

The role of artificial intelligence in the control of antibiotic resistance



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Background and Importance

Antibiotic resistance is a phenomenon associated with the inappropriate use of antibiotics, whereby microorganisms acquire resistance to the pharmacological mechanism of action, making the resulting infections more difficult to treat. To address this issue, the World Health Organization (WHO) has released the AWARE manual, which classifies antibiotics into three categories: **Access**, **Watch** and **Reserve**.

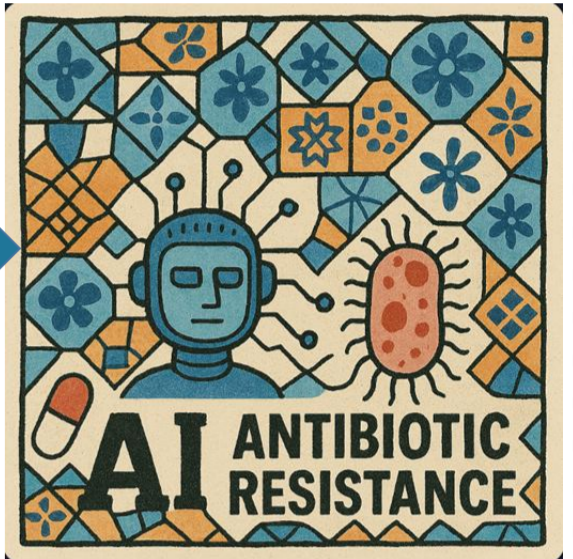
The strategic directives and operational recommendations aimed at promoting the rational use of antibiotics are issued by

- ✓ AWARE classification
- ✓ National Action Plan on Antimicrobial Resistance (PNCAR) 2022-2025

Aims and Objectives

The primary objective of this study is to mitigate this phenomenon through the implementation of a standardized, justification-based request form for antibiotics classified within the Watch and Reserve categories, with the aim of promoting their appropriate and judicious use and reinforcing the activities of the Hospital Infection Control Committee (CIO).

The specific objective is to reduce bacterial resistance and healthcare-associated infections (HAIs) by encouraging the use of artificial intelligence (AI) by clinicians and pharmacists as a decision-support tool aimed at minimizing prescribing errors.

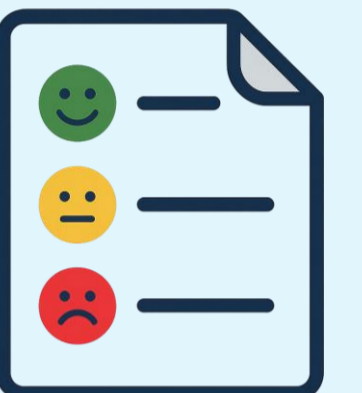


Materials and Methods

During the last analyzed quarter of 2025, prescribing trends for antibiotics such as **piperacillin/tazobactam** and **ceftriaxone** were evaluated in the General Surgery and Internal Medicine departments during the period prior to the implementation of antibiotic request forms

The analysis revealed an increase in prescriptions for pneumonia and sepsis, with a total of **45** requests for piperacillin/tazobactam and **121** for ceftriaxone.

The objective was to assess prescribing appropriateness and the corresponding antibiogram in collaboration with clinicians, in order to prevent resistance phenomena and inappropriate prescriptions.

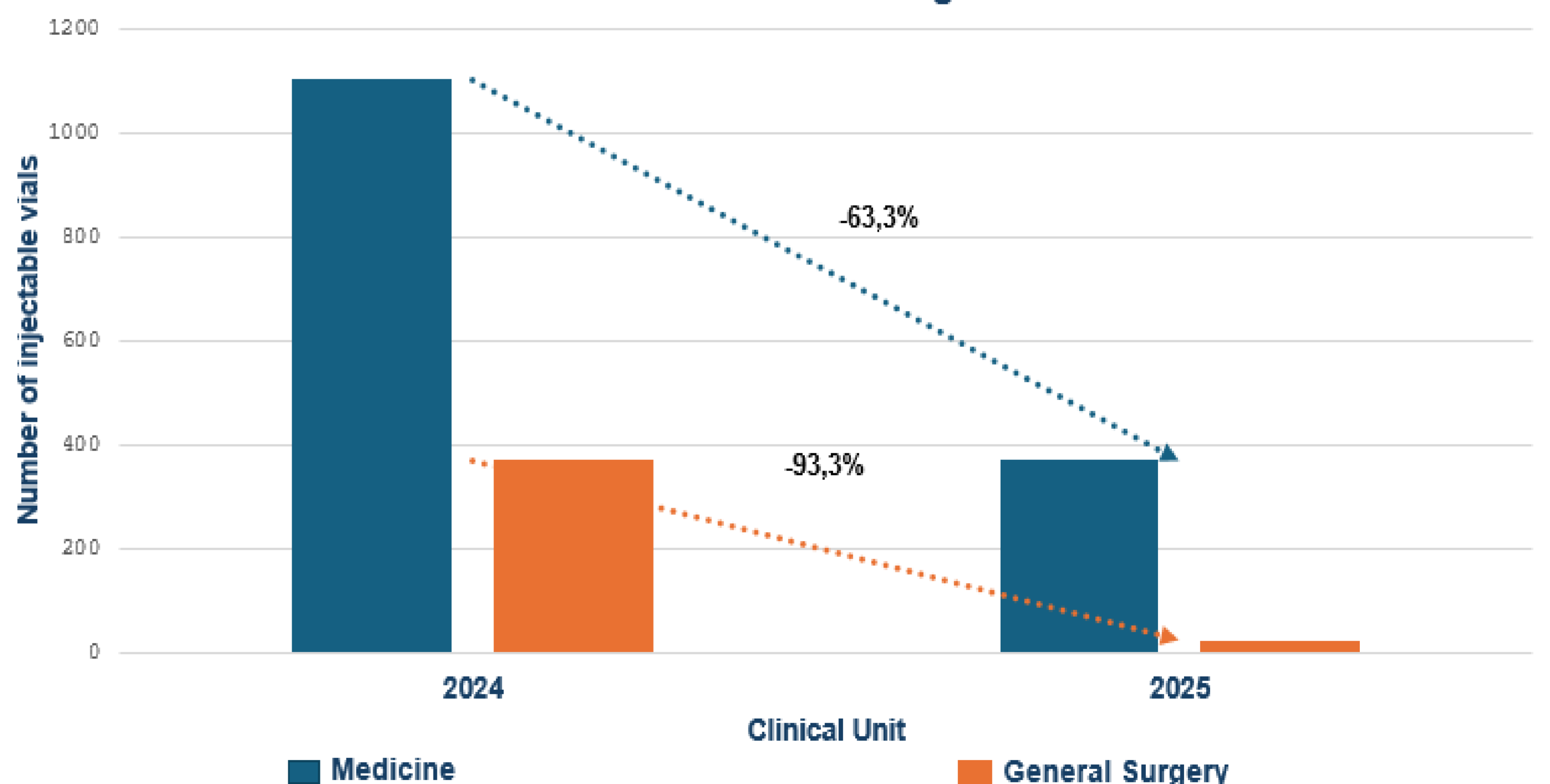


Results

Following the implementation of these **prescription request protocols**, a marked reduction of approximately **50%** in prescriptions for the two antibiotics evaluated was observed compared to the previous period. Specifically, comparing first quarter 2024 with first quarter 2025 for piperacillin/tazobactam, a significant decrease in the number of vials prescribed was noted in both the Internal Medicine and General Surgery units. In the Internal Medicine unit, prescriptions decreased from **1102** to **371** vials, while in General Surgery they dropped from **371** to **25** vials.

Looking ahead, the integration of AI-assisted diagnostics could further reduce prescriptions by **25.4%**, contributing to a substantial decrease in antibiotic overprescribing.

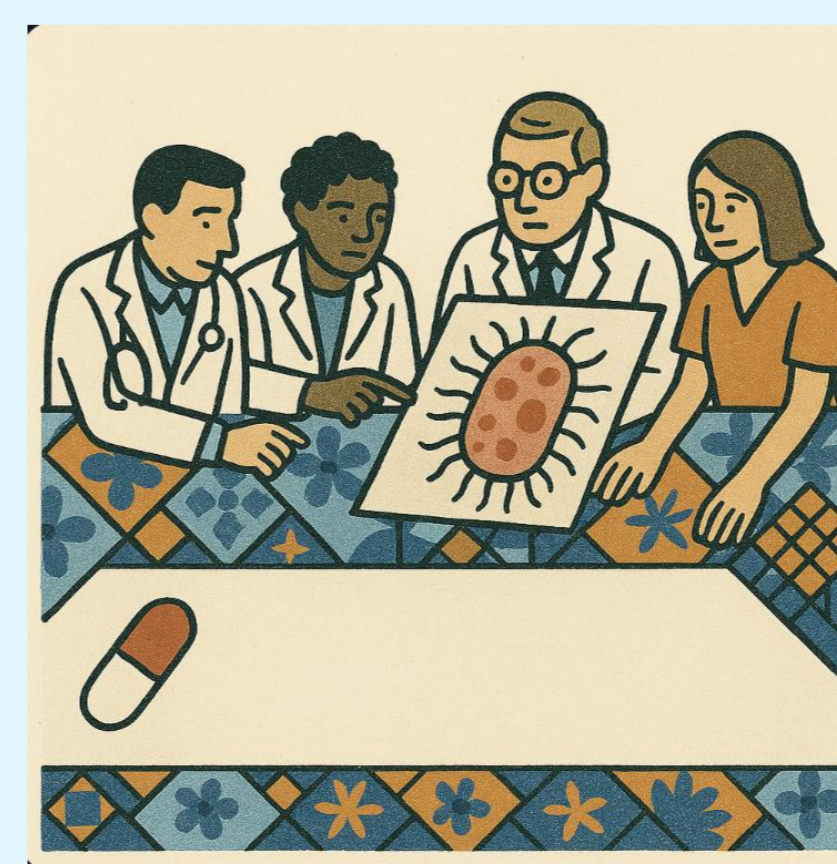
Reduction of injectable antibiotic prescriptions in clinical units through the use of artificial intelligence



Conclusions and Relevance

The implementation of Antimicrobial Stewardship strategies and antibiotic-sparing interventions has contributed to optimizing the use of Watch and Reserve antibiotics, resulting in reduced antibiotic consumption, shorter hospital stays, and decreased treatment duration.

Digital platforms and mobile applications represent the future for enhancing therapeutic decision-making; however, they will never replace the decisions made by the Infection Control Team (CIO) in ensuring the most appropriate therapeutic approach.



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