



## SPECIAL ARTICLE

# Quality indicators on the use of antimicrobials in critically ill patients



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### KEYWORDS

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**Abstract** Quality indicators have been applied to many areas of health care in recent years, including intensive care. However, they have not been specifically developed and validated for antimicrobial use in critically ill patients. Antimicrobials play a key role in intensive care units not only in the prognosis of each individual patient, but also in the development of resistance and changes in the flora in this setting. Evaluating the use of these agents is complex in the intensive care unit, however, because the indications vary greatly and antimicrobial treatment is often changed during admission.

We designed and developed specific quality indicators regarding the use of antimicrobials in critically ill patients admitted to the intensive care unit. These indicators are proposed as a tool for application in intensive care units to detect problems in the use of antimicrobials. Future trials are needed, however, to validate these indicators in a large population over time.  
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### PALABRAS CLAVE

Indicadores de calidad;  
Antimicrobianos;  
Pacientes críticos

### Indicadores de calidad sobre el uso de antimicrobianos en pacientes críticos

**Resumen** Los indicadores de calidad se han aplicado a muchas áreas de la atención sanitaria en los últimos años, incluyendo el área de cuidados intensivos. Sin embargo, no se han desarrollado y validado indicadores específicos para el uso de antimicrobianos en pacientes críticos. Los antimicrobianos desempeñan un papel clave en las unidades de cuidados intensivos no sólo en el pronóstico de cada paciente individual, sino también en el desarrollo de resistencias y los cambios en la flora bacteriana. La evaluación del uso de estos fármacos es compleja en las unidades de cuidados intensivos debido a la variedad de indicaciones y a los cambios en el tratamiento antimicrobiano durante el ingreso.

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Hemos diseñado y desarrollado un conjunto de indicadores de calidad específicos en relación con el uso de antimicrobianos en pacientes críticos ingresados en las unidades de cuidados intensivos. Estos indicadores se proponen como una herramienta para su aplicación en las unidades de cuidados intensivos para detectar problemas en el uso de antimicrobianos. Serán necesarios posteriormente, ensayos para validar estos indicadores en una población grande y a lo largo del tiempo.

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## Introduction

Quality indicators are monitoring systems that can be defined as quantitative criteria for evaluating and monitoring the quality and efficiency of health systems. They aim to provide useful information about deviations from standard practice, and to facilitate decision-making by objectively assessing what is being done in a health system.<sup>1</sup> An indicator is the basic element that periodically assesses and measures an important aspect of health care. Indicators are required to meet three characteristics to ensure their usefulness. First, they must be valid, so as to detect problems in quality. Second, they must be sensitive, to detect all instances where there is a quality problem. And third, they must be specific, to detect only those cases that have a quality problem.<sup>2</sup>

The process of developing quality indicators follows a series of steps. The first step is to define the area to be monitored and to identify the most relevant aspects to be studied. Next, each indicator needs to be specifically designed, including the description of the aspects that guarantee its validity. Once the indicators are defined, they must be systematically measured and the results should be compared with the reference value. On continuation, the results must be analysed in order to detect differences with the reference value and to identify a possible problem regarding quality. If a problem is detected, improvements in quality can be planned. Re-evaluation of the indicator can then test whether the plan is effective and whether the problem is solved.<sup>3,4</sup>

Quality in critical care is of maximum significance as patients in Intensive Care Units (ICUs) are vulnerable and their physiological response mechanisms are altered. They also require life support with drugs and devices that make their treatment more complex, rendering them more susceptible to complications. Therefore, in this group of patients it is essential to have tools that help ensure quality care.<sup>5</sup>

In 2005, the Spanish Society of Intensive Care Medicine and Coronary Units published a document with 120 quality indicators relating to critical patient care. This document was reviewed in 2011 and has recently been accepted for inclusion in the National Quality Measures Clearinghouse (NQMC), and the Agency for Healthcare Research and Quality (AHRQ) in the United States. Of the 120 indicators, two refer to the use of antimicrobials in hospitals, but none refer specifically to the use of antimicrobials in the ICU.<sup>2</sup>

Infections play a major role in the morbidity and mortality of critically ill patients.<sup>6</sup> It has been shown that early administration of appropriate antimicrobial improves the outcome of critically ill patients. At the same time, however, bacterial resistance to antimicrobials used to treat infections in hospitalized patients is increasing. As this problem is more acute in ICU patients, sound knowledge of the therapeutics and pharmacokinetics of antimicrobials is essential for their selection and adjustment during a patient's admission.<sup>7,8</sup>

Studying the use of antimicrobials in the ICU is difficult. One reason is that antimicrobial agents can be administered for several purposes, either as prophylaxis or as treatment for a wide variety of indications. When determining which antimicrobial to use as treatment, many factors must be taken into account. It is necessary to consider the source of the infection, its form of presentation and its location. Another reason is that antimicrobials often need to be changed during ICU stay in view of microbiological results, the patient's clinical course, possible adverse effects, multiresistant pathogens, and de-escalation.<sup>9</sup>

Although many recommendations have been proposed to optimize antimicrobial use,<sup>10,11</sup> quality indicators have not yet been defined and validated in respect to their use in the ICU setting. Recently, the Group Coordinator of the ENVIN-HELICS ("National Study of Nosocomial Infection Surveillance" in Spain and "The Hospitals in Europe Link for Infection Control through Surveillance") proposed quality indicators for the use of antimicrobials in the ICU and they retrospectively determined the value of these indicators in a sample of patients admitted to ICUs in Spain in 2005 and 2006.<sup>12</sup> To date, however, there are no documents published that define the fundamental aspects of each indicator.

## Objectives

The aim of this work was to develop a set of quality indicators for antimicrobial use in critically ill patients admitted to the ICU. The indicators were defined to assess relevant aspects regarding selection and change of antimicrobials, such as global consumption, adequacy of treatment, and duration. These indicators would be a useful tool for health care professionals to assess antimicrobial use in critically ill patients and to detect quality problems for misuse of these drugs.

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