Novel Indicators for Enhancing the Clinical Outcome Metrics of Antimicrobial Stewardship Programs

To the Editor—One of the main challenges that face antimicrobial stewardship programs (ASPs) is proving their effect on the incidence of multidrug-resistant (MDR) microorganisms and the related mortality.¹ It can be especially difficult in centers with a limited incidence of bacterial resistance, where large samples may be required to demonstrate significant changes.² This might be a reason to assess the ecological impact of interventions through the incidence of all MDR isolations, including colonizations,³ but such assessments may not reflect their effect on the incidence of clinical infections.

An educational ASP implemented in our hospital in 2011 proved to be effective in reducing the inappropriate use of antimicrobials as well as global antibiotic consumption in the center.³ In a recent publication,⁴ we were able to show that the sustained effect of our program on antibiotic use produced a reduction of the incidence and mortality of nosocomial bloodstream infections (BSIs) by MDR bacteria and Candida spp. To solve the aforementioned drawbacks, we employed an ecologic interrupted time-series study and pooled as a sole indicator the incidence of all MDR bacteria and Candida spp producing BSIs, considering that they all share as a preferential risk factor the previous exposure to antibiotics. Additionally, we measured the changes in crude death rate (deaths per 1,000 occupied bed days) of these infections.

We found several important advantages in these 2 novel indicators: (1) pooling several mechanisms of resistance in the same indicator improved the power of the sample to show the effects of the reduction of antibiotic pressure in the center; (2) assessing infections instead of colonization provided information on the clinical benefits of the intervention; and (3) measuring the absolute reduction in mortality using the crude death rate let us show the burden of mortality avoided by the program. This metric is relevant because reductions in the rate of mortality of infections can be difficult to prove when they depend on multiple factors that require complex patient-level analyses. But if antibiotic pressure (and subsequently bacterial resistance) is reduced in a center, a reduction in mortality in absolute terms should be expected, as shown in our article.⁴

Researchers interested in this approach should be aware of certain considerations. The pooled analysis of MDR does not replace the surveillance of specific mechanisms of resistance; otherwise, occasional outbreaks could pass unnoticed. It also requires an analysis of the possible influence on results of infection control programs coexisting with the ASP. In this case, if different interventions sequentially occur during the study period, a joint-point regression analysis may allow researchers to establish mathematically (ie, not subjectively) when the inflection point occurs.⁵ Regarding the assessment of mortality, precautions should also be adopted to prevent ecologic bias. For instance, the total number of cultures and incidence of susceptible bacteria should be measured because a decrease in the incidence of MDR-produced deaths could also be explained by a reduction in diagnostic tests or by general improvements in the prevention of infections. Antimicrobial stewardship programs aiming to reduce antibiotic consumption should also monitor the mortality produced by susceptible bacteria to ensure the safety of the intervention.

In conclusion, we propose 2 novel indicators that, used properly, could enhance the ability of ASP to prove their clinical and ecological impact in a feasible and objective way.

Acknowledgments

We acknowledge the invaluable contribution of all the antimicrobial stewardship program professionals: doctors, clinical microbiologists, pharmacists, nurses, and other members of the hospital. We thank the hospital manager and medical director, and the Andalusian Health Service (SAS) of the Regional Ministry of Health of Andalucía (Spain) for supporting the antimicrobial stewardship program.

Financial support: The program received public funding from the Regional Health Ministry of Andalucía (grant no. PI-0361-2010), which did not participate in the development of the program or the analysis of its results.

Potential conflicts of interest: Dr Cisneros has served as a speaker for Novartis, Astellas, Pfizer, Merck Sharp & Dohme, Janssen and AstraZeneca, outside the submitted work. Dr Molina, Dr Valencia, and Dr Gil-Navarro report personal fees from Merck Sharp & Dohme Spain, all outside the submitted work. Dr Molina declares travel grants from Astellas outside the submitted work. All other authors declare no competing interests.

José Molina, MD;¹
Germán Peñalva, MD;¹
José A. Lepe, PhD;¹
Raquel Valencia, PhD;¹
María V. Gil-Navarro, PhD;²
José M. Cisneros, PhD¹

Affiliations: 1. Clinical Unit of Infectious Diseases, Microbiology and Preventive Medicine, Institute of Biomedicine of Seville (IBIS), University Hospital Virgen del Rocío, CSIC, University of Seville, Seville, Spain; 2. Clinical Unit of Pharmacy, Institute of Biomedicine of Seville (IBIS), University Hospital Virgen del Rocío, CSIC, University of Seville, Seville, Spain.

Address correspondence to José Miguel Cisneros Herreros, Clínica Unit of Infectious Diseases, Microbiology and Preventive Medicine, University Hospital Virgen del Rocío, Seville (Spain). Av/ Manuel siurot s/n 41013 Seville Spain (jmcisnerosh@gmail.com).

© 2018 by The Society for Healthcare Epidemiology of America. All rights reserved. DOI: 10.1017/ice.2018.65

References


