American Journal of Infection Control ■■ (2016) ■■-■■

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major articles

International Nosocomial Infection Control Consortium (INICC) resources: INICC multidimensional approach and INICC surveillance online system

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Key Words:
nosocomial infection
health care–associated infection
device-associated infection
antibiotic resistance
ventilator-associated pneumonia
catheter-associated urinary tract infection
central line–associated bloodstream infections
limited-resources countries
low-income countries
network

Background: The International Nosocomial Infection Control Consortium (INICC) is an international, nonprofit, multicentric health care–associated infection (HAI) cohort surveillance network with a methodology based on the U.S. Centers for Disease Control and Prevention's National Healthcare Safety Network (CDC-NHSN). The INICC was founded in 1998 to promote evidence-based infection control in limited-resource countries through the analysis of surveillance data collected by their affiliated hospitals. The INICC is comprised of >3,000-affiliated infection control professionals from 1,000 hospitals in 67 countries and is the only source of aggregate standardized international data on HAI epidemiology. Having published reports on device-associated (DA) HAI (HAI) and surgical site infections (SSIs) from 43 countries and several reports per individual country, the INICC showed DA HAI and SSI rates in limited-resources countries are 3-5 times higher than in high-income countries.

Methods: The INICC developed the INICC Multidimensional Approach (IMA) for HAI prevention with 6 components, bundles with 7-13 elements, and the INICC Surveillance Online System (ISOS) with 15 modules.

Resources: In this article the IMA, the ISOS for outcome surveillance of HAIs and process surveillance of bundles to prevent HAIs, and the use of surveillance data feedback are described.

Comments: Remarkable features of the IMA and ISOS are INICC's applying of the latest published CDC-NHSN HAI definitions, including their updates and revisions in 2008, 2013, 2015 and 2016; INICC's informatics system to check accuracy of fulfillment of CDC-NHSN HAI criteria; and INICC's system to check compliance with each bundle element.

Founded in 1998, the International Nosocomial Infection Control Consortium (INICC) is an altruistic, nonprofit, open, multicentric health care–associated infection (HAI) surveillance network, which is comprised of an international board of 30 members from high-income and limited-resources countries and >3,000 affiliated infection control professionals (ICPs) from 1,000 hospitals in 500 cities of 67 countries from the following 6 World Health Organization regions: Africa, Americas, Eastern Mediterranean, Europe, South East Asia, and Western Pacific.

The INICC is focused on the surveillance and prevention of device-associated (DA) HAIs (eg, central line–associated bloodstream infection [CLAB], pneumonia [PNEU], and urinary tract infection [UTI]) in adult, pediatric, and neonatal intensive care units (ICUs), step-down units, and inpatient wards and surgical site infections (SSIs) on the assessment of compliance with hand hygiene (HH), bundles, improving antimicrobial consumption, and reducing bacterial resistance, length of stay (LOS), mortality, costs, and needlestick injuries.

With methodology based on the U.S. Centers for Disease Control and Prevention's National Healthcare Safety Network (CDC-NHSN),[1] the INICC has promoted evidence-based infection control by providing hospitals internationally and, particularly, in limited-resource countries with free training and access to free online surveillance tools. Since 1998, INICC surveillance has been fundamental to increase the knowledge on the incidence of DA-HAIs, device utilization, extra LOS, extra cost, extra mortality, microorganism profile, and bacterial resistance internationally.[2-6] This was done through the publications of 5 pooled multinational biannual

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Conflicts of Interest: None to report.

Funding/Support: Support for the activities carried out at International Nosocomial Infection Control Consortium Headquarters was provided by Dr. Rosenthal and Foundation to Fight against Nosocomial Infections.

http://dx.doi.org/10.1016/j.ajic.2016.01.005

reports,[2-4,6,7] starting in 2006.[2] This was also done at the national level in many studies, with a report being published for the first time in 2003 with data from Argentina,[8] and reports being published later on with data from other countries.[9-29] As the only source of aggregate standardized international data on the epidemiology of HAIs, the INICC has acknowledged that DA HAIs rates in limited-resources countries are 3-5 times higher than in western countries.[3]

The burden posed by SSIs on patients' safety internationally and, particularly, in limited-resource countries has also been shown by the INICC to be higher than in western countries,[30] with pooled data of 30 countries[31] and data occurring at a national level.[32-38]

Additionally, the INICC has conducted studies that analyzed the relationship between DA HAI rates and a country's socioeconomic condition according to the World Bank criteria (upper-middle income, lower-middle income, and low income) and type of hospital (public, academic, and private).[39,40] Such study findings showed that a higher socioeconomic level and being a private institution were variables correlated with a lower DA HAI risk.[39,40]

Cost, LOS, and mortality attributable to DA HAI have also been determined by the INICC internationally through prospective, matched analyses of CLAB and PNEU.[41-43] For LOS and mortality, the INICC applied a new multistate model, including specific censoring to ensure the estimation of the independent effect of each DA HAI, and not the combined effects of multiple DA HAIs.[7,44-46]

To reduce the incidence of these higher rates internationally and, particularly, in limited-resource countries, the INICC adopted the INICC Multidimensional Approach (IMA) to prevent and control HAIs. The IMA consists of the simultaneous implementation of 6 components, 4 of which are conducted using an online platform, called the INICC Surveillance Online System (ISOS).

On the one hand, the ISOS enables ICPs to conduct online prospective, active, surveillance cohort studies designed to collect specific data per patient from all patients, both those with and those without HAI. This allows for the identification of risk factors of HAIs (eg, age, sex, severity illness score, invasive devices utilization, and several surrogates of HAIs) and the validation of HAIs, thereby ensuring that the latest published CDC-NHSN criteria are met in each DA HAI diagnosis, so as to avoid under-reporting and inconsistent selections caused by oversight. On the other hand, the ISOS has tools to assess compliance with each bundle element through the online process surveillance.

The successful application of the IMA and ISOS resulted in significant reductions in the rates of CLAB, ventilator-associated pneumonia (VAP), and catheter-associated urinary tract infection (CAUTI) in pooled multinational studies in the ICUs[31,47-53] of many countries and also at the national level.[54-66]

In most limited-resource countries, there are laws mandating the implementation of HAI prevention programs, and hospital accreditation is becoming very common. However, among the many causes influencing these higher HAI rates in limited-resource countries are the variable levels of adherence to bundles, constraints on funds and resources for infection control, low nurse-to-patient staffing ratios, and high proportions of inexperienced nurses, all of which have been shown to have association with increased risk of DA HAIs and SSIs.[67] Finally, the use of outdated technology has also been reported to be another factor (ie, vented intravenous infusion systems containers and 3-way stopcocks are used near-universally in limited-resource countries rather than closed intravenous systems or split septum, which are the standard of care in most developed countries).[7,68-75]

The improvement of adherence to HH has been long considered the cornerstone of HAI prevention. Since 1998, the INICC has been applying the INICC Multidimensional Hand Hygiene Approach (IMHHA), published for the first time in 2003 in a study from Argentina.[76] It includes the following 6 components: (1) administrative support, (2) supplies availability, (3) training and education, (4) reminders in the workplace, (5) process surveillance, and (6) performance feedback. The results of the implementation of the IMHHA were published in a pooled multinational study conducted in 19 countries[77] and also at a national level.[76,78-85]

Advancing our understanding of the epidemiology, prevention, and control of HAI is a continuous concern within the many thousands of hospitals and billions of patients worldwide. The lack of enough knowledge regarding HAI in limited-resource settings led the INICC to the conceptualization and development of the IMA and ISOS.

The importance of this article lies in the presentation of a clear and comprehensive description of the INICC's resources, the IMA and the ISOS, with methods and tools for HAI surveillance, applying the latest published CDC-NHSN HAI definitions, including their updates and revisions in 2008, 2013, 2015 and 2016 and the INICC's validation informatics system to check the accuracy of fulfillment of CDC-NHSN HAI criteria and a system to check compliance with each bundle element. In this way, the INICC's resources and methods are useful to accurately measure HAIs, prevent HAIs, and reduce their rates and consequences.

CHARACTERISTICS OF PARTICIPATING HOSPITALS

The hospitals participating in the INICC provide in-patient services to adult, children, and newborns requiring acute care. They also provide services to patients admitted to inpatient wards and step-down units and patients undergoing surgical procedures of any type. They may be of any size and ownership, affiliated or unaffiliated with a medical school. Although participation is voluntary and free, hospitals are in charge of applying for INICC membership. They should have both adequate personnel and support for infection control and approval from hospital administration to participate in the INICC.[3]

METHODOLOGY, APPROACH, AND RESOURCES

Through the IMA and ISOS, the INICC applies 2 kinds of surveillance: outcome surveillance and process surveillance.

IMA

The INICC developed the IMA, a system to measure and reduce HAI rates, mortality, LOS, costs, bacterial resistance, and antibiotic consumption that is comprised of the simultaneous implementation of 6 components[86]: (1) bundles, (2) education and training, (3) online outcome surveillance of HAI rates and their adverse consequences, (4) online process surveillance to evaluate compliance with bundles, (5) online feedback of HAI rates and their adverse consequences, and (6) online performance feedback. As part of the IMA, the INICC uses an online platform called ISOS, which includes components 3, 4, 5, and 6 of the IMA (Fig 1).

BUNDLES

The INICC bundles of interventions for HAI prevention were designed as adaptation of the bundles and recommendations and guidelines published by the Institute for Healthcare Improvement (IHI),[87] Centers for Disease Control and Prevention,[88] Society for Health Care Epidemiology of America, Infectious Diseases Society of America,[89] Association for Professionals of Infection Control,[90] and Joint Commission International.[91]

To describe the INICC process and define key elements of a bundle, by way of example, we subsequently present the CLAB prevention bundle herein.

According to a study published by the INICC in 2010,[47] in 15 limited-resource countries from regions of Africa, Americas, Eastern Mediterranean Europe, South East Asia, and Western Pacific, standard