

REVIEW

PARTICIPATION OF NURSES IN ANTIMICROBIAL STEWARDSHIP PROGRAMS: AN INTEGRATIVE REVIEW

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ABSTRACT

Objective: To investigate publications in the literature on the participation of nurses in antimicrobial stewardship programs.

Method: Integrative review with search in the following databases: the Medical Literature Analysis and Retrieval System Online, the Latin American and Caribbean Center on Health Sciences Information, and the Cumulative Index to Nursing and Allied Health Literature. As inclusion criteria, full articles in Portuguese, English, or Spanish published between January 2007 and May 2018 were selected.

Results: Of the 140 articles found, 12 met the inclusion criteria, and were organized into the following three categories: "nurses' competencies in antimicrobials stewardship programs" (five articles), "lack of knowledge and need for training" (six articles), and "systemic action" (one article). **Conclusion:** Nurses may contribute significantly to antimicrobial stewardship programs; however, educational actions, studies, and public policies are necessary for their effective participation.


DESCRIPTORS: Multiple Bacterial Drug Resistance; Nurses; Antimicrobial Stewardship; Professional Competence; Systematic Review.

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O ENFERMEIRO NOS PROGRAMAS DE GERENCIAMENTO DO USO DE ANTIMICROBIANOS: REVISÃO INTEGRATIVA

RESUMO

Objetivo: investigar na literatura publicações acerca da participação do enfermeiro nos programas de gestão do uso de antimicrobianos.

Método: revisão integrativa com busca nas bases de dados: Medical Literature Analysis and Retrieval System on Line, Literatura Latino-Americana de Ciências da Saúde e Cumulative Index to Nursing and Allied Health Literature. Como critérios de inclusão, foram selecionados artigos disponíveis na íntegra, publicados entre janeiro de 2007 e maio de 2018, nos idiomas português, inglês ou espanhol.

Resultados: foram encontrados 140 artigos, 12 atenderam aos critérios de inclusão, e foram organizados em três categorias: "competências do enfermeiro nos programas de gestão do uso de antimicrobianos" (cinco artigos), "déficit de conhecimento e necessidade de capacitação" (seis artigos) e "ação sistêmica" (um artigo).

Conclusão: os enfermeiros podem contribuir de forma substancial com os Programas de Gerenciamento do uso de Antimicrobianos, porém são necessárias ações educacionais, pesquisas e políticas públicas para que a sua participação seja efetiva.

DESCRITORES: Farmacorresistência Bacteriana Múltipla; Enfermeiro; Gestão de Antimicrobianos; Competência Profissional; Revisão Sistemática.

EL ENFERMERO EN LOS PROGRAMAS DE OPTIMIZACIÓN DEL USO DE ANTIMICROBIANOS: REVISIÓN INTEGRATIVA

RESUMEN

Objetivo: Investigar publicaciones sobre la participación del enfermero en programas de optimización del uso de antimicrobianos.

Método: Revisión integrativa con búsqueda en bases Medical Literature Analysis and Retrieval System on Line, Literatura Latinoamericana en Ciencias de la Salud y Cumulative Index to Nursing and Allied Health Literature. Para inclusión, fueron seleccionados artículos disponibles integralmente, publicados entre enero de 2007 y mayo de 2018, publicados en portugués, inglés o español.

Resultados: Se encontraron 140 artículos, 12 atendían los criterios de inclusión. Fueron organizados en tres categorías: "competencias del enfermero en los programas de optimización del uso de antimicrobianos" (cinco artículos), "déficit de conocimiento y necesidad de capacitación" (seis artículos), y "acción sistémica" (un artículo).

Conclusión: Los enfermeros pueden contribuir sustancialmente con los Programas de Optimización del Uso de Antimicrobianos, resultando necesarias acciones educativas, investigaciones y políticas públicas para que su participación resulte efectiva.

DESCRITORES: Farmacorresistencia Bacteriana Múltiple; Enfermeros; Programas de Optimización del Uso de los Antimicrobianos; Competencia Profesional; Revisión Sistemática.

INTRODUCTION

Antimicrobial resistance is an increasing problem that limits and hinders the treatment of healthcare-associated infections (HAIs), especially in hospitalized patients⁽¹⁾.

Studies indicate that the inappropriate use of antimicrobials in hospitals ranges between 25% and 68%, and leads to the emergence of multidrug-resistant microorganisms, HAIs, increased costs associated with patients, increased length of hospital stay, and increased mortality rates⁽¹⁾. In addition, studies show that the greatest incidence of medication errors occurs during the administration of antibiotics⁽²⁻³⁾.

Optimizing antimicrobial prescriptions, monitoring its use, and combining these actions with infection prevention and control strategies proved to be effective in reducing HAIs⁽⁴⁾. In addition, a careful selection of antimicrobials and appropriate treatment duration can delay or prevent the emergence of drug-resistant microorganisms^(1,4).

Antimicrobial stewardship programs (ASPs) emerged in the 1990s; however, the first orientation guide on their implementation in healthcare services was only published in 2007 by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America⁽⁴⁾.

The ASPs adopt a multidisciplinary approach to minimize the development of multidrug-resistant microorganisms, by means of a multimodal strategy that includes the selection of appropriate antimicrobials and optimization of their dose and duration, minimizing toxicity and side effects⁽¹⁾. These programs were implemented in several hospitals in Brazil and worldwide and, currently, although described as multidisciplinary, there is a lack of knowledge on how nurses can participate in ASPs⁽¹⁾.

One study published in 2016 describes the existence of 900 articles on ASPs, published in medical, pharmaceutical, or microbiology journals, of which only 11 publications were found in nursing journals, showing the lack of literature on the role of nurses in ASPs⁽⁵⁾.

In another study published in 2005, the authors mentioned that the collaboration of infection control nurses in these programs is restricted to the sharing of multidisciplinary data, showing that their potential contribution to the management of antimicrobials use is still under-explored^(1,6).

In Brazil, resolution of the Brazilian Collegiate Board – RDC no. 7 of 2010⁽⁷⁾ and the Brazilian National HAI Prevention and Control Program – quadrennium 2016-2020⁽⁸⁾, recommend the development of actions to reduce and control the incidence of multidrug-resistant microorganisms by healthcare institutions, whereas the national guideline for the development of antimicrobial stewardship programs in healthcare services, published by the Brazilian National Health Surveillance Agency (ANVISA, per its acronym in Portuguese), describes the responsibility of the developers of antimicrobial stewardship programs, but does not clearly define the role of nurses⁽⁴⁾.

In this respect, this integrative review sought to bring significant contributions to the nursing area, in order to add to the knowledge construction on interdisciplinary practices, to optimize the use of antimicrobials and improve patient safety. Therefore, the objective of the present study was to investigate, in the literature, the participation of nurses in antimicrobial stewardship programs.

METHOD

This was an integrative literature review, which enables synthesis and analysis of the scientific knowledge already produced on the theme, allowing to indicate knowledge gaps that must be filled with the development of further studies⁽⁹⁾. The present study was

conducted by two independent researchers, from July 2017 to May 2018.

The following stages were covered for the development of the present study: establishment of the study's guiding question and objectives; articles' inclusion and exclusion criteria (sample selection); studies' categorization; analysis of results; results' discussion and presentation; and knowledge synthesis⁽⁹⁾.

The present study was guided by the following question: "How do nurses participate in antimicrobial stewardship programs"?

The following databases from the healthcare area were consulted to answer the guiding question: Medical Literature Analysis and Retrieval System Online (MEDLINE/PubMed), Latin American and Caribbean Center on Health Sciences Information (LILACS), and Cumulative Index to Nursing and Allied Health Literature (CINAHL). The descriptors used in the search were defined according to each database, that is, the Medical Subject Headings (MeSH) in MEDLINE/PubMed, the Health Sciences Descriptor (DeCS) in LILACS, and the List of Subject Headings in CINAHL. For publications' search in each database, descriptors were combined by the Boolean operators AND/OR. Chart 1 describes the search strategy used in each database.

Chart 1 – Descriptors and search strategy used in each database. São Paulo, São Paulo, Brazil, 2018

Descriptors:		
MEDLINE/PubMed	LILACS	CINAHL
("Anti-infective Agents"[Mesh] OR anti-infective OR anti-bacterial OR antimicrobial* OR antibiotic*) AND (stewardship OR "Practice Patterns, Physicians"[Mesh] OR "prescribing practices" OR "restriction polices") AND nurs*	(tw:(Anti-infecciosos)) OR (tw:(Ação Antimicrobiana)) OR (tw:(Agentes Anti-Infecciosos)) OR (tw:(Fármaco Anti-Infecciosos)) OR (tw:(Microbicidas)) OR (tw:(Agentes Antimicrobianos)) OR (tw:(Antimicrobianos)) AND (tw:(Gestão de Antimicrobianos)) OR (tw:(Gestão de Antibacterianos)) OR (tw:(Gestão de Antibióticos)) AND (tw:(nurs*))	(MH "Antibiotics+") OR "antibiotic" OR (MH "Drug Resistance, Microbial") OR (MH "Antiinfective Agents") OR "antimicrobial", "stewardship" OR (MH "Prescribing Patterns") OR "prescribing patterns", (MH "Public Policy") OR (MH "Hospital Policies") OR (MH "Health Policy") OR (MH "Policy Making") OR (MH "Health Policy Studies") AND "nurse" OR (MH "Nurse+") OR "nursing" OR "nurses role".

The following inclusion criteria were used for the selection of articles: full primary articles with a qualitative, quantitative, or mixed approach indexed in the databases selected; published in English, Portuguese, or Spanish; regarding the participation of nurses in antimicrobial resistance control; and published from January 2007 to May 2018. The delimitation of the search period is justified by the fact that the first orientation guide to implementing ASPs was published in 2007⁽⁴⁾.

Citations, editorials, letters, comments, abstracts of annals, duplicate publications, theses, dissertations, term papers, review articles, book chapters, and articles that did not approach the participation of nurses in antimicrobial resistance control were excluded.

In the first analysis, titles and abstracts of publications were read to verify adequacy to the inclusion criteria described. A full reading of publications was carried out in cases where titles and abstracts were insufficient to define the theme researched. The flow of the articles selected is represented in Figure 1.

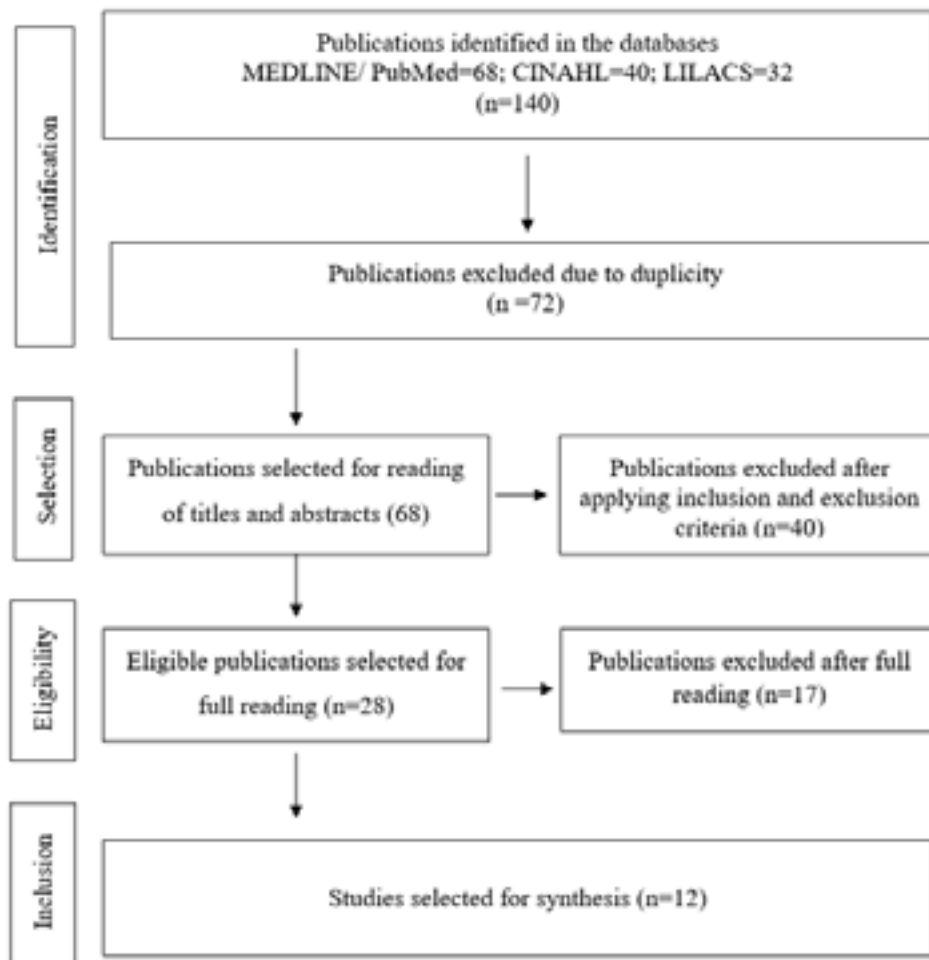


Figure 1 – Flowchart of the articles selected, evaluated for eligibility, and included and excluded. São Paulo, São Paulo, Brazil, 2018

The studies were classified according to the following evidence level: Level 1 – synthesis evidence of cohort or case-control studies; Level 2 – evidence of a single cohort or case-control study; Level 3 – evidence on meta-synthesis of qualitative or descriptive studies; Level 4 – evidence of a single qualitative or descriptive study; and Level 5 – evidence from opinions of experts⁽¹⁰⁾.

For analysis and further synthesis of the articles that met the inclusion criteria, an Excel® spreadsheet including the following information was used: publication year; authorship; country of origin; methodological design, main results, and evidence level. The results found were presented descriptively.

Because the present study made use of public domain databases and did not include the participation of human beings as study subjects, approval of a research ethics committee was not required.

RESULTS

In the cross-checking of descriptors, 140 articles that approached the participation of nurses in ASPs were found. After the reading of titles and abstracts, and search refinement, 12 articles were selected, as presented in Table 1.

Table 1 – Characteristics of the publications on the participation of nurses in antimicrobials stewardship programs. São Paulo, São Paulo, Brazil, 2018

Year	Authors	Article's title	Journal	Country of origin
2011	Edwards et al. ⁽¹⁾	Covering more territory to fight resistance: considering nurses'role in antimicrobial stewardship	J Infect Prev	England
2012	Abbo et al. ⁽¹¹⁾	Nurse practitioners' attitudes, perceptions, and knowledge about antimicrobial stewardship.	The Journal of Nurse Practitioners	United States
2013	Gillespie et al. ⁽¹²⁾	Improving antibiotic stewardship by involving nurses.	American Journal of Infection Control	Australia
2014	Abera et al. ⁽¹³⁾	Knowledge and beliefs on antimicrobial resistance among physicians and nurses in hospitals in Amhara Region, Ethiopia.	BMC Pharmacol Toxicol	Ethiopia
2015	Toska et al. ⁽¹⁴⁾	Antibiotic resistance and irrational prescribing in paediatric clinics in Greece.	Br J Nurs	Greece
2015	Hamilton et al. ⁽¹⁵⁾	Point-of-prescription interventions to improve antimicrobial stewardship.	Clin Infect Dis	United States
2015	McGregor et al. ⁽¹⁶⁾	Assessing knowledge of antimicrobial stewardship.	Nurs Times	Scotland
2016	Manning et al. ⁽¹⁷⁾	Combating antibiotic resistance: the role of nursing in antibiotic stewardship.	American Journal of Infection Control	United States
2016	Wentzel et al. ⁽¹⁸⁾	Antibiotic information application offers nurses quick support.	Am J Infect Control	Netherlands
2016	Olans et al. ⁽⁵⁾	The critical role of the staff nurse in antimicrobial stewardship – unrecognized, but already there.	Clinical Infectious Diseases	United States
2017	Wilson et al. ⁽¹⁹⁾	An online course improves nurses' awareness of their role as antimicrobial stewards in nursing homes.	American Journal of Infection Control	United States
2018	Carter et al. ⁽²⁰⁾	Exploring the nurse's role in antibiotic stewardship: A multisite qualitative study of nurses and infection preventionists	American Journal of Infection Control	United States

The 12 articles included in this study were published in English, from 2011 to 2018. The years 2015 and 2016 stood out with six publications. Regarding country of origin, six studies (50%) were published in the United States, and with regard to the main author's education, eight studies (66.6%) were published by professionals who were not from the nursing area.

Regarding evidence level classifications, eight publications (66.6%) were classified as level 4 – evidence of a single descriptive or qualitative study. For data analysis, the studies included in this study were categorized into the three following categories: "nurses' competencies in ASPs" (five), "lack of knowledge and need for training" (six), and "systemic action" (one). The articles' methodological design, main results, categorization, and evidence level are presented in Table 2.

Table 2 – Characteristics of the publications and evidence level of the articles included in the study. São Paulo, São Paulo, Brazil, 2018

Reference	Methodological design	Main results	Category	Evidence level
1	Descriptive	Nurses are able to participate in the following stages of ASPs: treatment specificity; treatment duration; antimicrobial route of administration; surgical prophylaxis; administration time; treatment monitoring; outpatient antimicrobial treatment.	Nurses' competencies	4
11	Descriptive	Nurses present poor knowledge on antimicrobials, which strengthens the need for an approach on the theme.	Lack of knowledge and need for training	4
12	Cohort	Educational sessions improved nurses' knowledge and reduced the endovenous administration of antimicrobials.	Lack of knowledge and need for training	2
13	Cohort	Nurses present poor knowledge on antimicrobials.	Lack of knowledge and need for training	2
14	Cohort	The participation of nurses in ASPs may contribute to educate patients and families on the implications of the unnecessary use of antimicrobials and antimicrobial resistance to public health.	Nurses' competencies	2
15	Descriptive	Educational action, which included multidisciplinary visits, audits, and feedback, improved nurses' knowledge.	Lack of knowledge and need for training	4
16	Descriptive	Nurses present poor knowledge on antimicrobials and reported that high workloads are a barrier to knowledge acquisition.	Lack of knowledge and need for training	4
17	Descriptive	Recommends the use of practical, educational, research, and public policies (ex.: support, promotion, and participation in national programs) focused on the participation of nurses in ASPs.	Systemic action	4
18	Cohort	The use of an application on antimicrobials was positively evaluated by nurses, providing support for information on antimicrobials.	Lack of knowledge and need for training	2
5	Qualitative	The actions of nurses in ASPs are associated with: collection of clinical culture samples; interpretation of the microbiological results; differentiation between colonization and infection; evaluation of infection risk, and development of a questioning attitude.	Nurses' competencies	4
19	Descriptive	The competencies of nurses in ASPs are: evaluation of infectious risks, collection of laboratory samples for microbiological analysis, and interface with other team members.	Nurses' competencies	4
20	Descriptive	Questioning on the need for urine sample collection for culture, to ensure the appropriate collection of material for culture, encourage replacement of endovenous with oral administration routes.	Nurses' competencies	4

DISCUSSION

In the United States, it is estimated that more than 2 million people develop severe infections caused by drug-resistant bacteria, and, at least, more than 23,000 people die every year as a direct result from these infections⁽¹⁷⁾. On average, 50% of the patients hospitalized receive at least one antibiotic, half of which are unnecessary or inappropriate⁽¹⁹⁾.

In a retrospective analysis carried out in 505 hospitals, 78% presented evidence of potentially inappropriate use of antibiotics, representing more than 12 million dollars in potentially preventable healthcare costs. In outpatient, homecare, and pediatric services, the inappropriate use of antimicrobials occurred in 70%, 58%, and 10% of the cases, respectively^(17,19,21).

According to one study carried out in 2016 in pediatric emergency care services, the most common reasons for the inappropriate prescription of antibiotics were the spectrum of wide action (41%), incorrect dose (22%), and inappropriate indication (17%)⁽²¹⁾. In addition, studies point out a greater incidence of medication errors during the administration of antibiotics⁽²⁻³⁾.

Antimicrobial resistance is one of the main global threats of infectious diseases, potentially harmful to human and animal health, agriculture, and economy. This increasing resistance was appointed by the Centers for Disease Control and Prevention (CDC) as one of the five main threats to health in the United States, and led to the development of the National Action Plan for Combating Antibiotic-Resistant Bacteria, which demands the establishment of ASPs in all intensive care hospitals up to 2020^(5,22).

According to the literature, successful ASPs demand the active involvement of all healthcare specialties to implement strategies, initiatives, and actions aiming at reducing antimicrobial resistance^(4,17).

Although ASPs are interdisciplinary and must include the participation of pharmacists, physicians, microbiologists, infection controllers, and managers, nurses have not yet been totally involved, in spite of their main role in the administration of antibiotics and success showed in the implementation of other infection prevention and control actions^(1,17,19,23). This evidence creates an environment that prevents healthcare institutions from assuming a truly interdisciplinary approach to prevent antimicrobial resistance^(1,17,24).

According to recent publications, nurses are considered essential to ASPs, due to their central position in communication, care coordination, monitoring of patients' conditions 24 hours a day, safety, and response to antimicrobial treatments^(1,5,24).

As part of the work process, nurses evaluate infection sources, collect and record data on patients' allergy, collect laboratory samples for microbiological culture, receive laboratory and image results at first hand, establish specific precautions when appropriate, initiate antimicrobial treatment, follow patients' evolution, monitor side effects, and interface with other healthcare team members^(19,24).

In the stage regarding treatment specificity, nurses are able to evaluate if the treatment prescribed is in accordance with the microbiological results, as well as ensure that the prescription of wide spectrum antimicrobials is limited whenever possible^(1,5,17,19,24). With regard to treatment duration, nurses, in collaboration with physicians and pharmacists, may contribute so that antimicrobials are prescribed for an appropriate time^(1,17,24).

Regarding administration routes, nurses are able to monitor prescriptions of endovenous antimicrobials and participate in discussions on the replacement with oral administration^(1,14,19,24). With regard to surgical prophylaxis, in collaboration with physicians and pharmacists, nurses are able to analyze if antimicrobials are prescribed for an appropriate time, ensuring that medications are administered at the right time to increase patient survival and quicken hospital discharge^(1,5,17,19,24).

In addition, nurses are in a key position to facilitate patient referral to outpatient antimicrobial treatment in cases where hospitalization is directed to long antimicrobial treatment. This pro-active patient care approach reduces the length of hospital stay, thus minimizing the risk of acquiring HAIs and associated costs, allowing patients to continue treatment at home^(1,24).

In this respect, involving nurses in ASPs may promote opportunities to discuss treatments, indicate antimicrobials, and establish their duration, increasing even more the multidisciplinary and interdisciplinary management of ASPs. However, it is worth mentioning that nurses must be trained to appropriately perform their role^(11-13,15-16,18,24).

According to the technical document published by the American Nurses Association (ANA) and the CDC in 2017, nurses feel insecure with regard to their knowledge on microbiology and pharmacology. In this regard, these agencies suggest training sessions on the following topics: collection of laboratory samples for culture and interpretation of results; the difference between colonization and infection; assertive communication; criteria for replacement of antimicrobial administration routes endovenous versus oral; and allergy history⁽²⁴⁾.

According to publications, participation in training programs promotes the improvement of knowledge, critical reasoning, and teamwork^(12,15,18-19).

One study carried out in 2017 describes that nurses who participated in an online course on antimicrobials presented improvement of knowledge (76% pre-course to 86% post-course, $p < 0.001$) and self-confidence to be involved in discussions in ASPs⁽¹⁹⁾. In one study carried out in the Netherlands, the use of an application on antimicrobials led to the improvement of communication between nurses and physicians and agility in decision making⁽¹⁸⁾. Another study carried out in Australia showed that, after an educational action, nurses were able to coordinate risks of endovenous antimicrobial therapy treatments and were aware of the benefits of replacing endovenous antimicrobial therapies with oral antimicrobial therapies⁽¹²⁾. In addition, it is worth mentioning the contribution of nurses as educators of patients and families, providing guidance on the implications of the unnecessary use of antimicrobials and their consequences for public health^(14,24).

In the last decade, national and international organizations have approached antibiotic resistance in reports, conferences, and scientific publications. However, even with all global attention, the nursing area as a whole has been relatively quiet on the theme of antimicrobial resistance⁽¹⁷⁾.

In this respect, studies propose national and local actions to involve nurses in the theme. At national level, it is necessary to explore alternatives of professional recognition, include the theme in the agenda of meetings, prioritize publications on the theme in nursing journals, and include the theme in nursing undergraduate curricula. At local level, the proposal is to promote training, involve nurses in multidisciplinary visits, and emphasize that the rational use of antimicrobials is of utmost importance for patient safety^(17,24).

CONCLUSION

The rational use of antimicrobials is of utmost importance for patient safety, and nurses have significant contributions to reduce antibiotic resistance.

To act effectively in ASPs, nurses must develop and improve the necessary competencies to act in an interdisciplinary and effective way. Therefore, participation in training sessions is essential.

The knowledge synthesis of the present study shows a lack of national literature on the theme, which suggests the opportunity for further studies on the nursing area, and prevention and control of HAIs in Brazil.

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