The relation between the compliance with an intervention bundle and the risk of central line associated bloodstream infections

Emma Smid*[1], Sabine de Greeff[1], Suzanne Geerlings[2], Margreet C. Vos[3], Mayke Koek[1]

[1]National Institute for Public Health and the Environment (Rivm), Epidemiology and Surveillance, Bilthoven, Netherlands

[2]Academic Medical Center - University of Amsterdam, Department of Internal Medicine, Amsterdam, Netherlands

[3]Erasmus MC University Medical Center, Medical Microbiology and Infectious Diseases, Rotterdam, Netherlands

Background: Central venous catheters (CVC) are an important cause of bloodstream infections leading to additional treatment, increased hospital stay and increased costs. In 2009 an 6-item intervention bundle was implemented to prevent central line associated bloodstream infections (CLABSI) in Dutch hospitals. Four items were aimed to optimize hygienic/sterile insertion of the CVC: hand hygiene, precautions during insertion, disinfection of the skin and selection of insertion site. The two other items consisted of daily checks: a daily check on the indication of the CVC, and a daily check of the insertion site on the presence of infection symptoms. Hospitals were asked to report compliance or non-compliance with these 6 items together with the incidence of CLABSI within the Dutch nosocomial surveillance network (PREZIES). The aim of this study was to determine the impact of the compliance with the intervention bundle on the incidence of CLABSI in The Netherlands.

Material/methods: From 2009 to 2013, data from hospitals reporting compliance or non-compliance with the intervention bundle for at least 80% of their CVCs annually were included. CLABSI incidence rates were estimated using multilevel Cox regression and reported as hazard ratios (HR). We analyzed the effect on CLABSI incidence of compliance with the entire bundle and we separately analyzed the effect of compliance with the 4 items reported during insertion and the 2 daily check items. Multilevel Cox regression techniques were used, adjusted for age, gender, application, insertion site and year of participation.

Results: From 2009 to 2013 we obtained data from 33 hospitals reporting (non-)compliance with the intervention bundle for at least 80% of the CVCs annually, resulting in data of 12,139 CVCs and 83,629 catheter-days of 9,105 patients. The annual CLABSI incidence per 1000 CVC-days significantly decreased from 2.4 in 2009 to 2.0 in 2013 (p=0.02). Compliance with the 4 bundle-items measured during insertion of the CVC was associated with a reduction in the risk of a CLABSI, although this effect was not statistically significant (HR=0.94, 95% CI 0.88-1.00) when compared to non-compliance or partial compliance. Similar analyses for the two daily check bundle items and for the total bundle revealed a positive association with the risk for CLABSI (HR: 1.19, 95%CI 1.14 – 1.25 and HR=1.13, 95%CI: 1.08 - 1.18 respectively).

Conclusions: After implementation of the intervention bundle, a significant reduction in CLABSI was observed. Compliance with the bundle items measured during insertion of the CVC was non-significantly associated with a reduction in the risk of CLABSI. Reported Compliance with the entire bundle however was associated with an increase in the risk for CLABSI. Presumably the daily check items were better reported with patients having an increased risk of infection.