Previously published studies show a wide range of prevalence of antibiotic use in the ICU (between 45 and 85%).[21,22] There are several reasons for the high consumption of antibiotics in the ICU: (i) patients admitted with serious community-acquired infections (i.e., community-acquired pneumonia and complicated intra-abdominal infection) and (ii) acquisition of the infection during the nosocomial stay, favored by the presence of multiple comorbidities, the high rates of invasive device use and the presence of risk factors for infections due to MDR pathogens.[23-26] In that sense, we have recently published that the prevalence of HAI in LA ICUs is 11.6%.[27]

HAI (mainly nosocomial pneumonia) accounts for nearly one-half of all antibiotic prescriptions used in our patients. In these particular indications, it is well established that the appropriate empirical antimicrobial treatment is associated with better survival; therefore, several authors recommend the use of broad-spectrum antibiotics (alone or in combination) for the empirical treatment of these serious infections.[13] However, not to consider the tailored therapy in these cases, this could lead to the possibility of "collateral damage," where overuse/misuse of antibiotics is associated with MDR-pathogen infections.[18] The low level of intention – to demonstrate the microbiology of the infections (especially in severely ill patients) – increases this possibility. The challenge is that the ICU physicians should understand that obtaining microbiological cultures before initiating empirical antimicrobial therapy is part of the diagnostic work-up of ICU patients.[27]

"ESKAPE pathogens" (with the exception of *Enterococcus faecium*) were the most common microorganisms isolated in our patients (>60%), with a similar MDR profile to that described by several microbiological surveillance systems in the region.[6,28] The T.E.S.T. program (Tigecycline Evaluation and Surveillance Trial) has found that rates of ESBL–*K. pneumoniae* and carbapenem-resistant *Acinetobacter baumannii* and *Pseudomonas aeruginosa* were higher in LA than in North America and Europe (37.9%, 37.6%, 35.8% vs. 9.7%, 13.1%, 15.1% and 15.3%, 14.8%, 17.4%, respectively). In contrast, the rates of methicillin resistance among *S. aureus* were higher in North America (53.7%) than in LA (46.6%) and Europe (25.1%).[6]

The prescription habits found in our study seem justified for several reasons: (i) nearly 50% of the registered infections were nosocomial, where MDR-microorganisms are frequently involved,[29] (ii) 50% of the patients had received previous antibiotic therapy during the present hospitalization, other than carbapenems, in more than 85% of the cases. Extending the spectrum of the antibiotic previously prescribed is a very common concept between ICU physicians. (iii) High rates of ESBL-producing Gram-negatives were found in our patients. Carbapenems are stable against hydrolyzing activity of ESBLs and are regarded as the drug of choice for the treatment of infections caused by ESBL-producing Enterobacteriaceae. The combination with vancomycin extends the spectrum toward methicillin-resistant *Staphylococcus aureus* MRSA. (iv) The early effective therapy for infections in critically ill patients (defined as antimicrobial treatment that covers the infecting pathogens) is associated with low mortality rates,[30] therefore, a fresh approach to the effective treatment of patients with serious infections is to use a broad-spectrum antibacterial treatment followed by precision therapy based on susceptibility results,[8] and (v) physicians trust carbapenems because they are potent antibiotics, with an ultra-broad spectrum of activity that encompasses MDR and difficult-to-treat Gram-negative bacteria, with several clinical trial data that support its clinical effectiveness.

Although carbapenems are frequently considered the drugs of choice for treatment of serious infections due to Gram-negative organisms, there are increasing reports of carbapenem-resistant organisms worldwide. In the specific case of LA, the prevalence of carbapenem-resistant *A. baumannii* has increased markedly,[31] along with the prevalence of carbapenem-resistant strains of *P. aeruginosa*[29] and Enterobacteriaceae.[32-34] Another problem to be worry about is the description in LA of Enterobacteriaceae isolates (particularly *K. pneumoniae*) that possess carbapenem-hydrolyzing enzymes belonging to the KPC family of beta-lactamases (Colombia,[32] Brazil,[33] and Argentina[34]). Related to other classes of carbapenemases (the metallo-β-lactamases), in August 2010, reports indicated the emergence of a mechanism of resistance in enterobacteria that caused outbreaks and was related to an increase in morbidity and hospital mortality in India, Pakistan and England. Subsequently, it was also reported in Europe, Japan, Australia, Canada and the United States of America. Because of its geographical origin, the mechanism was named "New Delhi metallo-β-lactamase" (NDM).[35] In LA, the circulation of metallo-β-lactamase of type VIM had been reported mainly in non-fermenting Gram-negative bacilli, such as *Pseudomonas aeruginosa*, *Acinetobacter baumanni* and, to a smaller degree, in Enterobacteria; however, NDM had not been detected at the moment of this study. NDM-type metallo-β-lactamase has spread to different countries via the related Enterobacteriaceae as *Klebsiella pneumoniae*, an agent commonly related to hospital infections.[35] The high prevalence of carbapenem-resistant *A. baumannii* in the region has increased markedly, along with the prevalence of carbapenem-resistant strains of *P. aeruginosa* and *K. pneumoniae*.[6]

Available studies demonstrate that the interaction between the ID specialist and the attending physician may improve the diagnosis and the appropriate antibiotic treatment of severe infections.[36] Two of us (DC and RB) have found that the close interaction between the ID consultant and the ICU physician has reduced the broad-spectrum cephalosporins and vancomycin consumption significantly in the ICU, using a prospective audit of antimicrobial use strategy.[37]

In that sense, several authors have demonstrated that ID consultation was significantly associated with an increased proportion of appropriate first-line treatments, as well as an increase in correction of first-line inappropriate treatments, when the microbiologic results become available.[36] Because antimicrobial therapy is frequently prescribed in the ICU, stewardship is particularly relevant in this setting because it provides the necessary framework to improve antimicrobial use. Our thought related to these particular findings, based on personal experience, is that the ID physicians in LA probably have the same limitations prescribing antibiotics in an ICU patient as the ICU specialist (i.e., patient′s high severity score, low percentage of microbiological documentation, misdiagnosis, "just in case" prescriptions and legal imperatives, among others).

For patients with upper and lower respiratory tract infection, post-operative infections and severe sepsis patients in the ICU, randomized-controlled trials have shown a benefit of using PCT algorithms to guide decisions about initiation and/or discontinuation of antibiotic therapy. For some other types of infections, observational studies have shown promising first results, but further intervention studies are needed before use of PCT in clinical routine can be recommended.[20] However, The limited resources frequently available in LA hospitals seems to be the main reason for the low percentage of use of this biomarker.

In conclusion, carbapenems (alone or in combination) were the most frequently used antibiotics prescribed in LA ICUs. However, the problem of the carbapenem resistance in LA requires that physicians improve the use of this class of antibiotics. In fact, the increased use of carbapenems to fight the growing prevalence of MDR bacteria, particularly ESBL-producing strains, shows early signs of eroding the effectiveness of the carbapenems. A more highly targeted and restrained use of these drugs, aimed at preserving their antimicrobial activity, is probably warranted. Their therapeutic substitution in specific pathologies is one of the strategies to reach this objective; e.g., the use of tigecycline instead of carbapenems in intra-abdominal infections where ESBL-producing Gram-negatives are suspected.[38]

However, based on the limitations of the model used, the results of this study must be taken with caution. We hope that our current study may generate enthusiasm for prospective studies, with more robust designs, in order to support or reject our conclusions.

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