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Practice Points

Reducing central-line-associated bloodstream infections by half: it is possible

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Healthcare-associated bloodstream infection (BSI) and especially central-line-associated bloodstream infection (CLABSI) are known to be preventable in up to 70% of cases [1–3]. In acute care hospitals, mean CLABSI rates of 1.44–20.90 per 1000 central-line-days (CLD) in the intensive care units (ICUs) of the International Nosocomial Infection Control Consortium (2010–2015) have been reported [4]. The Belgian incidence of healthcare-associated BSI, at 8.4 per 10,000 patient-days, has changed little during recent years in acute care hospitals (www.nsih.be). One healthcare-associated BSI out of four was classified as CLABSI. At University Hospitals Leuven, surveillance of CLABSI started in the year 2012. Because of an initially high CLABSI rate of 4.4 and 6.1 per 1000 CLD in non-ICU and ICU units respectively, a hospital-wide quality improvement project was initiated.

We aim to report how we established a multi-faceted approach to reduce CLABSI incidence, using evidence-based practices for central-line insertion and maintenance. Well-defined surveillance definitions were used, based on both US Centers for Disease Control and Prevention and Belgian surveillance definitions [5–7]. Numerators were extracted from the Laboratory Information System and checked with medical charts. Per quarter, blood and catheter tip culture results from all patients were scored according to the CLABSI definition.

As an outcome measure for this improvement project, the number of CLABSIs per 1000 CLD was assessed per ward. The benchmark for action was internally determined as surpassing one CLABSI per 1000 CLD during two consecutive quarters [5].

Figure 1 presents the evolution in quarterly CLABSI rates, starting from quartile (Q)4, 2012 up to Q2, 2020 and stratified between ICU and non-ICU units. A hospital-wide significant and persistent decline of 61% CLABSIs was reached over the consecutive years of surveillance, with 1.3 and 2.8 CLABSIs per 1000 CLD on non-ICU and ICU units, respectively, in Q2, 2020.

The quality improvement actions leading to the observed decline in CLABSI rate in our hospital were multi-faceted, involving both basic infection control measures and technological interventions.

Basic socio-adaptive interventions to improve compliance with the catheter insertion and catheter care procedure were implemented first. As was demonstrated by the Study of the Efficacy of Nosocomial Infection Control (SENIC), surveillance is an important aid when starting with a programme to reduce CLABSI [8]. Our obtained surveillance data were reported to all involved healthcare workers of the hospital wards. This feedback makes them aware of the problem and empowers them in understanding the importance of compliance with hand hygiene principles and care bundles. On the other hand, stakeholders may ask for interventions based on high CLABSI rates.

Adherence to the indications for hand hygiene was measured with focus on hand hygiene before approaching a central line, supplemented with items of the catheter care and the catheter insertion bundle. Training techniques such as simulation-based training and locally developed e-learning modules focusing on the correct aseptic technique before catheter insertion and access were introduced.

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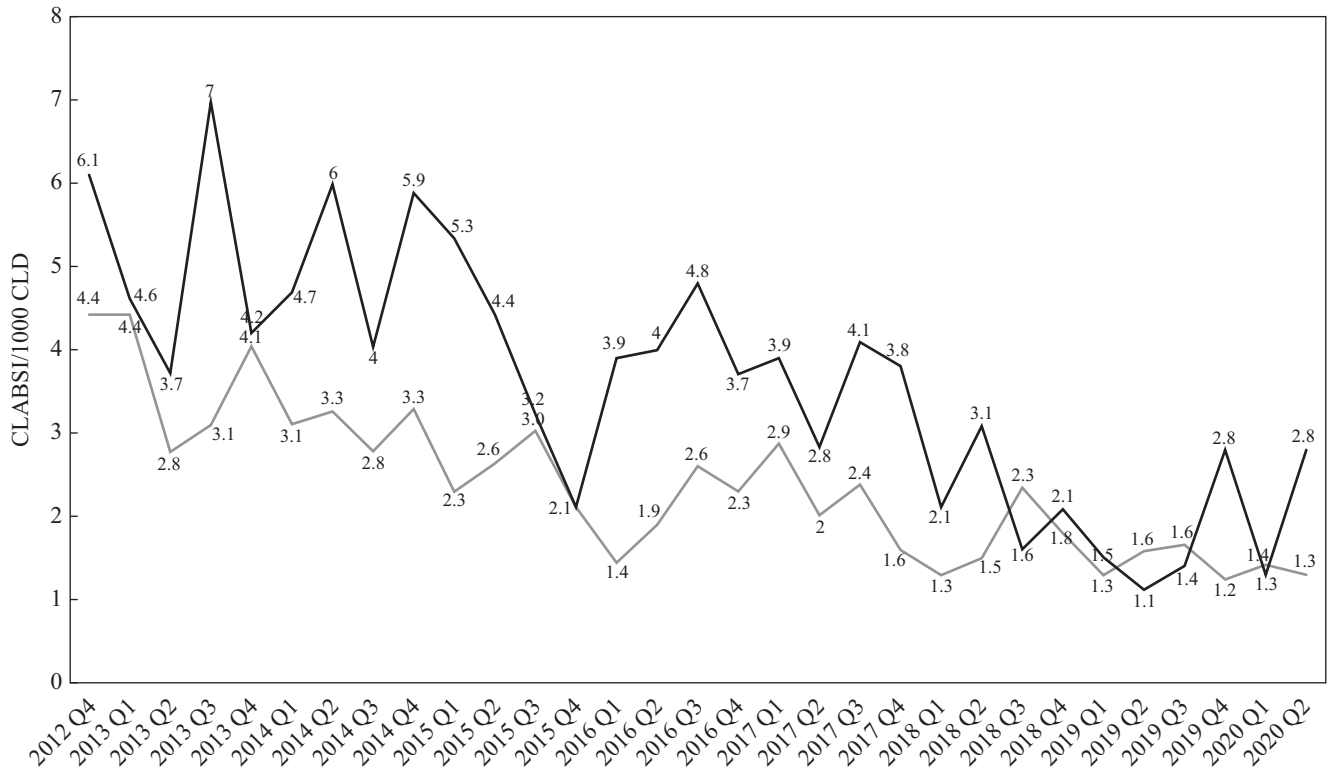

Figure 1. Evolution in quarterly central-line-associated bloodstream infection rate per 1000 central-line-days (CLABSI/1000 CLD) in intensive care units (ICU; black line) and non-ICU units (grey line), University Hospitals Leuven, from Q4, 2012 to Q2, 2020.

After having reached a stable and good compliance rate due to these basic interventions, continued surveillance permits to check the need for supplementary actions.

In case the CLABSI rate was still higher than the benchmark of more than one CLABSI per 1000 CLD, technological interventions were performed. The latter interventions may be implemented either hospital-wide or were ward-specific based on a risk assessment. Hospital-wide interventions in our setting included a change to chlorhexidine digluconate (CHG) 2% in alcohol 70% for catheter insertion and care. A standardized care plan per catheter type integrated in the electronic patient file was another hospital-wide intervention offering healthcare workers a reminder to check all items of a catheter care bundle while caring for a patient; a daily check of the necessity of the central line, visual inspection of the insertion site, dressing change, and administration set replacement are integrated in this care plan.

In selected wards with persistently high rates of CLABSI, specific technological interventions were introduced: a CHG dressing, CHG washcloths, antimicrobial-coated catheters, and a custom-made administration set with needleless connectors and hub protectors.

The CLABSI rate in our hospital decreased from 4.4 to 1.3 per 1000 CLD on non-ICU and from 6.1 to 2.8 CLABSIs per 1000 CLD on ICU units between Q4, 2012 and Q2, 2020, respectively (decrease of 71% and 54%). The proportion of units (ICU and non-ICU units) achieving a CLABSI rate of less than one per 1000 CLD per quarter gradually increased from 40% to 58% between Q4, 2012 and Q2, 2020. As expected, the use of central lines also decreased over the years, with an almost 10% decline from 32,338 CLD in Q4, 2012 to 29,334 in Q2, 2020. In addition, the COVID-19 pandemic did not hamper this positive evolution.

In conclusion, by contrast with national data reporting little change in CLABSI rates in Belgian hospitals between 2013 and 2019, the CLABSI rate and catheter utilization ratio have been decreasing in our hospital since 2012. A large-scale quality improvement project with continuous surveillance together with basic infection prevention and technological interventions to scale up quality of central line insertion and maintenance practices enabled this success.

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None declared.

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References

[1] Pronovost PJ, Watson SR, Goeschel CA, Hyzy R, Berenholtz S. Sustaining reductions in central-line associated bloodstream infections in Michigan intensive care units: a 10-year analysis. Am J Med Qual 2016;31:197—202.

[2] Latif AL, Kelly B, Edrees H, Kent P, Weaver S, Jovanovic B, et al. Implementing a multifaceted intervention to decrease central line

associated bloodstream infection in SEHA (Abu Dhabi Health Services Company) intensive care units: the Abu Dhabi experience. Infect Control Hosp Epidemiol 2015;36:816—22.

[3] Umscheid CA, Mitchell MD, Doshi JA, Agarwal R, Williams K, Brennan P. Estimating the proportion of healthcare-associated infections that are reasonably preventable and the related mortality and costs. Infect Control Hosp Epidemiol 2011;32:101—14.

[4] Rosenthal V, Al-Abdely H, El-Kholy AA, Aziz AlKhawaja SA, Leblebicioglu H, Mehta Y, et al. International Nosocomial Infection Control Consortium report, data summary of 50 countries for 2010—2015: device-associated module. Am J Infect Control 2016;44:1495—504.

[5] Dudeck MA, Edwards JE, Allen-Bridson K, Gross C, Malpiedi P, Peterson K, et al. National Healthcare Safety Network report, data summary for 2013, device-associated module. Am J Infect Control 2015;43:206—21.

[6] Sciensano. Surveillance of bloodstream infections in Belgian hospitals. Report 2020. Data up to and including 2019. Available at: https://www.sciensano.be/sites/default/files/bsi_report_2020.pdf [last accessed August 2022].

[7] National Healthcare Safety Network. Bloodstream infection event (central-line associated bloodstream infection and non-central line associated bloodstream infection). NHSN; January 2021. https://www.cdc.gov/nhsn/pdfs/pscmanual/4psc_clabscurrent.pdf [last accessed July 2022].

[8] Haley RW, Culver DH, White JW, Morgan W, Emori T, Munn V, et al. The efficacy of infection surveillance and control programs in preventing nosocomial infections in U.S. hospitals. Am J Epidemiol 1985;121:182—205.