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EVIDENCE-BASED STRATEGIES TO OPTIMIZE ANTIBIOTIC PRESCRIBING AND COMBAT RESISTANCE

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Abstract: Objective: To identify and review effective evidence-based strategies that can be implemented to improve antibiotic prescribing practices and reduce the development of antimicrobial resistance. **Methodology:** Narrative literature review developed according to the criteria of the PVO strategy, using the PubMed database. The search terms included ‘’antibiotic stewardship”, ‘’antibiotic protocols”, ‘’antimicrobial stewardship”, ‘’evidence-based”, ‘’evidence-based guidelines” and their combinations. After applying the inclusion and exclusion criteria, a total of 16 articles from 2019 to 2024 were selected. **Review:** Antimicrobial stewardship programs have shown great effectiveness in reducing the use of specific antibiotics, as well as highlighting the importance of training healthcare professionals to identify specific prescriptions. In addition, the use of rapid diagnostic technologies, such as biomarkers and rapid PCR tests, especially in emergency units, has proved essential for a more precise approach. Studies show that investments in rapid diagnostic infrastructure are offset by the reduction in costs associated with the treatment of infections, hospitalizations and complications arising from involved prescriptions. **Final considerations:** These actions promote the rational use of antimicrobials, improve clinical stages and control costs. However, limitations include specific research for the development of new drugs and lack of acceptance by health professionals and patients. Combating antimicrobial resistance (AMR) requires integrated efforts between the government, health professionals and society.

Keywords: Antimicrobial resistance, Antibiotics, Medical prescription.

INTRODUCTION

Antimicrobial resistance (AMR) is a serious global public health crisis, threatening to reverse advances in infectious disease control made over the last century (Mostafaei *et al.*, 2023). This problem is driven by the excessive and inappropriate use of antibiotics, poor infection control practices and the lack of regulation in the trade of these drugs in various regions. Data from the Global Antimicrobial Resistance and Use Surveillance System (GLASS) show alarming indicators of resistance in pathogens such as *Escherichia coli* and *Klebsiella pneumoniae*, reinforcing the need for coordinated actions to contain the spread of resistant bacteria (Bankar *et al.,* 2022).

In this scenario, antimicrobial stewardship (AMS) programs play a crucial role in promoting the rational use of antimicrobials. Such programs aim to implement evidence-based guidelines to reduce specific prescriptions, prevent healthcare-related infections and improve clinical outcomes, while minimizing costs. Measures such as hand hygiene, proper diagnosis and training of healthcare professionals are essential components of HMA. The World Health Organization (WHO), through its Global Action Plan launched in 2015, sets out strategic goals that include raising awareness of AMR and optimizing the use of antimicrobials in human and animal health (Bankar *et al*., 2022).

Precision medicine has emerged as an innovative tool in the fight against AMR, using genetic and molecular information to guide therapies more efficiently. This approach makes it possible to quickly identify pathogens and their specific characteristics, shortening diagnosis times and providing targeted treatments. Integrated into antimicrobial stewardship programs, outcome medicine has the potential to improve therapeutic efficacy and reduce the overuse of antibiotics, directly contributing to the mitigation of antimicrobial resistance (Watkins RR, 2022).

AMR is not limited to health impacts, but also affects the financial, environmental, food and social systems. It is estimated that it is responsible for around 700,000 deaths a year and, if effective practices are not implemented, it could generate economic losses of up to 100 trillion dollars by 2050. The pressure on health systems is growing, with an additional approximately 8 million days of hospitalization per year due to difficult-to-treat infections, which raises costs and increases the burden on patients (Majumder *et al.*, 2020).

Another critical point is the shortage of new antibiotics. In the last 30 years, only three drugs have been approved, reflecting an alarming decline in research and the development of new therapies. This scenario is aggravated by the lack of financial incentives, since current investment has been insufficient to meet global demands in the fight against AMR (Majumder *et al.,* 2020). In view of this, the aim of this study is to identify and review effective evidence-based strategies that can be implemented to improve antibiotic prescribing practices and reduce the development of antimicrobial resistance.

METHODOLOGY

This is a narrative literature review developed according to the criteria of the PVO strategy, which stands for: population or research problem, variables and outcome. This strategy was used to develop the research question "Which evidence-based strategies are most effective for improving antibiotic prescribing and reducing antimicrobial resistance?". The searches were carried out using the PubMed - MEDLINE (Medical Literature Analysis and Retrieval System Online) databases. The search terms were used in combination with the Boolean terms "AND" and "OR", using the following search strategy: ((antibiotic

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stewardship) OR (antibiotic protocols) OR (antimicrobial stewardship)) AND ((evidence-based) OR (evidence-based guidelines)). From this search, 599 articles were found, which were then submitted to the selection criteria. The inclusion criteria were: articles in English; published between 2019 and 2024 and which addressed the themes proposed for this research, review-type studies, meta-analysis, observational studies and experimental studies. The exclusion criteria were: duplicate articles, those made available in abstract form, those that did not directly address the proposal studied and those that did not meet the other inclusion criteria. After applying the inclusion and exclusion criteria, 16 articles were selected from the PubMed database to make up the collection of this study.

DISCUSSION

AMR is one of the main threats to global health, directly impacting advances in modern medicine and challenging the sustainability of health systems (Rout; Essack; Brysiewicz, 2021). According to Ting *et al.* (2020), the spread of AMR is intrinsically linked to the inappropriate use of antibiotics, aggravated by the lack of standardized guidelines, inaccurate diagnoses and specific patient demands. To tackle this problem, evidence-based strategies have been developed, with AMS, rapid diagnostic tools and educational interventions standing out as fundamental pillars.

AMS programs have shown great effectiveness in reducing antibiotic use, promoting rational and evidence-based practices. According to Kapur *et al.* (2019), these interventions are especially effective in hospital settings, such as Neonatal Intensive Care Units (NICUs), where empirical antibiotic use is common due to the severity of cases. In countries such as Canada, AMS programs implemented in NICUs result in substantial reductions in the use of broad-spectrum antimicrobials, improving clinical outcomes without compromising patient safety (Ting *et al.*, 2020). These initiatives include regular audits, continuous feedback to prescribers and the creation of specific guidelines adapted to the local epidemiological profile (Giamarellou *et al.*,2023) .

In low- and middle-income countries (LMICs), the challenges of implementing MH programs are more complex. Structural limitations, such as the lack of specialized professionals, integrated infrastructure and poorly developed surveillance systems, make it difficult to apply standardized strategies. However, local adaptations, such as simplified audits and low-cost guidelines, have shown a positive impact. For example, in some regions of Asia and Africa, the training of professionals to identify significant prescriptions and the introduction of restrictive measures, such as requiring specialist approval for last-line novelties, have resulted in significant improvements (Kakkar *et al.*, 2020).

In addition to AMS programs, the use of rapid diagnostic technologies is an essential tool in the fight against antibiotic prescribing. Biomarkers such as procalcitonin (PCT) and rapid PCR tests make it possible to distinguish bacterial infections from viruses, helping doctors to adjust treatments with greater results. In emergency units, these technologies have significantly reduced the use of specific antibiotics, promoting practices in line with clinical guidelines (Parker *et al.*, 2022). However, the adoption of rapid diagnostics faces challenges, such as high initial costs and the need for specialized training. Studies suggest that initial investments are offset by the reduction in costs associated with treating resistant infections, prolonged hospitalizations and avoidable complications (Neo *et al.,* 2020).

Another critical component is education and behavior change. Educational interventions aimed at healthcare professionals and patients are indispensable for promoting

more rational prescribing practices. Ongoing training programs, including practical workshops, improve doctor-patient dialogue, reducing the pressure for unnecessary prescriptions. In addition, educational materials, such as leaflets and information guides, present awareness-raising instructions on the risks of inappropriate antibiotic use (Borek *et al*., 2021).

The use of comparative feedback between doctors is another effective strategy for monitoring clinical practices against guidelines. Regular reports comparing concession rates help identify inappropriate patterns, encouraging behavioral changes, especially in hospital settings (Poje *et al.,* 2024).

Despite progress, challenges remain. Cultural and organizational resistance, combined with work overload and a lack of institutional support, are barriers to the sustainable implementation of strategies against AMR. In addition, the scarcity of longitudinal studies limits understanding of the sustained impact on these disciplines. Emerging technologies, such as Artificial Intelligence, have the potential to transform prescribing patterns and provide real-time support for clinical decisions, further contributing to the reduction of inconvenient prescriptions (Glasziou *et al.*, 2022).

Integrated, evidence-based strategies are essential in the fight against AMR. According to Borges *et al.* (2020), the success of these interventions requires a collaborative approach between governments, health professionals and the community. Robust public policies, coupled with investments in technology, education and infrastructure, are key to ensuring sustainable practices and protecting the advances of modern medicine. Tackling AMR is not just a technical challenge, but an ethical and social imperative that requires commitment and collective action (Schoffelen *et al.,* 2024).

FINAL CONSIDERATIONS

Combating antimicrobial resistance requires comprehensive and integrated strategies, most notably AMS programs, which carry out audits, provide continuous feedback and promote the appropriate use of antimicrobials based on evidence. Rapid diagnostic tools, such as biomarkers and PCR tests, are essential for more precise treatments and rapid therapeutic decisions, while educational courses strengthen the awareness of healthcare professionals and patients, reducing unnecessary prescriptions. These actions focus on the rational use of antimicrobials, resulting in improved clinical outcomes, reduced microbial resistance and cost control. However, challenges remain, such as the scarcity of research into the development of new antibiotics, the lack of adequate infrastructure in many countries and the cultural and social resistance of patients. In view of this, it is essential to expand AMS programs, invest in rapid diagnostic technologies, continuously train health professionals and implement public policies that ensure equitable access to strategies to combat antimicrobial resistance. This requires coordinated efforts between government, health professionals, academic institutions and society, with the aim of protecting global public health and promoting the sustainable advancement of medicine.

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