



EDITORIAL

## Nosocomial infections in premature infants, where are we going?☆



## Infecciones nosocomiales en recién nacidos prematuros, ¿hacia dónde vamos?

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Nosocomial infections, also known as hospital-acquired infections, continue to be a major global public health concern. They are associated with increases in mortality, long-term morbidity, length of hospitalization and health care costs. Premature infants are particularly susceptible to nosocomial infections and constitute a higher patient burden compared with other populations in both low- and high-resource settings. Limited-resource countries participating in the International Nosocomial Infection Control Consortium reported rates of nosocomial infection in premature infants that were 10–20 times higher compared to those reported by neonatal intensive care units (NICUs) in the United States to the Centers for Disease Control and Prevention (CDC).

In low-resource settings, nosocomial infections are most often linked to poor hygiene practices, delayed identification of infection and the scarcity of antibiotics. In high-income countries, prolonged use of life sustain central lines in life support and the emergence of multidrug resistant strains due to extensive use of broad-spectrum antibiotics have been identified as major risk factors.

Neonatal intensive care units continue to take steps aimed at preventing nosocomial infection outbreaks, especially central line-associated bloodstream infections

(CLABSIs), which are the most frequent type in preterm infants. Evidence-based care of central lines has resulted in a decrease in the incidence of CLABSIs over the last decade. The National Institute of Child Health and Human Development (NICHD) reported a decrease from 4.9 to 1.5 infections per 1000 central line days between 2007 and 2012,<sup>1</sup> with comparable decreases reported by the United States NICUs in the Vermont Oxford Network<sup>2</sup> and the NICUs included in the Canadian Neonatal Network.<sup>3</sup> The NICHD report evidenced a significant decrease in several states that achieved sustained zero CLABSI rates. Based on this finding, many institutions have implemented a policy of zero tolerance. Consequently, any nosocomial infection should be considered a failure.

Hand hygiene is the single most important preventive intervention for hospital-acquired infections overall. Aside from reducing the use of central lines and its duration, prevention bundles, which are sets of evidence-based measures that can improve outcomes when implemented together, have been particularly effective in preventing CLABSIs in the NICU setting. Lately, antibiotics stewardship programs and the use of the Kaiser ‘‘neonatal sepsis calculator’’ have been encouraged with the aim of promoting a more rational use of antibiotics and preventing the emergence of multidrug-resistant organisms.

Neonatal infection surveillance programmes are useful tools for improving and understanding the epidemiology of infection and the impact of quality-improvement interventions, contributing to reduce infection rates and effectively preventing the development of drug resistance. These

☆ Please cite this article as: del Moral T. Infecciones nosocomiales en recién nacidos prematuros, ¿hacia dónde vamos? An Pediatr (Barc). 2019;91:1–2.

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programmes are based on the collection of prospective data on infection episodes in NICUs with the aim of monitoring changes in the epidemiology of pathogens and in antimicrobial susceptibility. Although some reports question the efficacy of survey systems as a means to prevent nosocomial infections, many others have demonstrated positive results, and several neonatal infection surveillance programmes have been established worldwide.

In the article published in this journal, "Implementation of NeoKissEs in Spain: A validated surveillance system for nosocomial sepsis in very low birth weight infants",<sup>4</sup> the authors report the implementation of NeoKissEs, a surveillance program based on the NEO-KISS program originally developed and validated in Germany.<sup>5</sup> This programme is characterized by a patient-based rather than a unit-based format and the use of definitions specifically developed by a consortium of neonatologists. Although the original NEO-KISS established in Germany also collected data on ventilator-associated pneumonia and necrotising enterocolitis, the Spanish NeoKissEs report only includes episodes of sepsis. A system website that includes a database and directions on how to use the system were specifically developed for the purpose of the program. The authors describe the steps taken to implement the programme, emphasizing participation of multidisciplinary teams and good communication with frequent interaction and feedback as key factors for the successful participation of enrolled hospitals. Some of the strengths of this surveillance tool are the standardization of the definitions used and the easy access to the database. Within a few months, 45 hospitals that met the qualifying criteria became active participants and had collected data that could be used as a baseline and for comparisons among participating hospitals as well as with other health systems, which can guide the investigation of potentially modifiable risk factors.

Having introduced the programme, upcoming challenges include achieving consistent reporting over time and long-term sustainability. One way to meet these challenges is to institute mandated reporting of nosocomial infections in this population. In Germany, the rate of hospitals reporting CLABSI expanded when participation of NICUs became mandatory and NEO-KISS became the national nosocomial infection reporting system.<sup>5</sup> Similarly, in the United States, following the recommendations of the CDC, many states have enacted statutes that mandate submission of data on CLABSIs. A recent study found better reporting compliance in NICUs located in states where reporting is mandatory

compared with NICUs in states without such mandates (>90% vs 29–51%).<sup>6</sup> Canada also uses a similar system called SPIN (Surveillance Provinciale des Infections Nosocomiales). All these programs have reported success, improving rates of participation and decreasing rates of CLABSI.

The next step, therefore, should be to expand the NeoKissES program in Spain to make it the official nationwide surveillance program. From a public health perspective with a focus on patient safety and cost saving initiatives, the enforcement of mandatory reporting of nosocomial infections in this population by health care authorities and institutions seems a logical strategy.

The prevention of nosocomial infections continues to be a complex process within which a surveillance programme is an essential tool that contributes to tracking epidemiological trends, identifying risk factors and evaluating the effectiveness of preventive interventions. Collaborative efforts by health care providers, institutional commitment and the implementation of mandatory participation by the competent authorities are all important factors to achieve a successful and sustainable program.

## References

1. Patrick SW, Kawai AT, Kleinman K, Jin R, Vaz L, Gay C, et al. Health care-associated infections among critically ill children in the US, 2007–2012. *Pediatrics*. 2014;134:705–12.
2. Horbar JD, Carpentier JH, Badger GJ, Kenny MJ, Soll RF, Morrow KA, et al. Mortality and neonatal morbidity among infants 501 to 1500 grams from 2000 to 2009. *Pediatrics*. 2012;129:1019–26.
3. Shah J, Jeffries AL, Yoon EW, Lee SK, Shah PS, Canadian Neonatal Network. Risk factors and outcomes of late-onset bacterial sepsis in preterm neonates born at <32 weeks' gestation. *Am J Perinatol*. 2015;32:675–82.
4. Madrid-Aguilar M, López-Herrera MC, Pérez-López J, Escudero-Aragaluz J, Santesteban-Otazu E, Piening B, et al. Implementación de NeoKissEs en España: un sistema validado de vigilancia de la sepsis nosocomial en recién nacidos de muy bajo peso. *An Pediatr (Barc)*. 2018, <http://dx.doi.org/10.1016/j.anpedi.2018.06.020>.
5. Leistner R, Piening B, Gastmeier P, Geffers C, Schwab F. Nosocomial infections in very low birthweight infants in Germany: current data from the National Surveillance System NEO-KISS. *Klin Padiatr*. 2013;225:75–80.
6. Zachariah P, Reagan J, Furuya Y, Dick A, Liu H, Herzog C, et al. The association of state legal mandates for data submission of central line-associated bloodstream infections in neonatal intensive care units with process and outcome measures. *Infect Control Hosp Epidemiol*. 2014;35:1133–9.