best practices like timely IV-to-oral antibiotic switches and appropriate specimen collection. This led to reductions in unnecessary antibiotic use. Additionally, tailored AMS education for nurse prescribers can enhance their antibiotic prescribing behaviors and decision-making.

In terms of technology, the "On Call: Antibiotics" serious game developed by Castro-Sánchez *et al.* (**Figure 1, Figure 2**) presents several clinical scenarios with increasing difficulty and uncertainty, where decisions to prescribe antibiotics or not, and continue their use, are then balanced with the consequences of such use such as antibiotic-related colitis or peripheral vascular access inflammation. The impact of 'nudges' by nurses on the decisions made by the game user is explored, together with the effect of uncertainty imposed by late results from biological samples. Approaches based on serious games or software 'apps' may be increasingly common but are likely to still appeal more to younger, more technologically inclined nurses, and they may focus on the diagnostic and therapeutic steps of infection management, which are least likely to involve nurses.

Figure 1, Figure 2. Selected behavioral nudges in 'On call: antibiotics' game (Adapted from Castro-Sánchez *et al.* 2014).



Other interventions have focused on strengthening nurses' communication with prescribers and decision-makers, developing conversational 'scripts' to reduce anxiety in the interactions about IV-to-oral switch and continuation of antibiotic courses, aiming to understand optimal points for intervention during clinical conversations, with brief standardized sentences which encourage open communication about prescribing decisions.

While novel educational strategies, such as serious games and dialogue support, hold promise for building nursing's AMS capabilities, the overall impact and practicality of such approaches remain unclear based on existing evidence. The dialogue support model of providing structured guidance for therapeutic decisions could potentially assist novice nurses but faces philosophical concerns about oversimplifying inherently complex diagnostic and treatment decisions. There may be fears that this approach could promote "cookbook" clinical care and end up undermining nursing critical thinking over time. More robust trials evaluating the real-world clinical utility, cost-effectiveness, and sustainability of such interventions are needed to justify scaling these models and secure institutional investment, particularly in low- and middle-income settings. Moreover, both games and dialogue tools fundamentally adopt an individual-focused educational approach when AMS is a profound social and collective undertaking which requires sustainable system-level solutions. While more research is still needed, the existing evidence suggests that well-designed education interventions can positively impact nursing practice and patient outcomes in AMS. However, stand-alone

knowledge/skill boosters are unlikely to overcome entrenched cultural and structural barriers, such as hierarchies, staffing deficits, lack of peer support, and organizational prioritization of AMS. Ultimately, a multi-pronged approach integrating AMS training across nursing curricula from undergraduate to postgraduate and continued professional education will likely be required to build sustainable competencies.

Leadership development. Fostering grassroots networking opportunities for knowledge mobilization and seeding communities of practice, such as international nursing summits in AMS nursing organized in the UK, or national and international networks in AMS nursing, such as the Brazilian Nurses Network Tackling the Antimicrobial Resistance (REBRAN) in Brazil, should be encouraged. Other examples include the online community of practice on AMS nursing hosted by the British Society of Antimicrobial Chemotherapy, connecting nurses internationally, and building clinical and leadership capacity.

The emergence of "nurse leaders in stewardship" through such forums is helping advocate for clearer nursing role delineation and decision-making power to be formalized within national action plans. However, high-level policy endorsements and commitments alone are unlikely to be sufficient for widespread transformation. Substantive institutional support, sustainable funding models, and the accompanying scope of practice modernization will ultimately be required to operationalize nursing stewardship roles and antimicrobial management responsibilities at scale. Efforts such as those by US Centers for Disease Control and Prevention to develop comprehensive nurse-specific AMS competencies could help to codify minimum practice standards.

Organizational approaches. A final hurdle to clear for organizations interested in implementing nurse roles in AMS would be to decide which model to adopt. Institutions may choose 'vertical' roles, where highly visible, consultant-type roles, are introduced (which on the other hand may not translate into a true transformational impact), or increase the skills of all nurses via 'horizontal' programs. This call to systematically "scan the landscape" for existing nursing stewardship roles, collaborations, and research is prudent given the relative paucity of published literature and data in this area compared to other disciplines. Identifying and disseminating exemplar nurse-led AMS models that are successfully operationalized could help build a stronger evidence base to advocate for wider role adoption across regions and care settings.

However, this bottom-up approach, driven by grassroots nursing advocacy, has clear limitations without corresponding top-down commitments from organizational leadership, policymakers, and professional governing bodies. Pioneering nurses pushing the envelope on expanded antimicrobial management may be doing so, in contrast to the existing professional regulations in many jurisdictions. A symbiotic cycle of nursing initiatives demonstrating their stewardship value proposition, followed by formal policy/regulatory updates to license such activities in an accountable manner, may be required for widespread scale-up.

Conclusion

The challenge presented by drug-resistant infections deserves the full focus of health systems and their clinical workforce. Nurses, where available, are educated and eager to increase their involvement and leadership in AMS programs. However, to profit from their skills and compassion, health services and professional organizations must strengthen emerging and design new nursing roles, address educational shortcomings, and agree upon metrics of success. While nursing work and expertise in the clinical arena are vital and valuable, anchoring nurses in such a role runs the risk of underusing their full potential, limiting professional growth, and ultimately fueling dissatisfaction.

Increased educational content on AMS included in undergraduate and postgraduate nursing courses world-wide could foster the involvement of future nurses in AMS efforts. It is particularly important to develop educational interventions aimed at improving the communication, confidence, and assertiveness of nursing students and qualified nurses to participate in multidisciplinary decisions about antibiotic management. The call for nurses to increase their involvement in stewardship must integrate with local professional nursing culture, tradition, and legislative framework. Similarly, increased competencies and responsibilities must be carefully aligned with existing expectations from other professions to minimize friction and foster interprofessional collaborative practice.

Competing interests

The author has no financial and non-financial competing interests to declare.

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