

Improving the detection and management of central venous catheter-related blood stream infections in haemato-oncology patients

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Background

- Catheter-related bloodstream infections (CRBSIs) are an important cause of morbidity and mortality, with an estimated cost of £6,229 per patient^{1,2}.
- Diagnosing CRBSI is challenging, with UK and European surveillance projects utilising the “Hospitals in Europe Link for Infection Control through Surveillance” (HELICS) criteria³. Alternative definitions are available from the CDC⁴.
- Diagnosis requires both positive blood cultures and other microbiological criteria (see table below).
- National treatment guidelines are also lacking, with evidence for central venous catheter (CVC) removal being clear for certain organisms (*Staphylococcus aureus*, *Pseudomonas aeruginosa*, fungi and *Mycobacterium*) but unclear for skin flora organisms⁵.
- We evaluated our CRBSI incidence in haemato-oncology patients and assessed how we treat infections in this high-risk patient group.

Summary of HELICS criteria for CRBSI

Either:

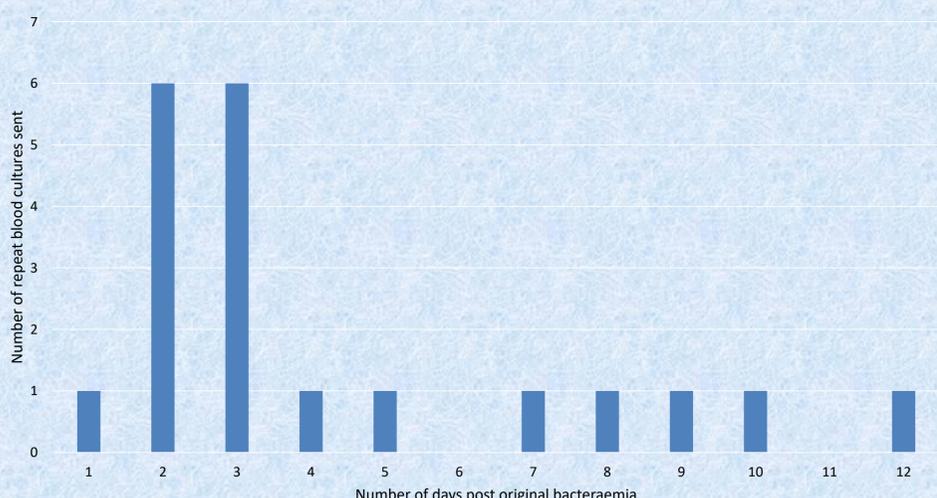
1. Semi-quantitative CVC culture > 15 CFU and one of: pus and/or inflammation at the insertion site or tunnel, fever >38°C, chills or hypotension which improves within 48hrs of catheter removal **or**
2. Differential delay of positivity of blood cultures: CVC blood sample culture positive 2hrs or less before peripheral blood culture (blood samples drawn at the same time) **or**
3. Positive blood culture with the same micro organism from pus from insertion site **or**
4. One positive blood culture with significant organism **or**
5. Two positive blood cultures for a common skin contaminant

Methods

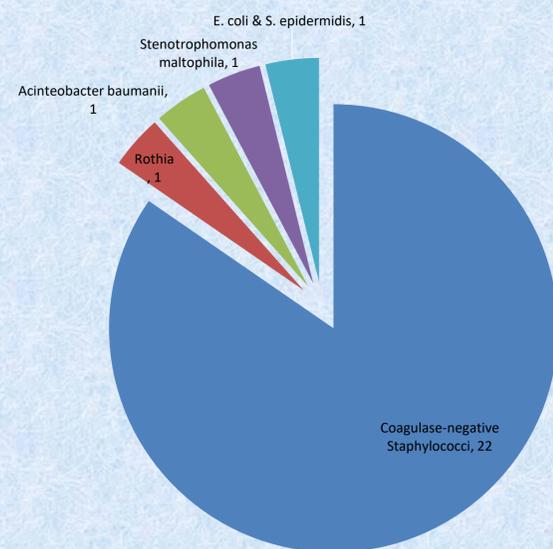
- The clinical records of all haemato-oncology patients who had a CVC inserted in 2016 were reviewed for positive blood cultures, and cross checked with all positive blood cultures coded as ‘line-related infection’ by a consultant microbiologist.
- Note was made of organisms isolated, antibiotics used and subsequent line management.

Results

- Of 114 CVCs inserted in 2016, there were 26 CRBSI episodes coded from 17 patients. 3 patients had more than one CRBSI coded per CVC.
- CVC removal dates were inconsistently documented, so we were unable to calculate line infection rate.
- Lines used were Hickman (58%) or PICC (42%) and the commonest underlying diagnosis was AML (84%).
- The median number of days the patient had been admitted prior to positive blood culture was 13 (Range 0 – 93)
- 7 out of 26 CRBSI episodes did not have paired blood cultures. In 13 out of 26 episodes which grew skin flora, only one set of positive blood cultures had been sent.
- Repeat blood cultures were taken in 20 of 26 cases. Mean days to repeat cultures was 3 days (range 1 - 12 days) (see **Figure 1** below)



- Most organisms isolated were coagulase negative staphylococci (n = 22), with the other organisms being *Rothia* (1), *Acinetobacter baumannii* (1), *Stenotrophomonas maltophilia* (1) and *Escherichia coli* (1), shown below in **Figure 2**:



- 10 CVCs were removed (median time from positive culture to removal 2.5 days, range 0-20 days). Antibiotic line locks were used in 13 cases, with a median duration of lock of 7 days (range 3 – 11 days). Systemic antibiotics were prescribed in 9 of the 13 cases where line locks used.

Conclusions

- We were unable to calculate line infection rates and therefore fulfil the definition of CRBSI due to poor documentation
- We therefore arranged educational sessions for medical and nursing staff to emphasise the importance of documenting line removal dates, taking paired blood cultures and clearly labelling samples.
- We also emphasised CRBSI prevention strategies including daily chlorhexidine washes for the duration of neutropenia. This was facilitated via talks at induction sessions, updating mandatory e-learning packages, and presenting at departmental meetings and junior doctor teaching.
- We reviewed and revised our local line lock antibiotic guideline to ensure a standardised approach and to mandate repeating blood cultures 72 hours into treatment to guide further management.
- A new focus group (consisting of a medical microbiologist, consultant haematologist, infection prevention nurse, IT support, venous access nurse, interventional radiology sister and senior nurses from haemato-oncology wards) was created to facilitate a period of prospective surveillance
- A software program was adapted to capture line insertion and removal dates.
- Data collection is currently ongoing, and this ‘real-time data’ should allow regular, accurate monitoring of CRBSI rates.
- This information will be used to assess the need for further preventative measures such as chlorhexidine impregnated dressings an/or antimicrobial coated lines as per EPIC 3 guidance 6

References

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6. epic3: National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England, Journal of Hospital Infection 86S1 (2014) S1–S70