Major Article

Multicenter study in Colombia: Impact of a multidimensional International Nosocomial Infection Control Consortium (INICC) approach on central line–associated bloodstream infection rates

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Background: The objective of this study was to analyze the impact of a multidimensional infection control approach and the use of the International Nosocomial Infection Control Consortium (INICC) Surveillance Online System on central line–associated bloodstream infection (CLABSI) rates from June 2003-April 2010.
Methods: We conducted a prospective, before-after surveillance study of 2,564 patients hospitalized in 4 adult intensive care units (ICUs) and 424 patients in 2 pediatric ICUs of 4 hospitals in 2 cities of Colombia. During baseline, we performed outcome surveillance of CLABSI applying the Centers for Disease Control and Prevention's National Healthcare Safety Network definitions. During intervention, we implemented the INICC multidimensional approach and the ISOS, which included a bundle of infection prevention practice interventions, education, outcome surveillance, process surveillance, feedback on CLABSI rates and consequences, and performance feedback of process surveillance. Bivariate and multivariate regression analyses were performed using a logistic regression model to estimate the effect of the intervention on the CLABSI rate.
Results: The baseline rate of 12.9 CLABSIs per 1,000 central line (CL) days, with 3,032 CL days and 39 CLABSIs, was reduced to 3.5 CLABSIs per 1,000 CL days, with 3,686 CL days and 13 CLABSIs, accounting for a 73% CLABSI rate reduction (relative risk, 0.27; 95% confidence interval, 0.14-0.52; *P*=.002).
Conclusions: Implementing the INICC multidimensional infection control approach for CLABSI prevention was associated with a significant reduction in the CLABSI rate of ICUs of Colombia.

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Central line–associated bloodstream infection (CLABSI) is considered to be among the most serious device-associated infections in the intensive care unit (ICU) setting.[1,2] According to studies from developed[2] and limited-resource countries,[3,4] the most important clinical consequences attributable to CLABSI are increased mortality rates, significant morbidity, and increased length of stay (LOS). From an economic perspective, CLABSIs are also responsible for significant increases in health care costs, as reported in both developed[2,5] and limited-resource countries.[3,4] The burden posed by CLABSI has not been systematically analyzed in limited-resource countries.[6] Although hospitals in limited-resource countries do implement basic infection control programs, compliance with infection control practices is variable.[6] As reported by the International Nosocomial Infection Control Consortium (INICC) in pooled studies[7-11] and in particular studies from Colombia,[12] the rates of CLABSI have been determined to be from 3-5 times higher than in Western countries.

It has been shown that the incidence of CLABSI in Western countries can be substantially prevented and reduced by >30% through basic but effective measures,[13] such as those described in the bundle for CLABSI prevention developed by the Institute for Healthcare Improvement[14]: (1) hand hygiene, (2) skin antisepsis with chlorhexidine, (3) maximal barriers, (4) insertion in subclavian vein, and (5) timely central line (CL) removal—were associated with a reduction in the incidence density of CLABI in developed countries.[15]

The present study was designed to determine the effect of the INICC multidimensional program for reduction of CLABSI rates in 4 adult ICUs and 2 pediatric ICUs of 4 hospitals of 2 cities in Colombia. Our program was implemented from June 1, 2003-April 30, 2010, and included 6 simultaneous interventions: (1) bundle of infection prevention practices, (2) education, (3) outcome surveillance, (4) feedback of CLABSI rates and adverse consequences, (5) feedback on CLABSI rates and consequences, and (6) performance feedback of process surveillance.

Outcome surveillance is conducted by means of an online platform called the INICC Surveillance Online System (ISOS), which is comprised of 15 modules whose effective impact in CLABSI rates reduction was shown in several studies.[16-23] The ISOS allows the classification of prospective, active, cohort surveillance data into specific module protocols that apply the U.S. Centers for Disease Control and Prevention's (CDC's) National Healthcare Safety Network (NHSN) definitions.[24]

The bundles of infection prevention practices of the INICC Multidimensional Approach (IMA) follow the basic recommendations published in the guidelines of the Society for Healthcare Epidemiology of America and Infectious Diseases Society of America in 2008[25] and the CDC in 2002.[26] At present, there is sufficient ethical and theoretical justification for conducting this particular study, and through its publication we can increase and spread awareness on this public health burden in Colombia.

METHODS

Background on the INICC

Founded in Argentina in 1998, the INICC was the first multinational research network established to control and reduce health care–associated infections (HAIs) at the international level through the analysis of data collected on a voluntary basis by a pool of hospitals worldwide.[11] The goals of the INICC include the development of a dynamic global hospital network that applies systematic surveillance of HAIs with standardized definitions and methodologies of the CDC-NHSN,[24] promotes evidence-based infection control practices, and performs applied infection control research to reduce rates of HAI, associated mortality, excess LOSs, costs, and bacterial resistance.[27]

Setting and study design

This multicenter, prospective, before-after study was conducted in 4 adult ICUs (3 medical-surgical and 1 coronary ICUs) and 2 pediatric ICUs of 4 INICC member hospitals in 2 cities from Colombia. This hospital had been actively implementing the IMA, as subsequently described, during a 3-month period for the baseline period and the following months for the intervention period, with an infection control team (ICT) comprised of infection control professionals and medical doctors with formal education and background in internal medicine, critical care, infectious diseases, microbiology, and hospital epidemiology.

Baseline period

The baseline period included only the performance of outcome surveillance and process surveillance. The length of the baseline period is 3 months for the following reasons. First, the sample size of patients and the number of months of data collection during the baseline period are sufficient enough to compare with the sample size of patients and the number of months of data collection during the intervention period. From a statistical perspective, the issue is addressed by considering the changes in rates over time. The relatively short baseline period may impact the SEM of our estimates. However, we found that this will not cause a bias in the results because there will not be systematic differences between the 2 groups. Second, our priority is to start the intervention as early as possible to achieve the desired results, such as lower CLABSI rates, as soon as possible.

Intervention period

The intervention period started in the fourth month of participation. This is a prospective cohort study, and each ICU joined the INICC program at different moments. Therefore, by the time we analyzed the impact of the INICC intervention, we had ICUs with different lengths of participation in the intervention period. For the coronary ICU, the baseline period was from September 1, 2003-November 30, 2003, and the intervention period was from December 1, 2003-June 30, 2004. For the 2 pediatric ICUs, one had a baseline period from September 1, 2003-November 30, 2003, and an intervention period from December 1, 2003-July 31, 2005, and the other had a baseline period from October 1, 2009-December 31, 2009, and an intervention period from January 1, 2010-April 30, 2010. The 3 medical-surgical ICUs also had different periods of participation: a baseline period from June 1, 2003-August 31, 2003, and an intervention period from September 1, 2003-November 31, 2004; a baseline period from April 1, 2003-June 30, 2003, and an intervention period from July 1, 2003-July 31, 2004; and a baseline period from June 1, 2003-August 31, 2003, and an intervention period from September 1, 2003-December 31, 2004.

IMA

The IMA includes the implementation of the CDC-NSHN methodology, but it adds the collection of other data essential to increase infection control professional's sensitivity to detect HAIs and avoid underreporting.[24] According to standard CDC-NSHN methods, numerators are the number of HAIs of each type, and denominators are device days collected from all patients, as pooled data, without determining the number of device days related to a particular patient and without collecting characteristics per specific patient.[24] This design differs from the IMA because the design of the cohort study through the INICC methods also includes collecting specific data per patient from all patients, both those with and those without HAI,