Revista ARACÊ
ISSN: 2358-2472

# ANTIMICROBIAL-ASSOCIATED ADVERSE EVENTS IN CRITICALLY ILL PATIENTS IN INTENSIVE CARE UNITS: NURSING ANALYSIS AND RISK MANAGEMENT

https://doi.org/10.56238/arev6n4-310

**Submitted on:** 19/11/2024 **Publication date:** 19/12/2024

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## ABSTRACT

The objective of the research was to identify the main challenges and reflect on adverse events to the use of antimicrobials in Adult Intensive Care Units, and nursing actions in risk management in the patient safety process. Scoping review with a qualitative approach. The inclusion criteria were articles that corresponded to the objectives and the guiding question of the study, full texts, published from 2019 to 2024, in free languages. The findings reveal a high incidence of adverse reactions, including infections associated with bladder catheters, toxicity, drug resistance, and medication errors in Intensive Care Units. The survey highlights the importance of continuing education of healthcare professionals, interprofessional collaboration, and the use of technologies, such as electronic prescription systems, to improve patient safety.

**Keywords:** Adverse events, Antimicrobials, Intensive care, Risk management, Nursing.

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ISSN: 2358-2472

## INTRODUCTION

The use of antimicrobials in Intensive Care Units (ICUs) is an essential strategy in the management of severe infections and in preventing the spread of multidrug-resistant pathogens. These units often treat patients with critical clinical conditions, immunosuppressed or undergoing invasive procedures, making them more vulnerable to infections. Due to this situation, the administration of antimicrobials becomes a necessary intervention to ensure the recovery and survival of patients (Sousa, 2021; Oliveira, Pacheco & Oliveira, 2022).

The selection and appropriate use of antimicrobials in ICUs present important challenges due to the complexity of the clinical conditions and the presence of multidrug-resistant microorganisms. The choice of antimicrobial agents, therapeutic dosages and duration of treatment require in-depth knowledge of the pharmacology of the drugs, the clinical characteristics of the patients and the resistance profile of the pathogens. Empirical therapy, often initiated before the specific identification of the etiologic agent, should be adjusted according to the results of microbiological cultures and susceptibility tests, with the aim of improving therapeutic efficacy and reducing the risk of developing resistance (Frangioti, 2019, Gabriel, 2019).

The indiscriminate or inappropriate use of antimicrobials can lead to the development of antimicrobial resistance, a significant public health challenge on a global scale. This resistance compromises the effectiveness of treatments, prolongs hospitalizations, increases patient morbidity and mortality, and entails high costs for health systems. Therefore, it is essential to adopt rational prescribing practices and follow evidence-based guidelines for the administration of antimicrobials in the Units (Oliveira, Pacheco & Oliveira, 2022; Santos, Correa & Silva; 2022).

Proper management of antimicrobial use involves the implementation of management programs, which aim to optimize the selection, dosage, route of administration, and duration of treatments. These programs are crucial for improving clinical outcomes for patients, reducing microbial resistance, and mitigating the costs associated with treating infections. In addition, they are essential to ensure patient safety (Frangioti, 2019; Gabriel, 2019).

The successful implementation of these programs requires the collaboration of a multidisciplinary team composed of physicians, pharmacists, microbiologists, and nurses. The joint engagement of these professionals is essential for the successful implementation

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and sustainability of stewardship programs in ICUs (De Lima et al., 2019; Soares, Pires & Gomes, 2023).

## COMMON ADVERSE EVENTS AND THEIR CAUSES

Adverse events related to the use of antimicrobials in Intensive Care Units (ICUs) represent a significant concern due to the potential negative impact on patient recovery, prolongation of hospitalization, and increased healthcare costs. Among the common adverse events associated with antimicrobials. The causes of these adverse events are multifactorial, requiring a multidisciplinary approach for prevention, monitoring, and effective management. Understanding and managing these adverse events is crucial to ensure patient safety (Frangioti, 2019; Gabriel, 2019).

Allergic reactions are the most common adverse events associated with the use of antimicrobials. They range from observed, mild rashes to severe anaphylactic reactions, which involve immediate medical intervention. Prior surveillance of known drug allergies and close monitoring of signs of allergic reactions are critical for the prevention and management of these events (Frangioti, 2019; Leite, Deuschlee & Deusshlee2019).

Toxicity is a frequent complication related to the use of antimicrobials in Intensive Care Units (ICUs), and can be triggered by excessive doses, accumulation in patients with impaired renal or hepatic function, or drug interactions. For example, aminoglycosides are known to cause nephrotoxicity and ototoxicity, while fluoroquinolones are associated with tendon injuries. Meticulous monitoring of serum drug levels and organ function is essential to prevent such adverse effects (Jesus et al., 2019; Gabriel, 2019).

Drug interactions represent another significant cause of adverse events. Patients in ICUs often receive multiple pharmacological therapies, increasing the risk of adverse interactions that compromise the efficacy of antimicrobials or potentiate their toxicity. Therefore, a thorough evaluation of the prescribed agents and effective communication among health professionals are crucial to mitigate this risk (Soares, Pires & Gomes, 2023; De Lima, et al., 2019).

The emergence of antimicrobial resistance represents a significant challenge in Intensive Care Units (ICUs). The included use of antimicrobials can promote the development of resistance, compromising the effectiveness of available treatments and providing viable therapeutic options. Antimicrobial resistance is associated with persistent infections, treatment failures, and clinical sequelae. Therefore, it is crucial to follow

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evidence-based guidelines to mitigate this growing problem (Oliveira, Pacheco & Pacheco, 2022; Santos, Corrêa Junior & Silva, 2022).

## RISK MONITORING AND MANAGEMENT

Monitoring and managing the risks associated with the use of antimicrobials in Intensive Care Units (ICUs) are essential to prevent and minimize adverse events, ensuring the safety and efficacy of treatment. This multidisciplinary approach involves early identification of potential risks, continuous patient monitoring, and rapid intervention when necessary (Jesus et al., 2019; Gabriel, 2019).

A critical aspect of this monitoring is pharmacological surveillance, which includes monitoring serum drug levels and assessing the patient's organ function. This follow-up is especially crucial for drugs with a narrow therapeutic range, such as aminoglycosides and vancomycin, where convenient doses may result in toxicity or ineffectiveness of treatment. Kidney and liver function should be assessed regularly to adjust antimicrobial dosages and prevent complications (Jesus et al., 2019; Gabriel, 2019).

Assessing the patient's clinical response to antimicrobial treatment is an essential component of monitoring, which includes watching for signs of clinical improvement, such as reduced fever and improved symptoms, as well as performing laboratory tests to verify the effectiveness of treatment. Adjustments to the therapeutic regimen may be necessary based on the patient's individual response and the results of microbial susceptibility tests (Frangioti, 2019; Leite, Deuschle & Deuschfe, 2019).

Risk management also addresses the prevention of medication errors, which are frequent causes of adverse events in ICUs. This involves implementing electronic prescribing systems, regular reviews of prescriptions, and ongoing education of healthcare providers on safe medication practices. Effective communication between doctors, nurses, pharmacists, and other members of the health team is essential to ensure accuracy in the prescription and administration of medications (Soares, Pires & Gomes, 2023; De Lima et al., 2019).

The implementation of antimicrobial stewardship programs is a key strategy for managing risks associated with the use of antimicrobials in Intensive Care Units (ICUs). These programs aim to improve the use of antimicrobials by promoting appropriate drug selection, dosage adjustments, choice of route of administration, and duration of treatment. In addition, they play a crucial role in preventing antimicrobial resistance, improving clinical

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outcomes for patients, and reducing healthcare costs. The active participation and collaboration of the entire multidisciplinary team are essential for the success of these programs (Oliveira, Pacheco & Oliveira, 2022; Santos, Corrêa Junior & Silva, 2022).

Monitoring and managing risks associated with antimicrobial use in ICUs requires a proactive and integrated approach. This includes rigorous pharmacological surveillance, continuous evaluation of clinical response, and prevention of medication errors, being key components to ensure patient safety and treatment efficacy (Oliveira, Pacheco & Oliveira, 2022; Santos, Corrêa Junior & Silva, 2022).

## PREVENTION STRATEGIES

Strategies to prevent adverse events associated with the use of antimicrobials in Intensive Care Units (ICUs) are essential to ensure both patient safety and treatment efficacy. Such strategies consist of a set of practices and protocols designed to minimize the risks inherent in antimicrobial therapy.

Among the primary approaches, the implementation of programs aimed at promoting the rational use of antimicrobials stands out, which include the selection of the appropriate therapeutic agent, the correct dosage, the appropriate route of administration, and the optimized duration of treatment. The goal of these programs is to improve patient clinical outcomes, reduce antimicrobial resistance, and reduce costs associated with infection management. The effective execution of these strategies requires the collaboration of a multidisciplinary team, composed of physicians, pharmacists, nurses, and microbiologists (Santos, Correa Júnior & Silva, 2022; Oliveira, Pacheco & Oliveira, 2022).

Ongoing education and training of healthcare staff are key components in preventing adverse events related to antimicrobial use. Such educational programs should provide up-to-date information on antimicrobials, addressing aspects such as their mechanism of action, potential side effects, drug interactions, and appropriate prescribing guidelines. In addition, training should emphasize the importance of close monitoring of patients, as well as early identification of signs of adverse reactions or treatment failures (Frangioti, 2019; Leite, Deuschle & Deuschle, 2019).

Close monitoring of patients represents another essential strategy for the prevention of adverse events. This process includes periodic assessment of kidney and liver function, monitoring serum drug levels, and detailed observation of any signs of toxicity or allergic reactions. The data obtained through this monitoring enable timely therapeutic

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adjustments, preventing the occurrence of serious adverse events (Jesus et al., 2019; Gabriel, 2019).

Strategies for preventing adverse events related to antimicrobial use in ICUs include ongoing education and training of healthcare staff, close monitoring of patients, evidence-based prescribing practice, and effective communication among staff members. These strategies are key to ensuring patient safety and improving clinical outcomes (Santos, Correa Júnior & Silva, 2022; Oliveira, Pacheco & Oliveira, 2022).

The practice of evidence-based prescribing is crucial to ensure patient safety. This approach involves the use of up-to-date clinical guidelines and decision-making based on robust scientific data. The initial empirical prescription should be reviewed and adjusted based on the results of microbiological cultures and susceptibility testing, ensuring that patients receive the most effective antimicrobial treatment for their specific condition (Soares, Pires, & Gomes, 2023; De Lima et al., 2019).

Effective communication and collaboration among health care team members are imperative for the prevention of adverse events. This involves clear and transparent discussions about the therapeutic plan, systematic review of prescriptions, and coordination among professionals involved in patient care. Efficient communication is vital to avoid medication errors and ensure that all team members are aware of the potential risks associated with treatment (Santos, Correa Júnior & Silva, 2022; Oliveira, Pacheco & Oliveira, 2022).

Strategies for preventing adverse events associated with antimicrobial use in ICUs encompass ongoing education and training of healthcare staff, close monitoring of patients, evidence-based prescribing practice, and effective communication among team members. Such approaches are key to ensuring patient safety and optimizing clinical outcomes (Santos, Correa Júnior & Silva, 2022; Oliveira, Pacheco & Oliveira, 2022).

## IMPACT OF ADVERSE EVENTS ON PATIENT RECOVERY

The impact of adverse events associated with the use of antimicrobials on the recovery of patients in Intensive Care Units (ICUs) is significant and multifaceted. Such events can trigger a series of complications that affect patients' health, quality of life, and clinical outcomes, in addition to posing additional challenges for health systems (Santos, Correa Júnior & Silva, 2022; Oliveira, Pacheco & Oliveira, 2022).

In addition, adverse events related to the use of antimicrobials can result in direct

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physical harm to the patient, such as organic toxicity, severe allergic reactions, and, in extreme cases, death. For example, renal or liver toxicity from inappropriate use of antimicrobials can have long-term impacts on the function of these organs. Severe allergic reactions, such as anaphylaxis, require immediate medical intervention and can be fatal if not treated promptly (Leite, Deuschle, & Deuschle, 2019; Frangioti, 2019).

Adverse events can also compromise the effectiveness of antimicrobial treatment. Drug resistance can result in treatment failures, necessitating the transition to alternative agents, which are often more expensive and have a higher potential for toxicity. This can delay the patient's recovery and increase the risk of further complications (Soares, Pires & Gomes, 2023; De Lima et al., 2019).

From a psychological and emotional point of view, adverse events can negatively impact the patient's quality of life and their satisfaction with the treatment received. Complications resulting from adverse reactions can generate feelings of anxiety, stress, and distrust of the health system. This can influence the patient's adherence to treatment and their willingness to actively participate in their own recovery process (Santos, Correa Júnior & Silva, 2022; Oliveira, Pacheco & Oliveira, 2022).

The impact of adverse events related to the use of antimicrobials on the recovery of patients in ICUs is wide-ranging, affecting physical, emotional, and economic aspects. These events can prolong the hospital stay, cause direct physical damage such as organic toxicity and severe allergic reactions, reduce the effectiveness of antimicrobial treatment, and negatively impact the patient's psychological well-being. Effective prevention and management of these events are crucial to improve clinical outcomes and quality of life for patients in ICUs.

## OBJECTIVE

Identify the main challenges and reflect on adverse events related to the use of antibicrobials in Adult Intensive Care Units, and nursing actions in risk management in the patient safety process.

## METHOD

The present study will be presented in the form of a scoping review recommended by the Joanna Briggs Institute (AROMATARIS et al., 2017). It is widely used in the area of health sciences with the purpose of synthesizing and disseminating the results of studies on

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a subject. The objective of a scoping analysis is to map, through a rigorous, systematic, transparent and rapid method, the state in a thematic area and its main concepts, providing a descriptive view of the reviewed studies (ARKSEY & O'MALLEY, 2007). The structure of this review is based on the structure proposed by Arksey and O'Malley (2007) and improved by Levac, Colquhoun and O'Brien (2010). It will consist of six consecutive pillars: 1) identification of the guiding question and research objectives; 2) identification of pertinent studies, which would enable the breadth and scope of the review's purposes; 3) study selection, according to the inclusion and exclusion criteria; 4) data mapping; 5) incorporation of results, through qualitative analysis correlated to the objectives and guiding question; 6) presentation of the results, identifying the implications for policy, practice or research (AROMATARIS et al., 2017).

To constitute the question that guided the present study, the PICO strategy was used, which represents an acronym for Patient, Intervention, Comparison and "Outcomes" (outcome). These four components are the fundamental elements of the research question and the construction of the question for the bibliographic search for evidence. The PICO strategy is used to construct research questions of different natures, arising from the clinic, from the management of human and material resources, from the search for instruments for symptom assessment, among others (SANTOS et al., 2007).

The PICO strategy was based on P: Critically ill patients in the adult Intensive Care Unit I: Identify in the literature the main challenges and reflect on adverse events to the use of antimicrobials C: not applicable; O: Nursing actions in risk management focused on patient safety. In view of the strategy, the guiding question of the study arose, "*What are the main challenges and, thus, reflect on adverse events related to the use of antimicrobials in critically ill patients in the adult Intensive Care Unit and nursing actions in risk management in the face of patient safety?".*

In view of the consolidation of the guiding question, searches were carried out in the Medical Literature Analysis and Retrieval System Online (MEDLINE) platforms via PubMed, Scientific Electronic Library Online (SciELO) and Latin American and Caribbean Literature in Health Sciences (LILACS). The Health Sciences Descriptors (DeCs) and *the Medical Subject Headings* (MeSH) were used for the searches: Adverse events, Antimicrobials, Intensive care. Risk management and nursing, using the operator boolendo AND.

The inclusion criteria were articles that corresponded to the objectives and the guiding question of the present study, complete, published from 2019 to 2024, in free

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languages. The exclusion criteria were for incomplete and/or paid, duplicate articles, after the date of publication, with theme escape. Articles with a qualitative and quantitative approach, scoping review articles, systematic review, clinical trial, theses and dissertations were included. Unfinished clinical trials and articles whose objectives differed from the objective proposed by this study were no longer included. It is noteworthy that for the structuring of the present article, it was guided by the recommendations of the Preferred *Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist.* For the traceability of the studies, the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension Scoping-Review* (PRISMA-ScR) (**Flowchart 1) was used**, which is divided into three pillars, namely: identification, selection, and inclusion. PRISMA is based on a minimum set of items previously based on consolidated scientific evidence, for the formation of systematic reviews and meta-analysis. The flowchart proposed by PRISMA, in addition to being dedicated to synthesizing the effects of interventions, is also a reference for reporting systematic reviews with objectives other than the opinion of interventions (PAGE et al., 2020; TRICCO et al., 2018).

The number of studies selected after each phase of the process is documented in the flowchart, providing a visual summary of the search and selection of the studies. This process ensures a systematic and replicable approach to the literature review, allowing other researchers to understand the steps taken and the criteria applied in the selection of studies, thus 188 articles were counted in the contemplated databases. The exclusion and inclusion criteria were applied, where a total of 77 articles were applied, the full reading was carried out and articles that were not scoping reviews, systematics or clinical trials were excluded, in addition to the exclusion of articles that were not within the research line, and the total number of 12 articles were contemplated for review.

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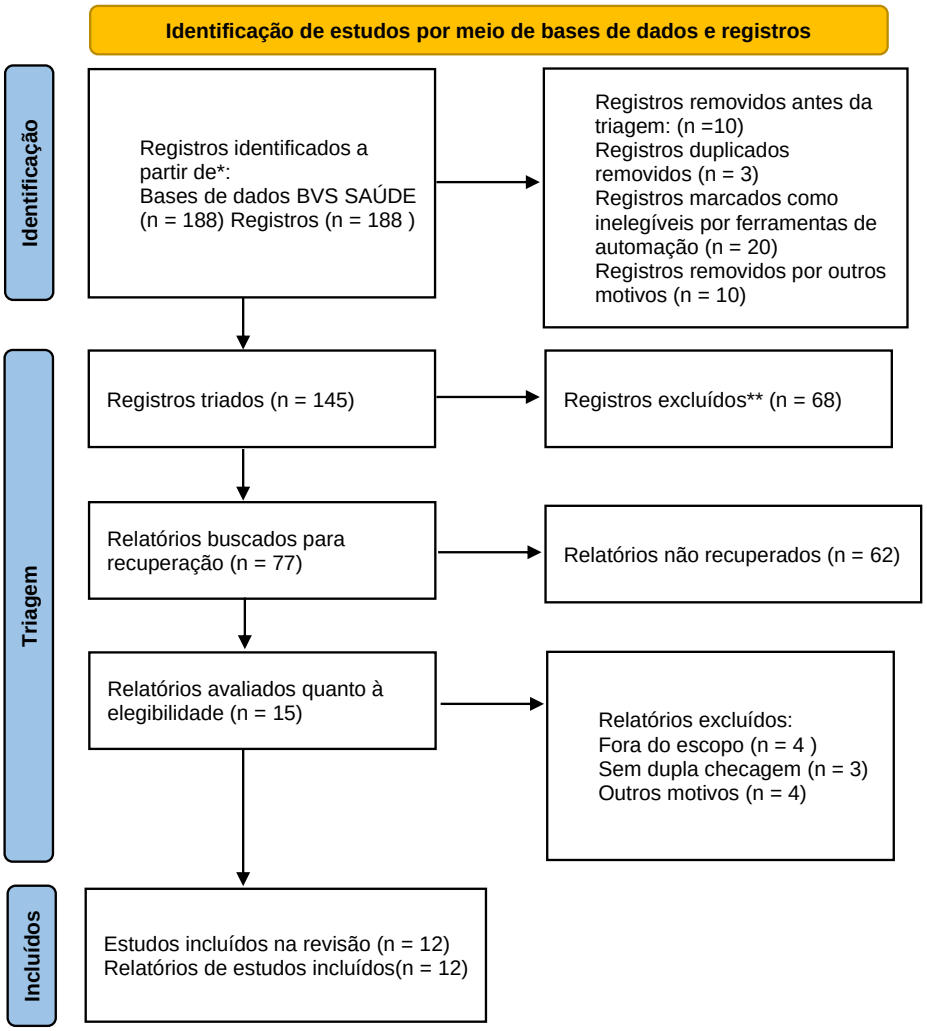
Figure 1 - research flowchart




## RESULTS

The results of this review, based on the PRISMA method, will be presented in the table below, which reveals a diverse landscape of significant findings with regard to adverse events related to the use of antimicrobials in ICUs. The selected studies, covering the proposed period, offer a comprehensive view of the challenges faced by health professionals and institutions in the prevention of adverse reactions.

Da Cruz Almeida et al. (2019) focus on nursing knowledge related to antimicrobial therapy in ICUs, using a sample of 80 health professionals. The study points to a variation in knowledge about antimicrobial therapy and recommends ongoing training and updating of knowledge for the entire ICU team in order to promote safer and more informed practices.

The importance of interprofessional action is reinforced in the study by França et al.

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(2021), which, through the analysis of 200 ICU records, identifies how multidisciplinary interventions can effectively reduce adverse events. This study corroborates the perspective that interprofessional collaboration is key to hospital infection control and patient safety.

Leite et al. (2019) examine adverse drug events in a hospital setting, based on 150 records of medication errors. The study underlines the prevalence of errors during prescribing and highlights the critical need for electronic prescribing systems to reduce such errors.

Jesus et al. (2019) and Soares et al. (2023) highlight the challenges posed by nephrotoxicity and drug resistance, stressing the urgency of reviewing antimicrobial prescribing and administration practices, and the need for health policies to standardize antibiotic prescribing, respectively.

Gabriel (2019) and Frangioti (2019) focus on the incidence of adverse events and the identification of medication errors and their clinical impacts. Studies suggest that prevention practices should be integrated into the hospital routine to reduce clinical impacts and that nursing plays a crucial role in the identification and prevention of these events.

Oliveira et al. (2022) observe the consequences of the indiscriminate use of antibiotics in ICUs, highlighting how such a practice can lead to adverse events and resistance, while Sousa (2021) analyzes failures in antimicrobial dispensing and their impact on patient safety and treatment effectiveness.

Finally, Santos et al. (2022) and De Lima et al. (2019) focus on the communication of adverse events and the role of the pharmacist in a multidisciplinary team, respectively. Both studies illustrate the importance of effective communication and collaborative action for the management of adverse events in ICUs.

Therefore, the range of findings presented in this chapter and illustrated in the subsequent table reflects the complexity and multidimensionality of adverse events associated with the use of antimicrobials in ICUs. They emphasize the importance of risk management practices, ongoing education, interdisciplinary collaboration, and the implementation of clinical decision support systems as crucial measures to improve patient safety and clinical outcomes.

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Chart 1 – Characterization of studies on adverse events to the use of antimicrobials in the intensive care unit, Sorocaba, SP, 2024.

| Author(s) | Year | Study Title | Study Type | Sampling | Results | Conclusions |
|---|---|---|---|---|---|---|
| DA CRUZ ALMEIDA et al. | 2019 | Nursing knowledge related to antimicrobial therapy in urinary tract infection in the intensive care unit | Clinical Case Studies | 80 health professionals in ICU | Varying knowledge about antimicrobial therapy | Continuous training and updating of knowledge is recommended for the ICU team |
| DE LIMA et al. | 2019 | Performance of the pharmacist in a multidisciplinary team in an ICU in hospital infection control | Clinical Case Studies | Collaboration of 50 pharmacists in ICU | Pharmaceutical intervention minimizes infections and improves antimicrobial use | The role of the pharmacist is essential in the control of infections in ICUs |
| HAMLETS | 2019 | Identification of medication errors and adverse events related to the use of antimicrobials and their clinical impact in a teaching hospital | Clinical Case Studies | 5-year retrospective study in a teaching hospital | Prevention strategies reduce medication errors and adverse events | Prevention practices must be integrated into the hospital routine to reduce clinical impacts |
| FRANÇA et al. | 2021 | Safe drug therapy: perspectives of nursing and pharmacy in ICU patient care | Clinical Case Studies | Analysis of 200 ICU records | Reduction of adverse events with multidisciplinary team interventions | Interprofessional collaboration is key to hospital infection control |
| GABRIEL | 2019 | Evaluation of the incidence of potential adverse events in a general hospital ICU: relevance for the Systematization of Nursing Care | Clinical Case Studies | Incidence analysis in 2 general hospital ICUs | Frequent adverse events and impact on nursing care observed | Nursing plays a crucial role in the identification and prevention of adverse events |
| JESUS et al. | 2019 | Antimicrobial-associated adverse events in a public hospital | Clinical Case Studies | Review of 120 adverse event cases | Common adverse events include nephrotoxicity and drug resistance | Urgent review of antimicrobial prescribing and stewardship practices |
| LEITE et al. | 2019 | Adverse drug events in a hospital setting | Clinical Case Studies | 150 records of medication errors | Medication errors prevalent during prescribing | Implementing electronic prescribing systems is crucial to reduce errors |
| MOTA & OLIVEIRA | 2019 | Urinary tract infection associated with urinary catheter: why don't we control this adverse event? | Clinical Case Studies | 100 patients with bladder catheter | High incidence of ITUAC and identified risk factors | Need for stricter protocols for the management of urinary catheters |

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|---|---|---|---|---|---|---|
| OLIVEIRA et al. | 2022 | The indiscriminate use of antibiotics in ICUs | Clinical Case Studies | 6-month observational study in ICU | Indiscriminate use of antibiotics leads to adverse events and resistance | Control of antibiotic use is necessary to prevent adverse events |
| SANTOS et al. | 2022 | Communication of adverse events and interprofessional work in ICUs: between the ideal and the (not) performed | Clinical Case Studies | Interviews with 40 health professionals in ICU | Ineffective communication contributes to the occurrence of adverse events | Improved interprofessional communication can decrease adverse events |
| SOARES et al. | 2023 | Prescription errors related to the use of antibiotics in hospitals in Brazil | Clinical Case Studies | Data analysis of 30 Brazilian hospitals | Frequent prescribing errors due to lack of clear guidelines | Need for health policies to standardize antibiotic prescribing |
| SHAH | 2021 | Analysis of the mode and effect of antimicrobial dispensing failure from hospital pharmacy to intensive care unit | Clinical Case Studies | Review of 500 Antimicrobial Dispensations | Dispensing failures impact patient safety and treatment efficacy | Reinforcement in the accuracy of drug dispensing is necessary for patient safety |

**Source:** Prepared by the authors

## DISCUSSION

The discussion of the results provides a critical analysis in the current context of practices in Intensive Care Units (ICUs). The studies reveal a number of challenges that health teams face in managing adverse events related to the use of antimicrobials and highlight the urgent need for improvements in the prescribing and administration practices of these drugs.

The findings of Mota and Oliveira (2019) highlight a critical gap in the control of urinary tract infections associated with urinary catheter The need for stricter protocols for the management of bladder catheters is a call to action for healthcare institutions in order to reduce these common adverse events and improve patient safety.

Da Cruz Almeida et al. (2019) and França et al. (2021) highlight the importance of knowledge and continuous education for health professionals, as well as interprofessional collaboration. These studies underscore how lack of knowledge and ineffective communication can contribute to medication errors and adverse events, suggesting that training and multidisciplinary collaboration are key to prevention.

Leite et al. (2019) and Jesus et al. (2019) point to the prevalence of medication errors and the need to review current practices. The implementation of electronic prescribing systems and the standardization of prescribing practices are recommended as

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effective strategies to minimize errors and drug resistance.

Soares et al. (2023) and Oliveira et al. (2022) highlight the challenges posed by the inappropriate use of antibiotics and the need for more robust health policies to standardize the prescription of antibiotics and control their indiscriminate use. This reinforces the need for effective ICU programs to guide the rational use of antimicrobials and combat drug resistance.

Gabriel (2019) and Frangioti (2019) focus on the incidence of adverse events and the identification of medication errors, respectively, reinforcing the vital role of nursing in the prevention and identification of adverse events, as well as the importance of prevention strategies integrated into hospital practices.

Sousa (2021) and Santos et al. (2022) raise questions about the accuracy of medication dispensing and the effectiveness of interprofessional communication. Both studies suggest that improvements in dispensing accuracy and communication may play a significant role in reducing adverse events in ICUs.

De Lima et al. (2019) highlight the role of the pharmacist in a multidisciplinary team, illustrating the importance of integrating different professionals in infection control and adverse event management.

In summary, the discussion of the results emphasizes the need for a holistic and multidisciplinary approach to the management of adverse events in ICUs. Critical analysis of the selected studies demonstrates the importance of continuous improvements in prescribing practices, education, communication, and collaboration among healthcare team members to improve patient safety and clinical outcomes.

## FINAL CONSIDERATIONS

The final considerations of this review highlight a number of important insights about the use of antimicrobials in Intensive Care Units (ICUs) and related adverse events. By resuming and responding to the proposed objectives, it is possible to conclude that the challenges faced in ICUs are substantial and require meticulous attention to the practices of prescribing, administering and monitoring medications.

The objective of identifying the main adverse reactions to antibiotics in ICUs and the role of nursing was achieved with a critical analysis of the literature, which revealed that adverse events such as infections associated with bladder catheters, allergic reactions, toxicity, and drug resistance are frequent and have a significant impact on patient recovery

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and clinical outcomes. It has become evident that nursing plays a crucial role in the early identification of these events, in patient education and in the implementation of interventions to prevent and manage these adverse reactions.

The results of the review also illustrate the importance of continuing education and updating the knowledge of health professionals. Variation in knowledge about antimicrobial therapy and ongoing training are critical to ensuring that prescribing and drug administration practices are carried out safely and effectively.

In addition, the review highlighted the need for interprofessional collaboration and effective communication among health team members. The implementation of electronic prescription systems and the adoption of evidence-based practices have been identified as key strategies to reduce medication errors and the incidence of adverse events.

The review also reinforced the need for robust health policies to standardize antibiotic prescribing and control their indiscriminate use. Effective programs are essential to guide the rational use of antimicrobials and combat growing drug resistance.

In conclusion, the final considerations highlight that the management of adverse events related to the use of antimicrobials in ICUs is a complex task that requires a multidisciplinary and evidence-based approach. Improvements in medication prescribing and administration practices, along with ongoing education and interprofessional collaboration, are vital to ensuring patient safety and enhancing care in ICUs. The study provided a comprehensive understanding of antimicrobial-associated adverse events in ICUs and highlights the importance of effective prevention and management strategies to improve patient outcomes in critical care settings.

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