BACK TO BASICS : Reducing intra-vascular catheter-related infections in patients on haemodialysis

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INTRODUCTION

Bacteremia related to Central Venous Catheters (CVC) is a major cause for morbidity in patients on Haemodialysis (HD).The presence of a CVC is associated with an incidence of 2-6 catheter-related bacteremia (CRB) cases /1000 catheter days. A period of increased incidence of CRB in our local dialysis unit prompted the need for a strategic intervention to decrease the number of these infections .

METHODS

- A Renal Infection Focus Group was set up .It comprised of a nephrologist, the Specialist Practice Development Nurse, Specialist vascular-access nurse , a microbiologist , an infection control nurse and the pharmacist.
- An audit of the number of CRB and exit site infections , in HD patients over 2011-12 was performed to set the baseline rates for our unit. Data was collected from the laboratory system (Telepath) and renal electronic database (CYBEREN) of all positive blood cultures (BC) and exit site cultures on HD patients.
- For the purpose of this audit ,both definite and probable CRB were included . Bactermias associated with line colonisations, as decided based on clinical scenario were excluded. Definitions used were :

Definite CRB: BC positive from the venous and /or arterial lumen ***plus*** peripheral vein culture positive with the same organism ***and*** no other possible focus of infection.

Probable CRB: BC positive from the venous and /or arterial lumen BC ***and*** No other possible focus of infection ***and*** absence of an accompanying peripheral blood culture set taken ***and/or*** isolation of same organism from a line tip/ exit site.

- All episodes of bacteremias were then reviewed at the earliest opportunity .
- The reviews of each CRB identified areas of either sub-optimal or inconsistent clinical practice , absence of clear guidance for insertion and management of vascular access ,incomplete documentation and inadequate training .
- Various interventions were implemented (Table 1) and the rates of CRB and exit-site infections were re-audited in 2014-15.

Table 1 : Interventions to prevent CVC-related infections

PRE- CVC INSERTION STAGE	POST-CVC INSERTION STAGE	POST-INFECTION STAGE
• Patient education • Indication for CVC ,forward planning towards fistulation • Compulsory body washes for all elective and emergency cases. • Skin preparation made consistent. • Training a cohort of personnel for line insertion. • Dedicated environment and equipment for line placement • Policies for line insertion ratified • Education of relevant staff • Regular competency assessment of dialysis staff • Clear documentation on Cyberen	• Exit site dressings: Frequency of dressing change increased • Use of antibiotic prophylaxis e.g. difficult insertion, MRSA colonisation • Patient advised regarding exit care • Visual exit site score (VES) documented at each HD session • Guidance created for early detection of exit -site infection. • Clear Documentation of any concerns	• Re-look at pre – and post insertion stages for sub-optimal practice • VES score documentation and whether managed as per policy • Paired blood cultures to be taken • Antibiotic and line management reviewed • use of antibiotic locks reviewed • Root cause analysis of all bacteremias . • Regular meetings to update issues and actions • Regular audits

RESULTS

The relevant findings are summarized in the Table 2. The spectrum of organisms associated with CRB and exit site infections are shown in Tables 3 and 4.

- There were 0.88 CRB /1000 catheter days in 2011-12 and this decreased to 0.71 / 1000 catheter days in 2014-15. (16 to 9/ 100 HD patients) .
- *Staphylococcus aureus* was the commonest cause of CRB. The rate of CRB due to S aureus was virtually the same in the two audit periods . (1.89 and 1.86 / 100 HD patients). This rate is within the Renal Association target recommendation of less than 2.5 / 100 HD patents.
- The rate of Gram negative bacteremia fell from 10 to 5.5 / 100 HD patients.
- The rate of exit site infections halved from 36.8 per 100 HD patients to 17.4 per 100 HD patients , especially , with a marked reduction in the number of exit site infections both with S. aureus and with Gram negative organisms.
- 18% of exit site infections were associated with a bacteremias in the 2014-15 ,while none in 2011-12.

Table 2: Summary of relevant findings

	2011-12	2014-15
Total number of patients on haemodialysis	106	161
Total number of catheter days	19165	20984
Rate of CRB/1000 catheter days	0.88	0.71
Rate of CRB / 100 HD patients	16	9
Rate of Staphylococcus bacteremia /100 HD patients	1.89	1.86
Rate of Gram negative bacteremias / 100 HD patients	10.3	5.5
Rate of exit-site infections /100 HD patients	36.8	17.4
Rate of S.aureus exit-site infection / 100 HD patients	16.9	8.7

Table 3: Organisms isolated in Catheter –related bacteremias

Organisms isolated in the catheter related bacteremias	2011-12 N=17	2014-15 N=15
Coagulase Negative Staphylococcus	4	1
Staphylococcus aureus	2	3
MRSA	0	0
Enterococcus spp	1	1
E.coli/Klebsiella spp	4	2
Proteus/Morganella spp	3	2
Serratia/ Enterobacter spp	0	2
Pseudomonas spp	3	0
Acinetobacter/Achromobacter /aerobic Gram negative bacteria	1	3
Candida	0	1

Table 4 : Organisms isolated from exit-site cultures

Organisms isolated from positive exit site cultures	2011-12 N=38	2014-2015 N=28
Staphylococcus aureus	18	14
MRSA	1	0
Pseudomonas spp	1	2
E coli/Klebsiella /Proteus spp	3	8
Undifferentiated Coliforms /aerobic GNB+/- skin flora	15	4
Streptococcus /Enterococcus spp	1	0
Anaerobes	0	3
Candida spp	0	1

DISCUSSION/CONCLUSIONS

- A variety of factors were identified in every CRB review , and hence the infection prevention strategy evolved over a period of time ,on our unit .
- Over time, the strategy incorporated all the identifiable factors leading to infections and put in measures to prevent them, as highlighted below.

Pre-CVC insertion phase measures

- Body washes were made mandatory for all cases for 1-3 days prior ,depending on the whether it was elective or emergency insertion.
- Procedures and training of personnel inserting lines were formalised .
- Dedicated environment/supplies for line placement were created.

Post insertion phase measures :

- Documentation of exit site and management of issues was embedded as routine practice for every HD session.
- Dressing were changed at each session and VES scores compulsorily documented .
- No antimicrobial –impregnated dressings/ lines were introduced, thus avoiding unnecessary expenditure.
- The historic practice of antibiotic prophylaxis at CVC insertion and prolonged antibiotic lock s were stopped , promoting antimicrobial stewardship.
- CRB and exit site infection management protocols were made robust for early identification and management .

Post-infection stage measures:

- Review of all bacteremias , audit and feedback .
- In conclusion, revisiting the basic principles of infection prevention ,systematically and the resultant multi-pronged interventions have helped the unit achieve a reduction in the number of CVC related infections, without need for additional resources .

REFERENCE : Clinical Practice Guideline:Vascular access for haemodialysis .UK Renal Association. 6th edition. 2015.