American Journal of Infection Control 44 (2016) 444-9

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major article

Device-associated infection rates, bacterial resistance, length of stay, and mortality in Kuwait: International Nosocomial Infection Consortium findings

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Key Words:
Hospital infection
nosocomial infection
health care–associated infection
antibiotic resistance
ventilator-associated pneumonia
catheter-associated urinary tract infection
central line–associated bloodstream infections
bloodstream infection
urinary tract infection
network

Background: To report the results of the International Infection Control Consortium (INICC) study conducted in Kuwait from November 2013-March 2015.
Methods: A device-associated health care–acquired infection (DA-HAI) prospective surveillance study in 7 adult, pediatric, and neonatal intensive care units (ICUs) using the U.S. Centers for Disease Control and Prevention's (CDC's) National Healthcare Safety Network (NHSN) definitions and INICC methods.
Results: We followed 3,732 adult and pediatric patients for 21,611 bed days and 671 neonatal patients for 4,515 bed days. In the medical-surgical ICUs, the central line–associated bloodstream infection (CLABSI) rate was 3.5 per 1,000 central line days, the ventilator-associated pneumonia (VAP) rate was 4.0 per 1,000 mechanical ventilator days, and the catheter-associated urinary tract infection (CAUTI) rate was 3.3 per 1,000 urinary catheter days; all of them were lower than INICC rates (CLABSI: 4.9; VAP: 16.5; and CAUTI: 5.3) and higher than NHSN rates (CLABSI: 0.9; VAP: 1.1; and CAUTI: 1.2). Resistance of *Staphylococcus aureus* to oxacillin was 100%, resistance of *Acinetobacter baumannii* to imipenem and meropenem was 77.6%, and resistance of *Klebsiella pneumoniae* to imipenem and meropenem was 29.4%. Extra length of stay was 27.1 days for CLABSI, 22.2 days for VAP, and 19.2 days for CAUTI in adult and pediatric ICUs. Extra crude mortality was 19.9% for CLABSI, 30.9% for VAP, and 11.1% for CAUTI in adult and pediatric ICUs.
Conclusions: DA-HAI rates in our ICUs are higher than the CDC-NSHN rates and lower than the INICC international rates.

BACKGROUND

Increasingly in scientific literature, device-associated health care–acquired infections (DA-HAIs) are considered one of the principal threats to patient safety in the intensive care unit (ICU) and are among the main causes of patient morbidity and mortality.[1]

The effectiveness of implementing an integrated infection control program focused on DA-HAI surveillance was demonstrated in the many studies conducted in the United States whose results reported not only that the incidence of DA-HAI can be reduced by as much as 30%, but that a related reduction in health care costs was also feasible.[2]

In the same way, it is fundamental to address the burden of antimicrobial-resistant infections and report pathogens and

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Funding: Becton, Dickinson and Company (BD) provided a grant for founding the publication process.
Conflicts of interest: none to report.

http://dx.doi.org/10.1016/j.ajic.2015.10.031

susceptibility to antimicrobials of DA-HAI–associated pathogens; therefore, informed decisions can be made to effectively reduce transmission of resistant strains and their determinants, such as strains with phenotypes with very few available treatments with chances of success.[3]

For >40 years, the U.S. Centers for Disease Control and Prevention's (CDC's) National Healthcare Safety Network (NHSN)[4] has provided benchmarking U.S. ICU data on DA-HAIs, which have proven invaluable for researchers, and served as an inspiration to the International Nosocomial Infection Control Consortium (INICC).[5]

The INICC is an international nonprofit, open, multicenter, collaborative health care–associated infection control network with a surveillance system based on that of the CDC's NHSN.[6] Founded in Argentina in 1998, the INICC is the first multinational surveillance and research network established to measure, control, and reduce DA-HAI and surgical site infections (SSIs) hospital-wide through the analysis of data collected on a voluntary basis by a pool of hospitals worldwide.[7]

The INICC has the following goals: to create a dynamic global network of hospitals worldwide and conduct surveillance of DA-HAIs and SSIs using standardized definitions and established methodologies, to promote the implementation of evidence-based infection control practices, and to carry out applied infection control research; to provide training and surveillance tools to individual hospitals, which can allow them to conduct outcome and process surveillance of DA-HAIs and SSIs, to measure their consequences, and to assess the impact of infection control practices; and to improve the safety and quality of health care worldwide through the implementation of systematized programs to reduce rates of DA-HAIs and SSIs, their associated mortality, excess lengths of stay (LOSs), excess costs, antibiotic usage, and bacterial resistance.[8]

This report is a summary of data on DA-HAIs collected between November 2013 and March 2015 in 7 ICUs in 2 hospitals in Kuwait that participate in the INICC.[5,7]

METHODS

Background on the INICC

The INICC is comprised of >2,000 hospitals in 500 cities of 66 countries in Latin America, Asia, Africa, Middle East, and Eastern Europe and has become the only source of aggregate standardized international data on the epidemiology of health care–associated infections (HAIs) worldwide.[5] The INICC is focused on the surveillance and prevention of DA-HAI in adult ICUs, pediatric ICUs, and neonatal intensive care units (NICUs), step-down units, and inpatient wards and SSIs in surgical procedures hospital-wide.

Setting and study design

This prospective cohort surveillance study was conducted in 7 ICUs from 2 hospitals in Kuwait City through the implementation of the INICC Multidimensional Approach (IMA), as subsequently described. The types of ICUs participating in this study were as follows: 2 coronary, 2 medical-surgical, 2 pediatric, and 1 neonatal.

In accordance with the INICC's charter, the identity of all INICC hospitals and cities is kept confidential.

INICC multidimensional approach

The IMA includes the implementation of the methodology of the CDC's NSHN, but adds the collection of other data essential to increasing infection preventionists' sensitivity to detect HAIs and avoid underreporting.[6] According to standard CDC's NSHN methods, numerators are the number of HAIs of each type, and denominators are device days collected from all patients, as pooled data (ie, without determining the number of device days related to a particular patient and without collecting features or characteristics per specific patient).[6] This design differs from the INICC Surveillance System 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, collecting risk factors of HAIs, such as invasive devices, and collecting surrogates of HAIs, which include but are not limited to high temperature, low blood pressure, results of cultures, antibiotic therapy, LOS, and mortality. By collecting data on all patients in the ICU, it is possible to match patients with and without HAI by several characteristics to estimate extra LOS, mortality, and cost.

The IMA comprises the simultaneous implementation of the following 6 components for HAI control and prevention: (1) a bundle of interventions, (2) education, (3) outcome surveillance, (4) process surveillance, (5) feedback on HAI rates and consequences, and (6) performance feedback.

Outcome and process surveillance are conducted by means of an online platform called the INICC Surveillance Online System (ISOS). The ISOS comprises 15 modules: 10 for outcome surveillance and 5 for process surveillance. The modules of the outcome surveillance and process surveillance components may be used singly or simultaneously, but once selected they must be used for a minimum of 1 calendar month.

In this study, we present the results of the outcome surveillance modules. The results of process surveillance, feedback on HAI rates and consequences, and performance feedback were not included in this article because will be published in another future study.

Outcome surveillance

Outcome surveillance through the ISOS allows the classification of prospective, active, cohort surveillance data into specific module protocols that apply the NHSN definitions published in 2013.[6] The site-specific criteria include reporting instructions and provide full explanations integral to their adequate application.[6]

The ISOS surveillance includes the following 10 modules: cohort surveillance of HAIs in adult and pediatric ICUs; cohort surveillance of HAIs in NICUs; cohort surveillance of HAIs in inpatient wards and step-down units; cohort surveillance of surgical procedures and SSIs; aggregated surveillance of HAIs in adult and pediatric ICUs; aggregated surveillance of HAIs in NICUs; microorganism profile and bacterial resistance; laboratory-based surveillance of multidrug-resistant organisms and *Clostridium difficile* infections; antimicrobial consumption; and surveillance of needlestick injuries.

Data collection and analysis

The ISOS follows the INICC protocol and infection preventionists, who collected daily data on central line–associated bloodstream infections (CLABSIs), catheter-associated urinary tract infections (CAUTIs), and ventilator-associated pneumonias (VAPs) and denominator data, patient days, and specific device days in the ICUs.

These data were uploaded to the ISOS and were used to calculate DA-HAI rates per 1,000 device days, mortality, and LOS according to the following formulas: device days consisted of the total number of central line (CL) days, urinary catheter (UC) days, or mechanical ventilator (MV) days. Crude excess mortality of DA-HAI equals crude mortality of ICU patients with DA-HAI minus crude mortality of patients without DA-HAI. Crude excess LOS of DA-HAI equals crude LOS of ICU patients with DA-HAI minus crude LOS of patients without DA-HAI. Device utilization ratio (DUR) equals the total number of device days divided by the total number of bed days.