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Editorial

When monitoring is not enough. Results of postoperative infection prevention bundles and a proposal



Quando vigilar no es suficiente. Resultados de los bundles de prevención de la infección postoperatoria y una propuesta

For the World Health Organisation, active surveillance of healthcare associated infections (HCAI) is one of the core components of infection control programmes¹. Surgical site infection (SSI) is one of the 3 most frequent HAIs, is partially preventable and is very costly for the patient and healthcare systems, so the establishment of systems for its epidemiological surveillance should be unavoidable.

However, our reality tells us that this is not the case. Although SSI surveillance may be feasible at the level of a hospital or a specific surgical procedure, the establishment of such programmes at the national level is so complex that it has not materialised in some European countries, including Spain. The peculiarities of the decentralised Spanish healthcare system have so far not allowed the implementation of a comprehensive infection surveillance programme, despite detailed projects outlined by the Ministry of Health².

Accepting that SSI surveillance is certainly important, it may be that the lack of such a programme is now an opportunity rather than a major drawback. Perhaps this is no longer a time for 20th century-style infection control systems, but rather a time to “screen out” and move towards more modern systems with automated surveillance and intervention at their core. And there are arguments close to home, which we will try to unfold, to defend this proposal.

Surveillance of postoperative infection provides a detailed understanding of its scale and is based on the truism that any solution begins with identifying and understanding the problem. Systematic epidemiological surveillance programmes, whether at the level of a hospital or a network of hospitals, have achieved a clear and sustainable decrease in infection rates³, particularly during the first years of their existence. What remains to be determined is the cost-effectiveness of such active, manual clinical surveillance for the prevention of surgical infection, given the considerable

investment in human and organisational resources required. Moreover, the effectiveness of these programmes is not without controversy, with some studies showing heterogeneous results or even a stagnation of their effect over the years⁴.

This leads to the question of whether surveillance in itself is sufficient or whether it is better to direct available resources towards programmes that introduce quality improvement initiatives or specific prevention interventions, which may be more efficient. It is in this area that a process-structured style of working, using bundles (or groupings of measures) combined with checklists to facilitate compliance and complemented by education and dissemination programmes, becomes important.

This would involve moving from purely informative surveillance systems to programmes that introduce interventions aimed at changing the course of events, from being mere spectators of infection rates to being protagonists in their decline. It is in this area of bundles that there are already several positive experiences in Spain.

The bundle concept appeared in the medical literature at the beginning of the new millennium, with the initiatives of the Institute for Healthcare Improvement and the ICU catheter sepsis prevention bundle⁵. The concept was extended to surgery in 2003, thanks to the American Joint Commission, which focused on SSI preventive intervention. Initially, prevention bundles were described as a limited set of 3–5 simple and robust practices that were shown to be most effective when implemented together. Since then, there has been an extensive literature on the use of bundles in all types of surgery and the advantages of creating a culture of safety and fidelity to evidence-based checklists⁶.

However, most of the published bundles have been developed within the framework of a single hospital and

few of them are regional or national in scope, intended for use in a network of different hospitals. Some authors argue that SSI prevention bundles may be more difficult to implement on a multi-centre scale and that the clinical efficacy of nationwide programmes is not fully demonstrated.

In this regard, Spain has had the Zero Surgical Infection (ZSI)⁷ project since 2017, an initiative of the Spanish Society of Preventive Medicine, Health and Hygiene, which was sponsored by the Ministry of Health and joined by various scientific societies of anaesthesiology (SEDAR), gynaecology (SEGO), orthopaedics (SECOT), surgical nursing (AEEQ) and the Spanish Association of Surgeons. The ZSI project proposes a bundle of 5 preventive measures for any type of surgery: adequate iv antibiotic prophylaxis; skin antisepsis with alcoholic chlorhexidine; avoidance of hair removal from the surgical field or removal with electric clippers; maintenance of normothermia and perioperative glycaemia control; ZSI is also a mixed project that aims to collect the level of implementation of these measures and establish a surveillance system of SSI rates to facilitate the reporting of data to the National Surveillance System of HCAI. In 2019, ZSI involved 50 Spanish hospitals, with a somewhat heterogeneous distribution by autonomous region. According to project data, 55.5% of participating hospitals chose to adopt all 5 recommendations and 26.2% the 3 basic ones. The levels of compliance with 3 or 5 measures of the bundle were 86.8% and 56.7% in 2018, respectively.

Unlike ZSI, most of the bundles disseminated in general surgery are focused on colorectal surgery, no doubt in an attempt to decrease infection rates of up to 30% reported in this speciality. At least 3 meta-analyses⁸⁻¹⁰ have shown that, when proper adherence to specific evidence-based bundles is achieved, the risk of SSI in colorectal surgery is reduced by an average of 40%–50%. However, published colorectal bundles are composed of a wide range of recommendations and, moreover, do not achieve homogeneous results¹¹. In some cases, even with high adherence to the bundle components, no reduction in SSI rates was achieved^{12,13}, suggesting that, apart from the “bundle effect”, the correct selection of measures is the key to success¹⁴.

Analysed in detail, most of the published colorectal packages showed a beneficial effect on global SSI or superficial SSI, but in most of them organ-to-space SSI (O-E SSI) was not affected, probably because different types of infection have different pathogenesis and risk factors. This makes it difficult for the elements included in a prevention package to be effective for all types of SSI.

It is precisely in relation to colorectal surgery where another of the state initiatives related to bundles is born, within the programme for the Surveillance of Healthcare-Related Infections in Catalonia (VINCat). VINCat is an active, prospective and voluntary surveillance programme, with the participation of 65 public and private hospitals, which has been monitoring 30-day SSI rates in colorectal surgery, among 25 other types of surgical procedures, since 2007. Due to the relative stagnation of overall SSI and O-E SSI, at rates around 19 and 10%, respectively, VINCat decided to move in 2015 to an interventional-type surveillance system. To this end, a multidisciplinary team of surgeons, infectious disease specialists, anaesthesiologists and surgical nurses designed a

bundle aimed at infection prevention for this type of surgery. Dissemination of the bundle, in 2016, was associated with a 23% decrease in SSI incidence in its first year of implementation and consolidated a continued decline over the following years. In the analysis of nearly 50,000 interventions between 2007 and 2021, overall SSI declined from 22% to 8% and O-E SSI from 10% to 5%, by 2021. Notably, the VINCat bundle shows efficacy in both colon and rectal surgery¹⁵ and especially at all 3 levels of SSI, including organ-space.

The good results of the colorectal bundle inspired the development of the Programme for the Prevention of Surgical Infection in Catalonia (PREVINQ-CAT), which proposes, in a similar way to ZSI, various packages of preventive measures to reduce infections in all types of surgical procedures and specialties. PREVINQ-CAT, launched in 2018, proposes 2 bundles (general and accessory) with a total of 12 measures applicable to all types of surgery, plus 3 specific packages for colorectal, orthopaedic and cardiac surgery. In addition to the 5 ZSI measures, PREVINQ-CAT issues recommendations on preoperative shower, surgical hand hygiene, laparoscopy, plastic wound protectors, wound cleansing with physiological saline and change of surgical material at the end of contaminated interventions.

In contrast to the initial theoretical framework of the bundles, which advised the inclusion of only a small number of measures with a high level of scientific evidence, PREVINQ-CAT took into account that in some bundles elements have been added that lack strong evidence, but are “surgical common sense” measures that pose minimal risk and have potential benefit to the patient. The inclusion of such recommendations in bundles that have subsequently proved successful has provided second-grade evidence for measures such as the policy of changing gloves after anastomosis and before fascial closure or the replacement of surgical instruments before wound closure^{16,17}. Thus, the number of measures included in bundles has also expanded, with data from 3 recent meta-analyses favouring greater efficacy of preventive packages recommending 11 or more elements^{10,17-19}. The PREVINQ-CAT programme has achieved in its first 4 years of implementation the adherence of 51 Catalan hospitals, with a high level of compliance with the preventive measures, and has been associated with a homogeneous decrease in SSI rates in monitored elective procedures, including orthopaedic surgery, cardiac surgery, caesarean sections, cholecystectomies and colorectal surgery.

The results of ZSI and PREVINQ-CAT probably show that, within the framework of a comprehensive prospective multicentre surveillance system, a common set of measures can be successfully introduced for all types of surgical procedures and applied in all hospitals.

At the national level, the Observatory of Infection in Surgery (OIC) was established in 2017 at the initiative of the ACS and integrates 17 scientific associations in the surgical field (<https://oincir.org/>). Based on the findings of various surveys on the implementation of SSI prevention measures in Spain, the OIC is developing a postoperative infection prevention programme coordinated with ZSI, reviewing the recommendations of clinical guidelines and current scientific evidence and highlighting more than 40 methods of infection prophylaxis. The 75 drafters of the OIC’s SSI Prevention Project

are developing checklists and packages of preventive measures for the different surgical specialties, recommending that they be associated with other checklists, such as those of the ERAS programmes or the operating theatre safety checklist, which can improve adherence to SSI bundles.

Finally, HCAI surveillance systems are in a transition from manual, labour-intensive, almost artisanal and inefficient surveillance to semi-automated or fully automated surveillance that takes advantage of the possibilities of artificial intelligence and its algorithms, based on big data analytics and the concepts of mobile-health, natural language processing, machine learning, and Bayesian network²⁰. This will revolutionise post-operative infection surveillance programmes and free up time for infection control teams to focus on infection education and prevention programmes in hospitals. Artificial intelligence enables automated detection of suspected SSI adverse events from clinical course text, microbiology reports, imaging scans or coding of diagnoses, procedures, complications and readmissions. There are already fully automated methods that can directly provide SSI rates and semi-automated methods that select cases for review by infection control teams, reducing their workload by up to 60%.

The current problem of the lack of a comprehensive HCAI surveillance system may provide the solution. In a context of high technical sophistication of surgery, a modern interventional surveillance system, which proposes active preventive measures in the form of bundles and checklists and implements automated surveillance of SSI rates supported by artificial intelligence, should be pursued.

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