

## COMMENTARY

# Towards zero rate in healthcare-associated infections: one size shall not fit all...

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See related research by Exline *et al.*, <http://ccforum.com/content/17/2/R41>

### Abstract

ICU patients are identified as targets for quality of care and patient safety improvement strategies. Critically ill patients are at high risk for complications due to the complex and invasive nature of critical care. Several reports in the literature describe initiatives aiming to zero the healthcare-associated infection rate. We discuss the results of a study assessing a systematic team approach with very aggressive interventions surrounding the Institute for Healthcare Improvement Central Line-associated Blood Stream Infection bundle, which obtained a successful reduction of the rates. In addition, we discuss why some healthcare-associated infections are not fully preventable and the different reasons for this, the identification of which would be a cornerstone of quality improvement and safety promotion initiatives in critically ill patients.

ICU patients are identified as targets for quality of care and patient safety improvement strategies. Critically ill patients are at high risk for complications due to the complex and invasive nature of critical care treatments and procedures, the severity of their medical conditions, and the use of immunosuppressive drugs. Healthcare-associated infections are the most common complications affecting hospitalized patients and are associated with significant morbidity and mortality [1,2]; they account for approximately 100,000 deaths yearly in the United States [3]. Currently, infection control is a critical element of patient care and many healthcare-associated infection episodes are considered potentially preventable. The idea that 'most infections are unavoidable and some

could be preventable' has been changed to 'all infections are potentially preventable unless proven otherwise' [4,5]. However, it is clear that although valid data on the proportion of unpreventable episodes in different ICU settings are not available, different types of infection, such as catheter-associated bloodstream infections and healthcare-associated pneumonia, are preventable through different strategies but also with unequal results [5].

Several strategies have proven efficacy for preventing central line-associated blood stream infections (CLA-BSIs), but care bundle approaches seem to be the most prominent. Prevention strategies based on care bundles aim to translate the best available evidence into clinical practice, by allowing for a more uniform management of the patient. By comparison, implementation of individual interventions might improve patient care, but the implementation of several simple measures simultaneously, as a bundle, has a greater likelihood of improving outcome.

Exline and colleagues [6] implemented a systematic team approach with very aggressive interventions surrounding the Institute for Healthcare Improvement (IHI) CLA-BSI bundle focusing on continuous improvement of the strategy. In addition to the care bundle implementation, improvements in surveillance, review of the intervention process, timely feedback on CLA-BSI occurrence and sentinel event investigation of CLA-BSI at the unit level, positive reinforcement strategies, improvements in clinical and molecular epidemiological surveillance, educational strategies and chlorhexidine baths were also implemented. The positive results are encouraging and show the importance of continuous improvement of processes and surveillance with appropriate feedback as factors leading to quality improvement and better results. Interesting findings also include concerns regarding professional turnover and environmental issues. An additional insight provided by the study concerns the number of lumens and the very definition we use for surveillance purposes. As the denominator in the rate includes days of catheter use by patients, not considering the number of lumens or lines the patient is using, and with the increased complexity

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involved in treating ICU patients, many times using five or six lines, the effect of prevention strategies might be underestimated. This may argue for counting the number of lines or even lumens for a lumen/patient/day count, despite limitations and feasibility issues in many settings.

However, as acknowledged by the authors, although care bundle implementation appears to be associated with successful reduction of some healthcare-associated infection rates, these may not always be preventable given the high sensitivity and low specificity of clinical definitions and because some of the cultures with significant pathogens may be related to contamination or catheter colonization. Therefore, there should be a cautious interpretation of the impact of reduction and zero healthcare-associated infection policies that are beneficial in other clinical syndromes. Several differences regarding pathophysiology should be considered and generalization of the findings should be made cautiously. Considering healthcare-associated pneumonia, for example, misinterpretation of prevention study results and the pathophysiology of ventilator-associated pneumonia (VAP) may lead to an erroneous idea that a 'zero-VAP rate' is feasible. While CLA-BSIs are associated primarily with inaccuracies in insertion technique and handling of the catheter, healthcare-associated pneumonia pathophysiology is mainly determined by endogenous aspects, including endogenous flora and risk factors. Although some VAP care bundle study results are encouraging for obtaining an important reduction in VAP episodes, pathophysiological aspects of VAP, such as differences between early and late VAP episode risk factors that differ between trauma and medical patients, limit their ability to prevent all episodes of VAP [5]. Klompas [7] recently reported initiatives that misleadingly lower VAP rates, including interpretation of clinical signs and chest X-ray as strictly as possible, require consensus between preventionists and intensivists, or require microbiological documentation to confirm VAP diagnosis. This makes evident the high variability and how artificial or manipulated the rates might be.

An approach similar to that described for CLA-BSI is described in the FADO project [8], a strategy to assess the impact of implementing a care bundle package for VAP prevention on VAP rates and duration of mechanical ventilation. This original study evaluated an intervention based on a care bundle concept to prevent VAP, with interventions based on the pathophysiology of VAP, slightly different from those reported in IHI VAP bundle studies, and obtained a reduction in the incidence risk ratio of VAP of 0.78 (95% confidence interval 0.15 to 0.99), median ICU length of stay (from 10 to 6 days) and duration of mechanical ventilation (from 8 to 4 days) for patients with full bundle compliance (intervention period).

The prevention of healthcare-associated infections should be a cornerstone for quality improvement and safety promotion initiatives in critically ill patients. Significant improvements in outcomes can be achieved with high compliance in implementing a care bundle package for prevention of healthcare-associated infections. In addition, although it is difficult to maintain over a long-term period, significant benefits were documented by Exline and colleagues [6], and several strategies might be implemented to improve compliance with and the efficacy of these approaches. Effective design and implementation require a multidisciplinary approach taking into account barriers as well as facilitators. However, during the path towards a zero rate, we should not overlook that although the healthcare-associated infection concept makes epidemiological sense, the pathophysiology of the different clinical syndromes is variable, as is their potential to be fully preventable. So undertaking the journey towards a zero rate is valid but we should acknowledge that many different paths are needed to accommodate the complexity of the concept we are dealing with.

#### Abbreviations

CLA-BSI, central line-associated blood stream infection; IHI, Institute for Healthcare Improvement; VAP, ventilator-associated pneumonia.

#### Competing interests

The authors declare that they have no competing interests.

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