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Editorial

19 years of VINCat program: Exploring the past, present, and future of infection prevention in Catalonia

19 años del programa VINCat: explorando el pasado, presente y futuro de la prevención de infecciones en Cataluña

Healthcare-associated infections (HAIs) affect thousands of patients in Catalonia each year, significantly impacting the healthcare system. These infections result in considerable patient suffering, substantially increase healthcare costs, and challenge efforts to provide high-quality care. HAIs are, in addition, the leading cause of antibiotic resistance and adverse events in hospitalized patients, causing a significant loss of healthy life years and increased mortality rates. This monograph, commemorating 19 years since the VINCat program was implemented in Catalonia in 2006, is a recognition to all healthcare professionals from various sectors (hospitals, long-term care facilities, and primary care) who believe in the program's benefits and actively collaborate in preventing and controlling HAIs. This editorial also serves as a special tribute to the first director of the VINCat program, Dr. Francesc Gudiol, and to the director of Catalan Health Service at the time Dr. Josep Maria Argimón. Their visionary leadership and resolute determination two decades ago were instrumental in launching VINCat, successfully blending expertise with the essential financial support to ensure its implementation and growth.[1]

Over this period, we have gained significant knowledge, enhanced intervention capacities, and improved the program. Most importantly, we have prevented thousands of HAIs and related deaths within our healthcare system. This special issue of *Enfermedades Infecciosas y Microbiología Clinica* explores the trends of key surveillance indicators and highlights the program's ongoing efforts.

Over the years, experience has shown that eliminating HAIs remains exceptionally challenging, even with robust prevention and control programs. This challenge arises from multiple factors, including shifts in patient demographics, which now feature higher levels of frailty, greater comorbidity rates, and an aging population. Furthermore, advancements in medical practices have led to a significant increase in invasive procedures – such as vascular and urinary catheterization, as well as more frequent and complex surgeries – that amplify patient risk. Compounding these issues is the growing prevalence of multidrug-resistant organisms within healthcare settings, which facilitates colonization and leads to infections that are increasingly difficult to treat.

HAIs are the most common adverse events in healthcare settings highlighting the inherent risks of human-provided care.[2] However, an estimated 35–55% of HAIs are preventable through evidence-based practices such as consistent hand hygiene and adherence to infection prevention protocols irrespective of a country's income level.[3]

A landmark study in this field is the *Study on the Efficacy of Nosocomial Infection Control* (SENIC), conducted by Dr. Robert Haley in the United States during the 1970s.[4] This study demonstrated that implementing hospital-based surveillance and infection control programs could significantly reduce infection rates. Hospitals with active programs experienced a 30% reduction in HAIs, while those without such programs saw an 18% increase. SENIC also identified key components for effective infection control programs, including structured prevention and control activities, dedicated infection prevention professionals (medical and nursing staff), and systems for reporting infection rates to frontline healthcare workers. These findings established the foundation for the global implementation of infection prevention control programs (IPC), emphasizing the critical role of active, continuous epidemiological monitoring in reducing HAIs.

Despite these advancements, implementing IPC programs remains inconsistent worldwide. Significant gaps persist, particularly in developing countries, where resources and infrastructure for IPC are often insufficient.[5] Data from the latest prevalence survey of HAIs in European hospitals, conducted by the European Centre for Disease Control (ECDC), estimate that approximately 5 million patients (7.1%) annually develop an HAI in Europe, resulting in nearly 100,000 deaths.[6] In Catalonia, a region of Spain with 8 million inhabitants, 19,000 acute care hospital beds, and 986,000 annual hospitalizations, the annual prevalence survey according to VINCat data indicate that approximately 6.7% of patients – thousands each year – suffer an HAI during hospitalization, primarily surgical site, respiratory, or urinary infections. These figures underscore the critical threat to patient safety and well-being, highlighting the continued relevance and value of programs like the VINCat.

The guidelines issued by the World Health Organization (WHO) and the ECDC on the "Core Components" and "Core Competencies" of infection prevention and control (IPC) programs have been a valuable resource for assessing the strengths and identifying areas for improvement within the VINCat program.[7,8] A critical element of VINCat's success lies in integrating performance-based objec-

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tives into the Catalan Health Service's contractual agreements with healthcare facilities participating in the program. These objectives include key objectives, such as the composition and dedication of IPC staff – according to hospital admission volumes and complexity levels. Other contractual agreements include mandatory participation in surveillance indicators: point prevalence studies of HAIs in both acute-care and long-term care facilities; surveillance of vascular catheter-related bloodstream infections; surgical site infections for high-impact procedures such as colorectal, prosthetic (knee and hip arthroplasties), and cardiac surgeries; ventilator-associated pneumonia in intensive care units (ICUs); patterns of antibiotic consumption and antimicrobial susceptibility; and the use of alcohol-based hand rubs. These measures have provided a framework for targeted preventive interventions, resulting in substantial improvements. Most notably, there has been a significant reduction in the incidence of the most prevalent infections, including a remarkable decline in colorectal surgical site infections in recent years.[9]

The VINCat program has shown exceptional adaptability to the evolving dynamics of the healthcare landscape. In Catalonia, as in other advanced healthcare systems, significant shifts have occurred over recent decades. Hospital bed numbers have decreased, intensive care unit (ICU) capacity has expanded, major outpatient surgeries have become more common, and hospital stays have shortened.[10] These changes have intensified the severity of hospitalized patients' conditions, led to persistently high antibiotic consumption, and driven the emergence of multidrug-resistant organisms. These include extended-spectrum beta-lactamase (ESBL) and carbapenemase-producing Gram-negative bacilli and a notable rise in *Clostridioides difficile* infections.

Simultaneously, the demand for long-term care beds and primary care services has grown exponentially. The VINCat program has expanded its surveillance efforts to encompass these care settings. It now monitors annual antibiotic consumption in 63 acute care hospitals, 87 long-term care facilities, and 43 primary care management areas. Additionally, antimicrobial susceptibility reports are published annually across all three domains – hospitals, long-term care facilities, and primary care.

This availability of comprehensive data on antibiotic consumption and resistance has enabled the development of targeted strategies to optimize antibiotic use. Specific interventions include improving empirical treatments for urinary tract infections caused by *Escherichia coli*, reducing the duration of antibiotic therapies in surgical procedures, and promoting rapid streptococcal tests for pharyngitis in primary care. These initiatives demonstrate VINCat's commitment to adapting its surveillance and intervention strategies to meet the challenges of an ever-changing healthcare environment.

The primary challenge for the VINCat program lies in sustaining its current achievements amidst ongoing economic constraints. Healthcare authorities must continue prioritizing the prevention and control of HAIs and antimicrobial resistance (AMR). A robust, well-supported prevention and control program is essential for patient safety and maintaining the overall efficiency and quality of the healthcare system. Achieving this goal requires ensuring the availability and structure of infection control teams across all care settings, enhancing knowledge transfer to frontline professionals, and fostering adherence to evidence-based IPC practices. The role of the VINCat in driving these initiatives will remain critical. Looking ahead, the rapid advancement of artificial intelligence (AI) presents significant opportunities for infection control. AI can automate routine surveillance tasks, reduce the manual workload of infection prevention teams, and improve data quality and analysis. By leveraging AI, the program can enhance its surveillance and intervention capabilities, enabling faster identification of outbreaks, predictive modeling of infection risks, and more precise targeting of preventive measures. In addition to AI, integrating rapid diagnostic technologies to optimize resource utilization and other diagnostic initiatives – such as blood culture stewardship and rapid detection methods for multidrug-resistant organism colonization – can reduce unnecessary antibiotic use, accelerate treatment decisions, and improve patient outcomes.

Reflecting on the VINCat program's 19-year journey underscores its critical contributions to public health in Catalonia. The program has succeeded substantially in improving patient safety and reducing HAIs. However, ensuring its continuity and evolution is essential to meet future public health demands.

CRediT authorship contribution statement

Both authors have contributed equally to the development of this article.

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