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Commentary

Targeted Preventive Isolation in the ICU: Balancing Safety, Stewardship, and Sustainability

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The challenge of Multidrug-resistant Bacteria (MDR) in the intensive care setting continues to test the limits of infection control policies. While universal screening and isolation and other contact precautionary strategies have long been standard practice in many ICUs [1], their limitations, both in terms of cost and unintended consequences, are becoming increasingly apparent. Isolation is far from a neutral intervention: it demands substantial material and human resources, generates significant environmental waste, and can negatively impact patient experience and psychological well-being. It has been associated with adverse psychological effects, compromised quality of care, increased risk of medical errors, and higher costs related to staffing, equipments and logistics [2-7]. However, when applied too selectively, we risk missing colonized patients, failing to contain outbreaks, and initiating inappropriate empirical treatments.

In this context, our recently published multicenter study, conducted within the Spanish national Zero Resistance (RZ) program, aimed to refine the selection criteria to initiate preventive isolation measures upon admission to the ICU. The objective was to design a risk-based model that improves the accuracy of the identification of patients at high risk of MDR carrying, in particular extended-spectrum β-lactamase-producing Enterobacterales (ESBL), carbapenem-resistant Enterobacterales (CRE), multiresistant Pseudomonas aeruginosa, Acinetobacter baumannii, and methicillin-resistant Staphylococcus aureus (MRSA), based on readily available clinical and epidemiological variables.

Our findings suggest that the use of simple and readily available data at the time of admission (e.g., previous colonization, recent hospitalization, antibiotic use, and institutional risk profiles) can support more targeted preventive isolation. This approach demonstrated good sensitivity and acceptable specificity, allowing for earlier detection of high-risk patients while avoiding unnecessary isolation of those at low risk, thus enhancing infection control efficiency and optimizing resource allocation.

Nevertheless, the risk factor model proposed by the RZ project shows only moderate predictive performance. In our assessment, approximately one-third of MDR carriers were not suspected upon admission because they did not meet predefined risk criteria. In addition, a Spanish study published in 2021 [8] reported that nearly 70% of patients isolated under risk factors defined by RZ were ultimately non-carriers, indicating substantial overuse of isolation. Notably, these authors identified a history of previous MDR colonization or infection as the only significant risk factor associated with wearing at the time of ICU admission. In contrast, the findings of the Padilla-Serrano study [9] emphasized prior antibiotic use and postoperative admission to the ICU as key predictors of rectal colonization by ESBL-producing Enterobacterales. Our own findings support the notion that the cumulative presence of risk factors correlates directly with the probability of MDR carriage at admission. Besides, comorbidities such as immunosuppression, solid organ transplantation, and renal failure have been identified as further risk factors. All of these findings underscore the need to improve models capable of more accurately predicting the transport of MDRs at the time of admission.

On the other hand, we identified a significant number of MDR carriers who lacked any of the risk factors listed in the RZ project checklist. For example, about half of patients with MRSA or A. baumannii had no apparent risk factors. This finding highlights the importance of understanding the unique epidemiological profile of each ICU, based on the principle that the most relevant data are the local and current incidence rates of infections and MDR organisms [10].

The emerging trend is to leverage Artificial Intelligence (AI) tools to estimate, on an individualized basis, the probability of MDR carriage by integrating patient characteristics, hospital setting, and ICU-specific data. Our group has been working on machine learning–based models to enhance predictive accuracy. These tools can improve the timely identification of colonized patients, guide more appropriate empirical therapy, and potentially improve outcomes while reducing the misuse of broad-spectrum antibiotics. In parallel, minimizing unnecessary isolation can help alleviate the psychological burden on patients, reduce the overuse of personal protective equipment, and lower the environmental footprint of ICU practices—an increasingly relevant concern in modern healthcare.

In conclusion, we believe that targeted preventive isolation, based on real-world data and clinical pragmatism, offers a promising way forward. By isolating smarter, not more, we can better protect patients, staff, and the health care system as a whole.

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