Incidence of Central Line Related/Associated Bloodstream Infections in an Acute Hospital

Abstract:
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Bloodstream infection related to a central venous catheter (CVC) in the intensive care unit (ICU) is a substantial clinical and economic problem. Attributable mortality is estimated between 2% and 35%, and length of stay in the ICU is thought to increase by 9.5 to 11.9 days, causing substantial economic cost and excess morbidity. 1 Preventative strategies include reducing the number of catheter days, using dedicated central line teams, sterile semi permeable dressings and removing the intravascular catheter as soon as possible.

Introduction
Bloodstream infection related to a central venous catheter (CVC) in the intensive care unit (ICU) is a substantial clinical and economic problem. Attributable mortality is estimated between 2% and 35%, and length of stay in the ICU is thought to increase by 9.5 to 11.9 days, causing substantial economic cost and excess morbidity. 1 Preventative strategies include reducing the number of catheter days, using dedicated central line teams, sterile semi permeable dressings and removing the intravascular catheter as soon as possible.

Methods
The study was conducted in ICU and High Dependency Unit (HDU) in Our Lady of Lourdes Hospital (OLOLH) in Drogheda from 1st January 2013 to 30 Jun 2013. OLOLH is a 339 bed acute general hospital providing acute medical, surgical and maternity services to a catchment area of 307 032 people in counties Louth, Meath, and North County Dublin. Trauma services are provided for patients in above mentioned area as well as for those in county Cavan and Monaghan. ICU/HDU accommodates medical, surgical and trauma patients and provides five level 3 and three level 2 beds. An active patient care surveillance system was used in this study. Data was collected over the 12 month period on patients with a central catheter insertion. The catheters were divided into subgroups depending on their insertion site (internal jugular vein in ICU, subclavian vein in other icu). Most of the catheters used in ICU/HDU were four-lumen CVCs. The usual insertion site was internal jugular vein as well as subclavian vein. None of the catheters were coated. The blood cultures were processed in the Microbiology Department of OLOLH on analyzer BacT Alert 3D (Biomérieux, Marcy L’ETOile, France). ICU/HDU was routinely audited by Infection Prevention and Control Team. In 2012 this showed 63% compliance in January and 79% in May 2013. Environmental audit score was 88% in the studied time period. CVC care bundle was not in place at that time.

Results
234 patients were included in the study. Only 1 CLRBSI was identified in the time period January to June 2013. CLRBSI rate was calculated as follows:

Total number of CLRBSI = 1 x 1000 = rate per 1000 central line days
Total number of Central Line days=1070.

CLRBSI rate in ICU/HDU was 0.93/1000 central line days. There was no CLABSI identified in the studied time period. The patient with CLRBSI had a CVC inserted in internal jugular vein for 9 days and an arterial line was 10 days in situ. He was ventilated and naso-gastric (NG) tube fed. Antimicrobial treatment with meropenem and vancomycin lasted for 14 days prior to developing CLRBSI and the main indication was a severe community acquired pneumonia of an unknown origin. None of the catheters were coated. The blood cultures were processed in the Microbiology Department of OLOLH on analyzer BacT Alert 3D (Biomérieux, Marcy L’ETOile, France). ICU/HDU was routinely audited by Infection Prevention and Control Team. In 2012 this showed 63% compliance in January and 79% in May 2013. Environmental audit score was 88% in the studied time period. CVC care bundle was not in place at that time.

Discussion
Our study showed CLRBSI rate as low as 0.93 per 1 000 central line days. CLABSI rate was 0 per 1 000 central line days. The incidence rate was below expected level of 1.1, found in comparable critical care units in US hospitals. The study was published in Device-associated Module of National Healthcare Safety Network (NHSN) Report in 2010. A study in an 18-bed medical ICU of a large teaching healthcare facility in Geneva reported an incidence rate of 5.8/1000 central-line days for microbiologically documented BSIs, with dramatic decrease occurring following implementation of a CVC care bundle. 2 A retrospective study from 13 ICUs of Brugmann University Hospital, published in 2013, showed CRBSI rates as high as 2.95, 1.13 and 1.26 per 1 000 central line days in the ICU, high risk patients and in all ICUs respectively. 3 A UK study conducted in an acute general hospital, in the adult medical and surgical nine bedded ICU for 4 years, monitored CRBSI before and after interventions were introduced. Following interventions, the annual CRBSI rate fell from 3.4 to 0/1000 patient days with zero episodes during the final 19 months of the study. The authors describe a significant reduction in CRBSI for the first time in a UK ICU. 4 A Swiss prospective interventional study on 2009 showed that the number of BSIs in ICU decreased from 19.9 per 1 000 catheter days in the intervention phase to 1.0 per 1 000 catheter days in the intervention phase (p < 0.001). 5 Other studies have also reported a high rate of CRBSI.

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Concordance was found between US and European definitions of BSI. Very interesting results were presented by authors of an Irish multi-centre surveillance study, published in 2013. It involved 614 patients from 8 major teaching hospitals across the Republic of Ireland. Catheter related infections (CRI) rate was 2.2 per 1000 CVC days (95% confidence interval). Pathogens causing the 17 CRI episodes were: coagulase-negative staphylococci (n=6), Candida albicans (n=4), Enterobacteria species (n=2), vancomycin-resistant enterococci (n=2), Vancomycin-susceptible enterococci (n=1), methicillin-resistant Staphylococcus aureus (n=1) and methicillin-sensitive Staphylococcus aureus (n=1).

A threshold of CLABSI rate in ICU in OLOL hospital was found as low as 0.93/1000 central line days and CLABSI rate was 0 per 1 000 central line days. The results are consistent with background of enthusiastic IPCT and the ICU teams in OLOL Hospital. ICU environment was supportive to infection prevention and control interventions and audits. However, there are further interventions needed in the field of insertion bundles, maintenance and removal bundles as well as implementation of 2% chlorhexidin in 70% isopropylalcohol use for skin asepsis, as advised by the Irish national guidelines. In the future HELICS programme will facilitate use of standard surveillance methodologies and analysis.

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References