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PHARMACOECONOMICS AS A STRATEGY FOR OPTIMIZING THE COST-EFFECTIVENESS OF ANTIMICROBIAL AGENTS: A REVIEW

FARMACOECONOMIA COMO ESTRATÉGIA DE OTIMIZAÇÃO DO CUSTO-EFETIVIDADE DE ANTIMICROBIANOS: UMA REVISÃO

LA FARMACOECONOMÍA COMO ESTRATEGIA PARA OPTIMIZAR LA COSTOSA-EFECTIVIDAD DE LOS AGENTES ANTIMICROPOLÍTICOS: UNA REVISIÓN

https://doi.org/10.56238/sevened2025.018-051

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ABSTRACT

The hospital's management is complex, requiring a broad and multidisciplinary set of managerial competencies, ranging from administration concepts and human resources to specific knowledge related to the various professionals and clients it serves. In the current context, antimicrobial resistance is a major public health issue, as its expansion threatens the use of antimicrobials, medications that account for over 30% of the therapeutic arsenal used in hospitals. This study aimed to conduct a literature review on the topic. The results of this review demonstrated the important role of pharmacists, who should be included in and actively participate in the hospital infection control committee to minimize the spread of bacterial resistance in the hospital environment by applying techniques for the rational use of these medications.

Keywords: Bacterial Drug Resistance. Hospital Management. Clinical Pharmacy Services.

RESUMO

O hospital possui gestão complexa, demandando uma extensa e multidisciplinar relação de competências gerenciais que abrangem desde conceitos de administração, recursos humanos até conhecimentos específicos relacionados aos diversos profissionais e clientes que possui. No contexto atual, a resistência antimicrobiana é um importante tema para saúde pública, pois sua ampliação coloca em xeque a utilização de antimicrobianos, medicamentos que correspondem a mais de 30% do arsenal terapêutico utilizado em hospitais. O presente trabalho teve por objetivo realizar uma revisão bibliográfica a respeito do tema. Os resultados dessa revisão demonstraram um papel importante do profissional farmacêutico, que deve ser inserido e participar ativamente da comissão de controle de infecção hospitalar com o objetivo de minimizar a expansão da resistência bacteriana no ambiente hospitalar, aplicando técnicas de uso racional desses medicamentos.

Palavras-chave: Farmacorresistência Bacteriana. Gestão Hospitalar. Serviços de Farmácia Clínica.

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RESUMEN
La gestión hospitalaria es compleja y requiere un conjunto amplio y multidisciplinario de competencias gerenciales, que abarcan desde conceptos administrativos y de recursos humanos hasta conocimientos específicos relacionados con los diversos profesionales y clientes a los que atiende. En el contexto actual, la resistencia a los antimicrobianos es un importante problema de salud pública, ya que su expansión amenaza el uso de antimicrobianos, medicamentos que representan más del 30% del arsenal terapéutico utilizado en los hospitales. Este estudio tuvo como objetivo realizar una revisión bibliográfica sobre el tema. Los resultados de esta revisión demostraron el importante papel de los farmacéuticos, quienes deberían ser incluidos y participar activamente en el comité de control de infecciones del hospital para minimizar la propagación de la resistencia bacteriana en el entorno hospitalario mediante la aplicación de técnicas para el uso racional de estos medicamentos.

Palabras clave: Resistencia Bacteriana a Fármacos. Gestión Hospitalaria. Servicios de Farmacia Clínica.

1 INTRODUCTION

Hospital management is intrinsically complex, as it demands an extensive list of managerial skills, ranging from specific knowledge in the management of human, physical and financial resources to the adaptation to the increase in the base of elderly customers and those with chronic diseases, increasing hospital demand (regardless of whether its management is public or private), aggravating a situation of professional scarcity and long waiting lines (FARIAS; ARAUJO, 2017).

Among the physical resources, medicines make up an important fraction of institutional health expenditures and even at the national level. Properly applied, they are often the most cost-effective therapeutic resources. Pharmacoeconomics is the area that analyzes the costs and impact of drug therapies, seeking to combine therapeutic needs with the availability of financial resources, optimizing their use without harming the quality of treatment (SILVA et al, 2019).

In this sense, the hospital manager aims to reduce the maximum cost of medicines and maintain the quality of the drug treatment, maintaining the cost-benefit. For this, it needs technical-kinthific support from the hospital pharmacy (SAVERGNINI, 2016).

According to Ordinance No. 4,283, of December 30, 2010, the hospital pharmacy is the "clinical-assistance, technical and administrative unit, where activities related to pharmaceutical services are processed , directed exclusively by a pharmacist, composing the organizational structure of the hospital and functionally integrated with the other administrative and patient care units".

The clinical hospital pharmacist must work with the team to increase the quality and safety of patient care, as he intervenes by reducing the occurrence of adverse effects, reducing hospitalization time and costs, as well as mortality (RAMOS et al, 2019).

Antimicrobial therapy and its optimization is one of the main focuses of attention of hospital pharmacists, as they are the most commonly used drugs (and can account for up to 30% of all drugs dispensed), and in 50% of cases, their prescription is inappropriate or unnecessary (RAMOS et al, 2019).

In addition to the exacerbated consumption of antimicrobials that is a concern in the context of the rational use of medicines, hospital expenses have been showing a significant

increase, due to the growth of bacterial resistance, reducing the available therapeutic arsenal and making pharmacotherapy more expensive (SAVERGNINI, 2016).

Considering the scarcity of studies that relate hospital management with hospital pharmaceutical care and care services, the present study becomes relevant because it reviews the importance of pharmacoeconomic studies aligned with bacterial resistance studies seeking to reduce hospital costs and optimize pharmacotherapy.

2 DEVELOPMENT

Antimicrobials are the most prevalent drugs in hospitals and cause significant expenses in these institutions. It is estimated that 25% to 35% of hospitalized patients receive antimicrobials for the treatment of infections or as a surgical prophylaxis protocol. Thus, their prescription must be judicious and restricted to some circumstances, due to the impact they have on the individual microbiota (of patients who receive these drugs) and the environment. The inappropriate and/or irrational use of antimicrobials can lead to biological and financial losses and bacterial resistance (FERNANDES et al, 2012).

According to Teixeira, Figueiredo, and França (2019), bacterial resistance can be defined as an ecological event arising from mutations, transduction, or selection. These are bacterial responses to antimicrobials and their presence in the environment, resulting in the change of genes between strains of the same genera or different genera.

The use of antimicrobials has profoundly and radically changed therapeutics, care and life expectancy over the past 70 years. Its advent is related to the rapid decline in mortality from infectious diseases, increased life expectancy and the foundation for oncological therapies and transplants. Of all the components of the pharmacological arsenal, antimicrobials are the only ones that may lose their usefulness with the increase in indiscriminate use, which may lead to a resurgence of pharmacotherapy (CABRAL et al, 2015).

Antimicrobials are usually expensive drugs; infected patients have many direct and indirect medical expenses. There is an association between the development of bacterial resistance to antimicrobials and increased cost, hospital stay, and morbidity and mortality. These values are even higher for patients with sepsis in the ICU and increase in treated patients who did not survive (NANGINO et al, 2012).

In a prospective cohort study conducted at a university hospital in the city of Anta Maria, Southern Brazil, with 120 patients infected with the multidrug-resistant bacterium

Klebsiella pneumoniae carbapenemase (KPC), the exclusive analysis of drug costs for these patients during hospitalization was US$ 367,680.85. Antimicrobials accounted for 59% of the total of this amount, while they corresponded to only 7.1% of the drugs administered to these patients. These data indicate an important economic risk related to this bacterium, demonstrating that health systems may not be able to afford treatment against this and other resistant bacteria, demonstrating the need to develop new antimicrobials and clinical protocols (SANTOS, SECOLI, 2019).

Thus, it is necessary to employ strategies aimed at minimizing the increase in microbial resistance. The development of the CCIH is a mandatory requirement in the hospital's functional composition, as it will develop and implement preventive measures and rational use of antimicrobials in health services. The CCIH must be multiprofessional, stimulating hospital professional multidisciplinarity and the pharmacist has a key role actively acting in the selection and standardization of antimicrobials, antiseptic agents, disinfectants and sterilants for use in the hospital environment, in addition to responsibility for dispensing with antimicrobial prescriptions, and must intervene when these drugs are irrationally used (SILVA, PAIXÃO, 2021).

Some strategies for rational use are based on the development of use protocols for antimicrobials, release of use after confirmation and acceptance by the Hospital Infection Control Commission (CCIH), and antimicrobial stewardship management programs, such as the Antimicrobial Stewardship Program (ASP) (BEZERRA et al, 2021).

The objective of the ASP is to promote the judicious use of antimicrobials, seeking to optimize patient outcomes, while minimizing the risk of adverse effects (from toxicity profile to selection of potential pathogenic microorganisms), emergence and dissemination of bacterial resistance. Ideally, it should be accompanied by the reduction of economic costs, however, it should not be the main purpose, and the effectiveness of antimicrobials should be prioritized mainly by minimizing the induction and selection of antimicrobial resistance (BEZERRA et al, 2021; CABRAL et al, 2018).

In addition, it is necessary to consider the potential for drug interactions that these therapeutic agents may be involved in. Lopes et al (2011) argue that the prescription of antimicrobials is generally associated with other drugs, increasing the risk of drug interactions, a drug-related problem (PRM) that is very relevant to the safety of the patient's pharmacotherapeutic treatment.

Knowledge of the microbiological profile of the institution, seeking to understand the prevalence of the use of a certain antibiotic, contributes to an effective PSA, as it is able to perform a complete analysis of the susceptibility and resistance profile in line with the economic analysis of the impact of this profile on the hospital environment. Thus, the therapeutic arsenal of antimicrobials becomes an evidence-based tool for the correct use of these drugs, providing adequate support for empirical therapy of quality and safety. It is crucial to commit the hospital management and the multidisciplinary team, which must be well structured and include several professionals and, in addition, prioritize continuing education for continuous results of PSA (SILVA et al, 2017).

For Lopes et al (2011), multidisciplinarity contributes as an essential factor in the prevention of medication errors and the presence of the pharmacist (as well as other health professionals) contributes to ensuring the safe use of medications, ensuring the improvement of qualified care.

In a literature review, it was found that there are still regional trends in Brazil in which the CCIH is composed exclusively of physicians and nurses. As much as there is talk of the active performance of the pharmacist, his presence in the CCIH must be stimulated and guaranteed by other professionals. The hospital manager must often act as a mediator in these situations, seeking the insertion not only of the pharmacist, but of other professionals who actively contribute to solving problems related to bacterial resistance (COSTA et al, 2020).

The pharmacist in this context is important because he has technical mastery of the drug, from the processes related to the pharmacotechnics of the drug, through the pharmacological aspects (pharmacokinetics and pharmacodynamics), in addition to aspects inherent to the mechanism of action and bacterial spectrum, as well as storage, evaluation of the antimicrobial prescription, its dispensation or not. The pharmacist is responsible for pharmacovigilance, which consists of screening and reporting adverse reactions, and also pharmacoeconomic studies, which verify the financial viability of the treatment (COSTA et al, 2020; FERNANDES et al, 2012).

An evidence review carried out by Melo et al (2020) highlighted that the absence of a multidisciplinary team, especially pharmaceutical professionals, is a barrier that hinders the implementation of antimicrobial management programs in hospitals. This study demonstrates the importance of continuous training for health workers, recycling technical knowledge and also for managers, who need to have a more sensitive look at the issue, seeking a

management that does not only evaluate the financial issue, but privileges human resources, in quantity and quality, in addition to the need to qualify external services that the hospital needs (such as clinical laboratories with quality and credibility and services that allow the interface of various hospital sectors).

Antimicrobials represent 20% to 50% of drug expenditures in hospital services, in addition to being prescribed on a large scale in the outpatient setting. There is a growing trend in the use of these drugs and it is estimated that in Latin America, 50% of antimicrobials are used inappropriately, with a rate of self-medication per patient that varies from 20% to 40%. All these data serve as warnings for the emergence of global antimicrobial resistance (MELO et al, 2020).

A descriptive and observational study carried out in a hospital in Juiz de Fora carried out between 2006 and 2007 verified the effects of control measures on the dispensation of antimicrobials before and after their implementation. The study showed that there was an increase in the number of antimicrobial prescriptions in the period after the intervention, positively related to the increase in hospitalizations (FERNANDES et al, 2012).

However, the profile of antimicrobials dispensed was altered, with an increase in the consumption of 1st-line antimicrobials (2nd and 3rd generation cephalosporins and penicillins) and a decrease in the consumption of broad-spectrum antimicrobials (carbapenems, 4th generation cephalosporins and glycopeptides). This also resulted in a 5% increase in costs for penicillins and a 5% reduction in costs for carbapenem purchases. These results demonstrate the success of pharmaceutical intervention in the dispensing of antimicrobials, as they achieved a more cost-effective and safe empirical antibiotic therapy profile (the one without proof of the strain involved), reducing the risk of increased bacterial resistance to more modern antimicrobials (FERNANDES et al, 2012).

In a narrative review on the role of clinical pharmacists in converting intravenous therapy to oral sequence therapy (OST), eleven selected articles demonstrated reductions in costs, length of hospital stay, and overall duration of intravenous therapy. The role of the pharmacist in this study proved to be crucial for the adherence of prescribers to this clinical practice. This strategy is a type of antimicrobial management that is performed in stable patients, without involvement of the gastrointestinal tract, and the choice of antimicrobial should consider that the oral pharmaceutical form of the drug has good oral availability or be converted by a pharmacokinetic agent that presents this characteristic and therapeutic profile similar to that of the intravenous antimicrobial (RAMOS et al, 2019).

The reduction in direct costs with the acquisition of antimicrobials was verified in 5 of the 11 articles included in this review. More than the cost of the antimicrobial itself, the costs involving diluents, hospital materials, labor, hospital stay costs, and low bed turnover must be taken into account. Conversion to OST increased early hospital discharge rates, decreasing patient exposure to the ever-changing hospital microbiome and, consequently, decreasing the risk of care-related adverse events directly related to the use of intravenous antimicrobials such as pulmonary embolism, phlebitis, bacteremia, and even hospital infection. These results are directly related to the performance of the hospital pharmacist who works clinically, optimizing therapy through direct contact with the medical team (RAMOS et al, 2019).

A study conducted in a tertiary public hospital in the city of São Paulo, Brazil, demonstrated that the intervention of clinical pharmacy residents had an impact on the reduction of costs directly related to the use of medications, changing the administration of intravenous medications to their oral administration. They found that there was a significant reduction in several hospitalization scenarios, such as R$ 6,678.60 in savings in three days of hospitalization to R$ 22,262.00 in 10 days of hospitalization (ARAUJO, MELO, 2018).

In an integrative review by Silva et al (2022), it was demonstrated that the use of pharmacoeconomic tools as objective indicators for strategic evaluation and rationalization of expenses in hospital environments is a relevant and important cost-effective strategy, even for the inclusion of new pharmacotherapeutic technologies, making the pharmacist who masters these techniques an ally of the hospital manager for the performance of strategic and efficient management. Operative.

3 CONCLUSION

The present study demonstrated that bacterial resistance to antimicrobials is an extremely current and relevant topic, requiring more studies and research to help in the development of antimicrobials, but mainly, effective and safe clinical protocols with the arsenal that currently exists.

The pharmacist has training and is an ally in the management of resources destined to antimicrobials. The application of pharmacoeconomics by this professional is a promising and interesting tool for hospital management, because it considers not only costs, but also therapeutic effectiveness and safety.

REFERENCES

Araujo, A. P. V., & Melo, D. O. de. (2018). Substituição da via de administração de medicamentos: Atuação do residente farmacêutico e economia de recursos. Jornal de Assistência Farmacêutica e Farmacoeconomia, 3(2), 14–24. https://doi.org/10.22563/2525-7323

Bezerra, V. S., Bedor, D. C., Oliveira, D. E., Silva, R. D. da, Gomes, G. M., Lavor, A. L., Araújo, L. da C., Guerra, D. M., Barbosa, V. X., & Santana, D. P. (2021). Avaliação do perfil do uso de antimicrobianos em uma unidade de terapia intensiva após implementação de programa stewardship. Revista Brasileira de Farmácia Hospitalar e Serviços da Saúde, 12(2). https://doi.org/10.30968/rbfhss.2021.122.0551

Cabral, L. G., Meneses, J. P. de, Pinto, P. F. de C., & Furtado, G. H. C. (2018). Racionalização de antimicrobianos em ambiente hospitalar. Revista da Sociedade Brasileira de Clínica Médica, 16(1), 59–63.

Costa, I. R. da, Pinto, R. M. da S., Cristo, P. S. de, & Oliveira, L. B. (2020). A importância do farmacêutico na CCIH. Brazilian Applied Science Review, 4(6), 3720–3729.

Diário Oficial da União. (2010, December 30). Portaria nº 4.283, de 30 de dezembro de 2010 – Aprova as diretrizes e estratégias para organização, fortalecimento e aprimoramento das ações e serviços de farmácia no âmbito dos hospitais. Brasília.

Farias, G., & Araujo, F. O. (2017). Gestão hospitalar no Brasil: Revisão de literatura visando ao aprimoramento das práticas administrativas em hospitais. Ciências da Saúde Coletiva, 22(6), 1895–1904. https://doi.org/10.1590/1413-81232017226.26432016

Fernandes, I. de Q., Sousa, H. F. de, Brito, M. A. M. de, Tavares, S. N., Matos, V. C., & Souza, M. de O. B. (2012). Impacto farmacoeconômico da racionalização do uso de antimicrobianos em unidades de terapia intensiva. Revista Brasileira de Farmácia Hospitalar e Serviços em Saúde, 3(4), 10–14.

Lopes, D. M. de A., Gomes, E. V., Madeira, L. dos S., & Fernandes, R. L. V. (2011). Elaboração de material instrucional para consulta rápida no uso de antimicrobianos injetáveis. Revista Brasileira de Farmácia Hospitalar e Serviços da Saúde, 2(3), 11–17.

Melo, R. C. de, Araujo, B. C. de, Bortoli, M. C. de, & Toma, T. S. (2020). Gestão das intervenções de prevenção e controle da resistência a antimicrobianos em hospitais: Revisão de evidências. Revista Panamericana de Salud Pública, 44, e35. https://doi.org/10.26633/RPSP.2020.35

Nangino, G. de O., Oliveira, C. D. de, Correia, P. C., Machado, N. de M., & Dias, A. T. B. (2012). Impacto financeiro das infecções nosocomiais em unidades de terapia intensiva em hospital filantrópico de Minas Gerais. Revista Brasileira de Terapia Intensiva, 24(4). https://doi.org/10.1590/S0103-507X2012000400011

Ramos, A. B., Barbosa, M. M., Bertollo, C. M., Guimarães, P. H., & Nascimento, M. M. G. do. (2019). Farmácia clínica na terapia sequencial oral de antimicrobianos: Uma revisão de literatura. Revista Brasileira de Farmácia, 100(1), 3109–3091.

Santos, W. M. dos, & Secoli, S. R. (2019). Impacto econômico do tratamento de pacientes infectados com Klebsiella pneumoniae carbapenemase. Einstein, 17(4), 1–8.

Savergnini, A. M. (2016). Análise do perfil farmacoeconômico dos antimicrobianos do hospital Antônio Bezerra de Faria no período de 2013 a 2016 [Trabalho de Conclusão de Curso, Faculdade Católica Salesiana do Espírito Santo].

Silva, A. F. da, Barros, M. L. C. M. G. R., Vasconcelos, A. L. de, & Vieira, A. C. Q. de M. (2017). O impacto do farmacêutico clínico no uso racional de antibióticos em unidades de terapia intensiva. Boletim Informativo GEUM, 8(3), 41–52.

Silva, J. D. S., Aguiar, A. M., Marques, A. E. F., Borges, K. D. M., & Gonçalves, J. D. (2022). Farmacoeconomia como um meio de tomada de decisões na atuação dos farmacêuticos na gestão hospitalar: Uma revisão integrativa. Visão Acadêmica, 23(2). https://doi.org/10.5380/acd.v23i2.78297

Silva, J. O. da, & Paixão, J. A. (2021). Resistência bacteriana e a atuação do farmacêutico na promoção do uso racional de antibacterianos de uso hospitalar. Revista Artigos.com, 29, e7563.

Silva, R. C. da, Cardoso, F. P. de B. F., Alves, G. A. de C., & Dias, C. A. (2019). A farmacoeconomia como instrumento de racionalização sobre o uso de antimicrobianos em um hospital universitário da Paraíba. In Anais do VI Congresso Internacional de Envelhecimento Humano. Retrieved July 27, 2021, from https://editorarealize.com.br/editora/anais/cieh/2019/TRABALHO_EV125_MD4_SA3_ID2789_10062019235506.pdf

Teixeira, A. R., Figueiredo, A. F. C., & França, R. F. (2019). Resistência bacteriana relacionada ao uso indiscriminado de antibióticos. Revista Saúde em Foco, 11, 853–875.