Rangel-Frausto MS, Higuera F, Rosenthal VD, et al. Probability of Developing a Central Vascular Catheter Associated Bloodstream Infection When Comparing Open and Closed Infusion Systems in Mexico. In: Proceedings and Abstracts of the17th Annual Scientific Meeting of The Society for Healthcare Epidemiology of America; 2007 April 14-17; Baltimore, U.S.A.; 2007. p. 96.

Probability of Developing a Central Vascular Catheter Associated Bloodstream Infection When Comparing Open and Closed Infusion Systems in Mexico.

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OBJECTIVE:
To determine the probability of developing a central vascular catheter associated bloodstream infection (CVC-BSI) when comparing open and closed infusion systems (Viaflex®) in four intensive care units (ICUs) of Mexico City, Mexico..

METHODS:
An open label, prospective cohort, active healthcare associated infection surveillance, sequential study was conducted. The study was undertaken in adult patients admitted to four tertiary-care ICUs who had a CVC in place for at least 24 hours. CDC National Nosocomial Infections Surveillance Systems (NNIS) program definitions were used to define device associated infections. The probability of developing a CVC-BSI during the open infusion system period was compared to the probability of developing a CVC-BSI during a closed infusion system period. Time to first BSI was analyzed using a log rank test and is presented graphically using Kaplan Meier curves. The time to first CVC-BSI was examined in sequential three-day intervals. In addition, simple life table conditional probabilities are presented graphically to help explain the changing risk of infection over time.

RESULTS:
From December 2002 to November 2003, 1096 adult ICU patients with CVC in place for >24 hours were enrolled. Compliance with CVC site care (> 98%) and hand hygiene ($\geq$70%) was achieved during both periods.
The CVC-BSI rate during the open period was 16.1 CVC-BSI per 1,000 CVC days and during the closed period was 3.2 CVC-BSI per 1,000 CVC days (RR = 0.20, 95% CI = 0.11 – 0.36, P < 0.0001).

By examining the three-day intervals in the closed period, the conditional probability of acquiring a CVC-BSI was observed to be relatively constant (1.4% at days 2-4 to 0.5% at days 8-10).
In the open period, the conditional probability of acquiring a CVC-BSI was higher in each three-day interval compared to the corresponding three-day intervals in the closed period. The conditional probability of acquiring a CVC-BSI in the open period ranged from 4.9% at days 2-4 to 5.4% at days 8-10)

Overall, the chance of a patient acquiring a CVC-BSI was significantly decreased by 81% in the closed period (Cox proportional hazard ratio 0.19, $P < 0.0001$).

CONCLUSION:
To evaluate the effect of time on CVC-BSI, the probability of developing a CVC-BSI was assessed in sequential three-day intervals during each period. In the 2002 CDC guidelines, the recommendation was to not routinely replace CVC at fixed intervals. In our study, the BSI rate over time during the closed period remained constant and achieved levels published in the NNIS report. Whereas the cumulative probability of acquiring a CVC-BSI during the open period significantly increased over time and was higher than those reported by NNIS. Thus, by using this closed system the CDC guidelines can be followed. Adoption of a closed infusion system resulted in significant reductions of cumulative probability of developing a CVC-BSI.