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Editorial

Surgical Infections: Surveillance for Improvement☆

Infección quirúrgica: vigilar para mejorar

Healthcare-associated infections (HAI), or nosocomial infections, have a negative impact on patient health and place a significant care and financial burden on healthcare systems. They are considered the most preventable cause of serious adverse events in hospitalized patients.[1] Surgical site infection (SSI) is one of the most frequent nosocomial infections in Europe[2,3] as well as Spain,[4] entailing a considerable increase in costs and hospital stay.[5] In Spain, 5% of patients who undergo surgery are affected by SSI,[4] and close to half of SSI are considered preventable.[6] Before establishing prevention programs, however, prior understanding of the actual situation is necessary.

The epidemiological surveillance of SSI aims to determine the dimension of the problem as a step prior to being able to make improvements: information for action.[1] For a program to be effective, HAI surveillance must be active, prospective and continuous[7,8] during a surveillance period of 30–90 days after the procedure, as a high percentage of SSI are detected after discharge.[9]

The National Nosocomial Infections Surveillance (NNIS) System was established in 1970 in the United States as the first structured surveillance program for hospital infections.[10] Its objectives were to describe the epidemiology of hospital infections, promote epidemiological surveillance and facilitate the comparison of infection rates between hospitals (benchmarking).[11] The SENIC study was the first to demonstrate that infection surveillance and control programs are associated with a reduction in nosocomial infection rates.[12] It found a 30% decrease in HAI in hospitals that had effective surveillance programs, especially surgical infections (35%), while in centers without surveillance systems the overall infection rate increased by 18%. The only factor that contributed to reducing all-type nosocomial infection rates was epidemiological surveillance.

Initially, these programs were aimed at 'global surveillance' of hospital infections, but it soon became apparent that this objective was disproportionate in terms of the resources used. Pragmatism imposed a conceptual shift toward 'surveillance by objectives', focused on monitoring a number of process indicators (for example: usage of antiseptic alcohols and antibiotics, compliance with prophylaxis, femoral catheter rate in the ICU) or results (HAI rates, catheter-related bacteremia, prosthetic or colorectal SSI, pneumonia associated with mechanical ventilation, incidence of resistant microorganisms, or *Clostridium difficile* diarrhea).

The essential components of effective programs include: structured actions for the prevention and control of hospital infection, a specially trained doctor, one infection control nurse for every 250 beds, and a system for informing surgeons of infection rates. Inspired by pioneering experiences, various surveillance systems have emerged in other countries, such as VICNISS in Australia, RAISIN in France, or KISS in Germany.

In Spain, the *Estudi de Prevalença de la Infecció Nosocomial de Catalunya*, in 1988, planted the seed for the Study of the Prevalence of Nosocomial Infections in Spain (EPINE), which was started in 1990. Apart from the EPINE program, which only analyzes the prevalence of HAI, several active surveillance initiatives have been developed, such as the non-institutional working group Clinical Indicators of Continuous Quality Improvement (INCLIMECC), formed in 1997. Also, the Nosocomial Infection Surveillance (VINcat) system of public hospitals began in Catalonia in 1999 and extended to the entire Spanish territory in 2006 as the Nosocomial Infection Surveillance program. Currently, most autonomous regions of Spain have HAI surveillance programs in various stages of implementation.

Compared to other European countries, the overall panorama in Spain is, at the very least, improvable. In the 2011–2012 HAI prevalence report of the European Center for Disease Prevention and Control (ECDC), Spain is the European country with the highest SSI/HAI ratio (29%).[2] The same report states that the number of nursing professionals in Spain specialized in infection prevention and control is below the European average, and it is also below the rate established by the SENIC

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of 1/250 beds. Furthermore, specific SSI incidence reports by the ECDC include data from 14 EU member-states and Norway, but they do not have data for Spain.[13] It is no less worrying to remember that the objective defined by the SENIC back in 1977, that of providing information to surgeons about their SSI rates, is far from commonplace in Spain. In surveys carried out by the Surgical Infection Observatory, with the participation of Spanish surgeons from nine different specialties, 50% do not receive feedback on the SSI rates of their unit. This is even true for a subspecialty with a high risk of infection like colorectal surgery, where only 70% of surgeons know their SSI rate. Finally, there is currently no effective system at the national level for active surveillance and notification of surgical infections. Moreover, the few existing global initiatives collect data from few hospitals (64 in the case of INCLIMECC[14] or 50 in the case of Zero Surgical Infection [IQZ][15]).

With SSI prevalence results that show room for improvement, the need for an active and homogeneous surgical infection prevention and control program seems obvious. In 2015, a national framework document was published about the Surveillance System for Healthcare-Associated Infections,[7] based on a systematic review of the surveillance systems of other countries and of the autonomous communities, comparing regional systems existing at that time (Andalusia, the Canary Islands, Catalonia and Madrid), as well as the INCLIMECC and the Healthcare-associated Infections Surveillance Network (HAI-Net) of the European Center for Disease Prevention and Control (ECDC). Likewise, the Surveillance and Control Protocol for surgical site infection[16] was published in 2015, which is in an initial phase of implementation. Its aim is to determine the cumulative incidence of SSI for a series of surgical procedures (coronary artery bypass, colon surgery, hip and knee prostheses), providing communities and hospitals with national incidence rates, thereby contributing toward reducing SSI rates and participating in the surgical infection surveillance network of the ECDC. However, after consulting official web platforms, we were not able to find information on the degree of implementation of the program or its initial results.[17]

Epidemiological surveillance is a vitally important instrument to identify, measure and analyze health problems and, based on these data, to make decisions aimed at resolving issues. It is the first step toward an intervention that would allow for detected errors to be corrected and results improved. It is in this second phase of intervention where initiatives have already been implemented, such as the IQZ throughout Spain or the Program for the Prevention of Surgical Infection in Catalonia (PREVINQ-CAT), which propose preventive measures to reduce surgical infections. IQZ was not proposed as a surveillance system, but rather to reduce SSI by implementing a bundle of five prevention measures. Its secondary purpose is to collect the application of these measures and their results for their registration with the National HAI Surveillance System.[18] PREVINQ-CAT was born from the experience of continuous surveillance of surgical infection since 2006 and proposes two bundles of twelve measures applicable for all types of surgeries, plus three specific packages for colorectal, orthopedic and cardiac surgery.[19] Both initiatives are an example of where we could advance from a nationwide global surveillance program.

We know the indicators that should be measured in an epidemiological surveillance program, and we know that it is a dynamic process that involves data collection, analysis and dissemination of results. From here, imaginative efforts are necessary to unite the initiatives seen in different territories of Spain, combining them for the common good of surgical patients. Simultaneously, the suffering Spanish public healthcare system must be provided with sufficient resources, including an increase in the ratio of nurses specialized in infection prevention and control to reach international levels and ensures the necessary administrative and technological resources.

The field of private medicine is not excluded from surveillance or prevention programs like IQZ or PREVINQ-CAT. The considerable percentage of patients that are operated on at these hospitals outside the public healthcare system (around 30% of the procedures performed in our country) must receive the same high-quality care, overcoming the problems of lack of protocol homogeneity that often arise in these hospitals.

There are controversial aspects that should be debated. The publication of the results is necessary to ensure benchmarking and transparency of the system. However, to contribute to reliable data input, these results should not be used in hospital funding.

Finally, we are in a moment of transition from active, laborious and almost handcrafted surveillance toward automated or semi-automated surveillance that takes advantage of the possibilities offered by today's computer technology. The evolution of surveillance systems will take advantage of the new possibilities offered by artificial intelligence, allowing for automated detection of adverse events for suspected SSI based on the patients' clinical course, microbiology reports, or codes for diagnoses, procedures, complications and readmissions. The concepts of mobile-health, natural language processing, machine learning, Bayesian network, big data analytics,[20] etc. will undoubtedly revolutionize postoperative infection surveillance programs and free up time for the infection control teams to implement education and prevention programs in hospitals.

Einstein claimed that if he had an hour to save the world, he would spend fifty-five minutes defining the problem and only five minutes searching for the solution. Surveillance and knowledge of infection rates is the first essential step toward defining the problem, after which we can work on solutions to reduce its incidence.

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