

THE NURSE IN THE ANTIMICROBIAL STEWARDSHIP: AN INTEGRATIVE REVIEW

O enfermeiro no programa de gerenciamento do uso de antimicrobianos: uma revisão integrativa

El enfermero en el programa de gestión del uso de antimicrobianos: una revisión integrativa

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ABSTRACT: Objective: To analyze how scientific literature describes the nurse, as well as his/her role in the Antimicrobial Stewardship (AMS). **Method:** Integrative literature review, carried out by consulting the Scientific Electronic Library Online (SciELO), Latin American & Caribbean Health Sciences Literature (LILACS), and MEDical Literature Analysis and Retrieval System Online (MEDLINE) databases. **Results:** We included six articles that met the previously established inclusion criteria. They were published in English and disclosed in the MEDLINE electronic database. Half of the articles were published in scientific journals that had an impact factor evaluated above 2.0. The journals *Clinical Infectious Diseases* (8.216), *BMC Medical Informatics and Decision Making* (2.288), and *American Journal of Infection Control* (2.209) were highlights. Regarding the addressed themes, all the articles recognized the nurse as a key element in the AMS. **Conclusion:** Even though the studies in the literature are limited, we concluded that the participation of nurses promotes therapeutic optimization and rational use of antibiotics, contributing to the reduction of antimicrobial resistance. **Keywords:** Nursing, team. Antimicrobial stewardship. Cross infection.

RESUMO: Objetivo: Analisar como a literatura científica descreve o enfermeiro, bem como seu papel no Programa de Gerenciamento do Uso de Antimicrobianos (PGUA). **Método:** Revisão integrativa da literatura, realizada mediante consulta às bases de dados Scientific Electronic Library Online (SciELO), Literatura Latinoamericana e do Caribe em Ciências da Saúde (LILACS) e Medical Literature Analysis and Retrieval System Online (MEDLINE). **Resultados:** Foram incluídos seis artigos que atenderam os critérios de inclusão previamente estabelecidos. Todos foram publicados na língua inglesa e divulgados na base de dados eletrônica MEDLINE. A metade dos artigos foi publicada em revistas científicas que tiveram fator de impacto avaliado acima de 2,0, destacando os periódicos *Clinical Infectious Diseases* (8,216), *BMC Medical Informatics and Decision Making* (2,288) e *American Journal of Infection Control* (2,209). Quanto aos temas abordados, todos os artigos reconheceram o enfermeiro como peça fundamental no PGUA. **Conclusão:** Embora os estudos na literatura sejam limitados, foi possível concluir que a participação do enfermeiro promove otimização terapêutica e uso racional dos antibióticos, contribuindo para redução da resistência antimicrobiana. **Palavras-chave:** Equipe de enfermagem. Gestão de antimicrobianos. Infecção hospitalar.

RESUMEN: Objetivo: Analizar cómo la literatura científica describe el enfermero, así como su papel en el Programa de Gestión del Uso de Antimicrobianos (PGUA). **Método:** Revisión integrativa de la literatura, realizada mediante consulta a las bases de datos *Scientific Electronic Library Online* (SciELO), Literatura Latinoamericana y del Caribe en Ciencias de la Salud (LILACS) y *Medical Literature Analysis and Retrieval System Online* (MEDLINE). **Resultados:** Fueron incluidos seis artículos que atendieron a los criterios de inclusión previamente establecidos. Todos fueron publicados en el idioma inglés y divulgados en la base de datos electrónica MEDLINE. Mitad de los artículos fue publicada en revistas científicas que tuvieron factor de impacto evaluado arriba de 2,0, destacando los periódicos *Clinical Infectious Diseases* (8,216), *BMC Medical Informatics and Decision Making* (2,288) y *American Journal of Infection Control* (2,209). Con relación a los temas abordados, todos los artículos reconocieron al enfermero como pieza fundamental en el PGUA. **Conclusión:** Aunque los estudios en la literatura sean limitados, fue posible concluir que la participación del enfermero promueve optimización terapéutica y uso racional de los antibióticos, contribuyendo para la reducción de la resistencia antimicrobiana. **Palabras clave:** Grupo de enfermería. Programas de optimización del uso de los antimicrobianos. Infección hospitalaria.

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INTRODUCTION

Antimicrobial Resistance (AR) refers to the ability of the microorganism to withstand the action effects of previously prescribed antibiotics. This phenomenon is considered a public health problem, which compromises the effectiveness of current anti-infective treatments. Several factors contributing to the emergence of this phenomenon are highlighted, especially the use of antimicrobials without proper indication¹.

In the United States, 2 million Healthcare-Associated Infections (HAI) by antimicrobial-resistant microorganisms are estimated to occur every year, and at least 23,000 deaths occur as a result of these infections¹. In Europe, around 25,000 patients die from infections caused by multiresistant microorganisms, which generate additional costs for public coffers of approximately € 1.5 billion per year². In Brazil, resistance to antibiotics has been reported by several health services in the recent decades³.

In the national context, Ordinance No. 2,616, from May 12, 1998, established guidelines and standards for the creation of the Hospital Infection Control Program (PCIH, acronym in Portuguese) and included a mandatory policy for the use of antimicrobials, germicides, and hospital-medical materials⁴. At the same time, not only in Brazil, but also worldwide, through the World Health Organization (WHO)⁵ and the United States Center for Disease Control and Prevention, the issue of antimicrobial stewardship has gained wide discussion and highlight among the themes related to public health⁶.

The Antimicrobial Stewardship (AMS) establishes guidelines and strategies based on scientific evidence and laboratory data to create systematic actions that may prevent and control the spread of multiresistant microorganisms. Effectively implanted AMS favors better clinical outcomes, reducing the length of hospital stay, morbimortality, and unexpected care costs resulting from inadequate anti-infective treatments⁶⁻⁸.

Among the various professionals who make up the team responsible for the AMS, the nurses stand out. They are responsible for ensuring that bacteriological cultures are carried out before the start of antibiotics, because these promote discussions on the possible adverse effects caused by antimicrobials and review medical prescriptions daily, according to the indicated treatment and its duration.

Hence, this study is justified in elucidating the nurse's role as to the AMS, considering some literatures still do not recognize it as a key element for the program success. This research is important to provide data that draw the attention of health managers on the importance of nursing in the fight against AR. In addition, new reflections on the proposed theme are expected.

OBJECTIVE

To analyze how scientific literature describes the nurse, as well as its role in the AMS.

METHOD

This is a bibliographical study, an integrative literature review type. This method allows unifying the results based on a defined theme and incorporates the evidence in clinical practice, contributing to deepen the knowledge of the investigated subject⁹.

For the study preparation, the following steps were taken:

- establishment of research hypothesis or question;
- sampling or search in the literature;
- categorization of studies;
- evaluation of studies included in the review;
- interpretation of results;
- synthesis of knowledge or presentation of review⁹.

In the first stage, the theme and the research objectives were defined. As a guiding question, the following question was asked: What is the nurse's role in the AMS?

For the selection of studies, a bibliographic survey was carried out in the Scientific Electronic Library Online (SciELO), Latin American & Caribbean Health Sciences Literature (LILACS) and Medical Literature Analysis and Retrieval System Online (MEDLINE) databases through the Virtual Health Library (<http://bvsalud.org/>). For the retrieval strategy of scientific information, Boolean operators were used. The keywords defined for literary search were "Nurse" AND "Antimicrobial Stewardship" AND "hospital". The latter was used as a free descriptor, without the use of quotation marks. All keywords are part of the Health Sciences Descriptors (DeCS).

The following inclusion criteria were used: articles published in Spanish, English and Portuguese, from 2013 to 2017. The articles in the form of handouts were excluded from the research because they did not meet the necessary criteria, which reinforce the importance of searching for scientific evidence on the subject.

For data collection, a form was prepared by the author himself, including the title of the articles, the researchers' names, information of the journals (volume, number, pages, year and published journal), and the main highlights. Subsequently, data were transmitted to a synoptic table with the same information for the synthesis of studies.

After reading the scientific articles included in the integrative review, a descriptive analysis was performed, using percentage calculation and absolute values presentations in tables. Later, data were analyzed through the synthesis of authors' dialogues and discussed based on relevant literature.

The studies were grouped by content similarity and showed a single category: The nurse in the AMS.

Figure 1 shows the steps taken to select the articles that were part of the study sample.

RESULTS

Six articles that met the previously established inclusion criteria were included in this study. All of them were published in English and disclosed in the MEDLINE database. Table 1 presents the synthesis of the six articles that formed the sample.

From the total of articles on such subject, we verified that half (50.0%) was published in scientific journals that had an impact factor evaluated above 2.0, and the following journals stood out: Clinical Infectious Diseases (8.216), BMC Medical Informatics and Decision Making (2.288),

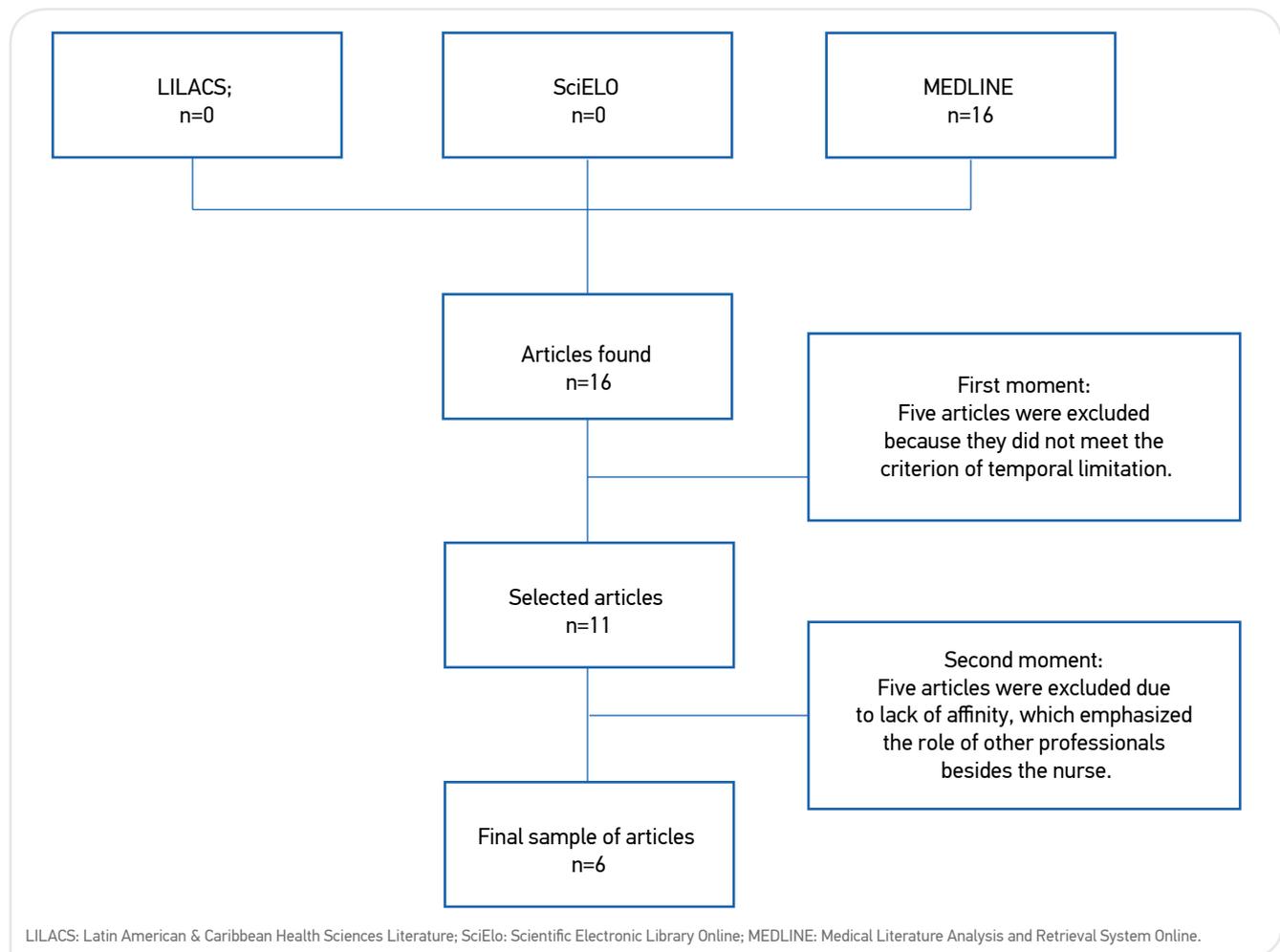


Figure 1. Literary search of scientific articles.

and American Journal of Infection Control (2.209), as seen in Table 2.

Regarding temporal delimitation, we observed in this integrative review that two (33.3%) of the selected articles are from 2013; two (33.3%) from 2014; one (16.67%) from 2015, and one (16.67%) from 2016 (Table 1). In addition, the absence of Brazilian studies published in the selected databases was notorious, with a predominance of international studies.

Regarding the addressed themes, all the articles recognized the nurse as a key element in the AMS. The studies highlighted the activities performed by this professional as essential for the reduction of AR, as well as for therapeutic optimization of infectious treatments. Key activities performed by nurses, such as daily review of medical prescriptions and administration of antimicrobials with adequate indication, dose and duration, stood out.

Chart 2. Impact factor of scientific journals evaluated for the study.

Journal	Impact factor
Clinical Infectious Diseases	8.216
BMC Medical Informatics and Decision Making	2.288
American Journal of Infection Control	2.209
Journal of the American Association of Nurse Practitioners	0.931
Journal of Continuing Education in Nursing	0.880
Nursing Standard	0.080

Table 1. Distribution of studies according to the year of publication.

Year of publication	Number	Percentage
2013	2	33.3
2014	2	33.3
2015	1	16.7
2016	1	16.7
2017	-	-

Chart 1. Synoptic table with synthesis of selected articles for the study.

Article title	Authors	Journal, year, volume, number and pages	Main Highlights
The critical role of the staff nurse in antimicrobial stewardship: unrecognized, but already there ¹⁰	Olans RN, Olans RD, DeMaria A Jr.	Clin Infect Dis. 2016;62(1):84-9	The nurse is a professional who has always performed several essential functions for the success of antimicrobial stewardship, such as continuous status monitoring of the patient and the assessors of antimicrobial therapeutic response.
Defining a role for nursing education in staff nurse participation in antimicrobial stewardship ¹¹	Olans RD, Nicholas PK, Hanley D, DeMaria A Jr.	J Contin Educ Nurs. 2015;46(7):318-21	The role of nurses in the AMS has not been clearly defined, requiring educational interventions to improve awareness of program components.
The urgent need for nurse practitioners to lead antimicrobial stewardship in ambulatory health care ¹²	Manning ML	J Am Assoc Nurse Pract. 2014;26(8):411-3.	In the AMS, nursing professionals should lead in addressing the therapeutic implications for patients and their care practice.
Participatory eHealth development to support nurses in antimicrobial stewardship ¹³	Wentzel J, Van Velsen L, Van Limburg M, de Jong N, Karreman J, Hendrix R, et al.	BMC Med Inform Decis Mak. 2014;14:45.	To perform complex antimicrobial-related activities, nurses need to consult various sources of information on a myriad of occasions, mainly because the information is not structured to match the professional's duties.
Antimicrobial stewardship: the role of the nurse ¹⁴	Ladenheim D, Rosembert D, Hallam C, Micallef C	Nurs Stand. 2013; 28(6):46-9.	The nurse's role is essential to ensure the correct use of antimicrobials through correct drug administration, contributing to the reduction of antimicrobial resistance.
Improving antibiotic stewardship by involving nurses ¹⁵	Gillespie E, Rodrigues A, Wright L, Williams N, Stuart RL	Am J Infect Control. 2013;41(4):365-7.	Nurses are essential to administer medications prescribed by the medical staff. The AMS should involve these professionals in order to improve the antimicrobial administration in the hospital environment.

AMS: Antimicrobial Stewardship.

DISCUSSION

The nurse in the antimicrobial stewardship

Medical prescriptions classified as inadequate or unnecessary may vary between 20 and 50% and justify the adoption of AMS as a strategy to guarantee efficient medical and therapeutic effect and to control the consumption of antibiotics in health services¹⁶. As a result, the indiscriminate use of these substances could be reduced as much as possible, and could have an impact on the decline in AR that threatens global public health.

AMS involves a multifaceted approach to policies, guidelines, educational strategies, and other strategies that ensure the best clinical outcomes. The strict control and monitoring of antimicrobials aims to reduce or eliminate potential risks, which affect the anti-infective treatment of patients³.

The proper management of antimicrobials in health services can considerably reduce the HAIs caused by multiresistant microorganisms¹⁶. The formation of an interdisciplinary team responsible for the execution of improvement actions related to AMS is essential, which would train health managers and disseminate feedback to those involved^{3,5-8}.

The national guideline for the elaboration of AMS in Health Services, launched by the Brazilian Health Regulatory Agency (ANVISA) in 2017, suggests the nursing team as one of the representatives for the formation of a management team. This team should coordinate administrative and general actions, thus establishing systematic evaluations and control for compliance with the plan in different units of a hospital. This document also cites the operational team, which is responsible for the elaboration, execution and monitoring of the AMS actions. The team must be comprised, at a minimum, by the following components of the management team: infectologist or physician with expertise in infectious diseases; clinical pharmacist, preferably with expertise in infectious diseases and antimicrobial use; nurse of the Hospital Infection Control Commission (CCIH, acronym in Portuguese), and clinical microbiologist³.

The nurse has a peculiar role in the patient's direct care. He/she develops several complex care activities, including the administration of medications. One study showed the importance of this professional as one of the leaders as

to the AMS, addressing the several implications related to the administration of antimicrobials for the nurse's practice of care¹².

Hence, the importance of nursing in the rationalization of antibiotic therapy through drug administration should be more explored in health services^{10,14,15}. It is noteworthy that nurses need to see themselves within the AMS, valuing their knowledge as educators and their informant support of the practices associated with AMS.

Even though the nurse's role has not been formally recognized as to the AMS or defined in the medical literature, it is important to elucidate that the professional has always played a number of essential functions for the program success. They are considered central communicators of the patient's status and evaluate the effects and/or possible side events related to antibiotic therapy¹⁰ for 24 hours.

One study evaluated 900 scientific articles on hospital AMS, and the authors identified that only 11 had been published in nursing journals¹¹. In this case, most of them were available in medical, pharmacy, microbiology and other journals, emphasizing the lack of studies elaborated by nurses on the subject.

A study carried out with 180 nurses showed that the professionals have great prominence, mainly in the identification of adverse reactions and acquisition of bacteriological cultures before the start of antimicrobials and active participation in health education related to the subject. However, the authors of this study have highlighted opportunities for improvement in some aspects, such as the review of microbiology results to determine the adequacy of the antibiotic and failures in the insertion of nurses in discussion rounds of the multidisciplinary team¹⁷.

Another relevant aspect is the education of health professionals, patients, companions and caregivers for the success of AMS, which is an essential factor that favors awareness and positively stimulates the operational team. The educational process for general involvement promotes the correct use of antimicrobials and favors the effective therapeutic management of patients with infection, and may favor outcomes with fewer adverse events³.

However, nurses still need to improve their knowledge of the components of AMS¹¹. A study showed that 98% of 210 nurses still report lack of specific antimicrobial-related training. It is inferred that education on the subject should not be limited to graduation, thus it should be expanded to places that involve care practice to patients¹⁸.

In addition to the need of improving nurses' knowledge regarding AMS, authors¹³ consider that professionals still need to consult several sources of information on a multitude of occasions, mainly because the specific data of the program are not structured to match the professional's tasks. Thus, the need to create technologies that favor the incorporation of medical protocols into the nurses' work routines was observed, reducing rework and optimizing the good practices of antimicrobial use.

Based on the careful reading of the selected articles, we noticed the importance of the nurses' participation in the rationalization of antimicrobial use. It is noteworthy that its specific attributions contribute to the effectiveness of actions in the AMS, in which its concerns regarding antibiotic selection, administration routes, dosage and duration of treatments favor the best clinical outcomes with minimal potential risk.

FINAL CONSIDERATIONS

The AMS optimizes drug therapy and decreases the resistance of microorganisms to antibiotics. For the program to

be implemented successfully, infection prevention and control guidelines should be adopted together to reduce the transmission of pathogens to patients in a care unit.

For the implementation of policies and regulations related to the AMS, an interdisciplinary team composed of several professionals should be formed. Even though the nurses have not been recognized by some studies as members of AMS, their participation promotes therapeutic optimization as well as rational use of antimicrobials.

The main objective of the study was achieved, and it was possible to know the nurses' role and their importance to AMS through this integrative review. It is noteworthy that the other professionals who make up the management team, such as infectologist, pharmacist, CCIH nurse and clinical microbiologist, contribute, in a mutual way, to therapeutic management with favorable outcomes and fewer adverse events to the patient. However, more researches with other methodologies and new approaches are fundamental to a better understanding of the studied subject.

REFERENCES

- Centers for Disease Control and Prevention (CDC). Antibiotic resistance threats in the United States, 2013 [Internet]. Atlanta: Centers for Disease Control and Prevention; 2013 [acessado em 8 jun. 2018]. Disponível em: <https://www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf>
- European Centre for Disease Prevention and Control. Factsheet for experts: antimicrobial resistance [Internet]. European Centre for Disease Prevention and Control; 2008 [acessado em 8 jun. 2018]. Disponível em: <https://ecdc.europa.eu/en/antimicrobial-resistance/facts/factsheets/experts>
- Brasil. Agência Nacional de Vigilância Sanitária (ANVISA). Diretriz Nacional para Elaboração de Programa de Gerenciamento do Uso de Antimicrobianos em Serviços de Saúde. Brasília [Internet]. Brasil: Agência Nacional de Vigilância Sanitária; 2017 [acessado em 9 jun. 2018]. Disponível em: <https://www20.anvisa.gov.br/segurancadopaciente/index.php/publicacoes/item/diretriz-nacional-para-elaboracao-de-programa-de-gerenciamento-do-uso-de-antimicrobianos-em-servicos-de-saude>
- Brasil. Ministério da Saúde (MS). Portaria nº 2.616, de 12 de maio de 1998. Dispõe sobre diretrizes e normas para prevenção e o controle das infecções hospitalares [Internet]. Brasília: Ministério da Saúde; 1998 [acessado em 9 jun. 2018]. Disponível em: http://bvsms.saude.gov.br/bvs/saudelegis/gm/1998/prt2616_12_05_1998.html
- World Health Organization. Global strategy for containment of antimicrobial resistance [Internet]. Geneva: World Health Organization; 2001 [acessado em 10 jun. 2018]. Disponível em: http://www.who.int/drugresistance/WHO_Global_Strategy_English.pdf
- Pollack LA, Srinivasan A. Core elements of hospital antibiotic stewardship programs from the centers for disease control and prevention. Clin Infect Dis [Internet]. 2014 [acessado em 10 jun. 2018];59(Supl. 3):s97-s100. Disponível em: <http://dx.doi.org/10.1093/cid/ciu542>
- Perez KK, Olsen RJ, Musick WL, Cernoch PL, Davis JR, Peterson LE, et al. Integrating rapid diagnostics and antimicrobial stewardship improves outcomes in patients with antibiotic-resistant Gram-negative bacteremia. J Infect [Internet]. 2014 [acessado em 10 jun. 2018];69(3):216-25. Disponível em: <http://dx.doi.org/10.1016/j.jinf.2014.05.005>
- Centers for Disease Control and Prevention (CDC). Core Elements of Hospital Antibiotic Stewardship Programs [Internet]. Atlanta: US Department of Health and Human Services, CDC; 2014 [acessado em 10 jun. 2018]. Disponível em: <http://www.cdc.gov/getsmart/healthcare/implementation/core-elements.html>
- Mendes KS, Silveira RCCP, Galvão CM. Revisão integrativa: método de pesquisa para a incorporação de evidências na saúde e na enfermagem. Texto Context Enferm [Internet]. 2008 [acessado em 10 jun. 2018];17(4):758-64. Disponível em: <http://dx.doi.org/10.1590/S0104-07072008000400018>

10. Olans RN, Olans RD, de Maria Jr. A. The critical role of the staff nurse in antimicrobial stewardship: unrecognized, but already there. *Clin Infect Dis* [Internet]. 2016 [acessado em 10 jun. 2018];62(1):84-9. Disponível em: <http://dx.doi.org/10.1093/cid/civ697>
11. Olans RD, Nicholas PK, Hanley D, DeMaria A Jr. Defining a role for nursing education in staff nurse participation in antimicrobial stewardship. *J Contin Educ Nurs* [Internet]. 2015 [acessado em 9 jun. 2018];46(7):318-21. Disponível em: <http://dx.doi.org/10.3928/00220124-20150619-03>
12. Manning ML. The urgent need for nurse practitioners to lead antimicrobial stewardship in ambulatory health care. *J Am Assoc Nurse Pract* [Internet]. 2014 [acessado em 10 jun. 2018];26(8):411-3. Disponível em: <http://dx.doi.org/10.1002/2327-6924.12150>
13. Wentzel J, Van Velsen L, Van Limburg M, de Jong N, Karreman J, Hendrix R, et al. Participatory eHealth development to support nurses in antimicrobial stewardship. *BMC Med Inform Decis Mak* [Internet]. 2014 [acessado em 9 jun. 2018];14(45). Disponível em: <https://doi.org/10.1186/1472-6947-14-45>
14. Ladenheim D, Rosember D, Hallam C, Micallef C. Antimicrobial stewardship: the role of the nurse. *Nurs Stand*. 2013;28(6):46-9. <http://dx.doi.org/10.7748/ns2013.10.28.6.46.e7802>
15. Gillespie E, Rodrigues A, Wright L, Williams N, Stuart RL. Improving antibiotic stewardship by involving nurses. *Am J Infect Control*. 2013;41(4):365-7. <https://doi.org/10.1016/j.ajic.2012.04.336>
16. Fridkin S, Baggs J, Fagan R, Magill S, Pollack LA, Malpiedi P, et al. Vital signs: improving antibiotic use among hospitalized patients. *MMWR Morb Mortal Wkly Rep* [Internet]. 2014 [acessado em 12 jun. 2018];63(9):194-200. Disponível em: <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6309a4.htm>
17. Monsees E, Popejoy L, Jackson MA, Lee B, Goldman J. Integrating staff nurses in antibiotic stewardship: Opportunities and barriers. *Am J Infect Control* [Internet]. 2018 [acessado em 9 jun. 2018];46(7):737-42. Disponível em: <https://doi.org/10.1016/j.ajic.2018.03.028>
18. Abera B, Kibret M, Wondemagegn M. Knowledge and beliefs on antimicrobial resistance among physicians and nurses in hospitals in Amhara Region, Ethiopia. *BMC Pharmacol Toxicol* [Internet]. 2014 [acessado em 11 jun. 2018];15:26. Disponível em: <http://dx.doi.org/10.1186/2050-6511-15-26>