Doncaster and Bassetlaw Teaching Hospitals
NHS Foundation Trust

# Management of Catheter Related Bloodstream Infection (CRBSI), including Antibiotic Lock Therapy.

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## BACKGROUND

Micro-organisms can gain access to the catheter lumen via a contaminated hub or infusate.

Colonisation of catheter external surface may result from contamination during insertion, via exit site colonisation or due to a bacteraemia.

The longer a catheter is in place, the more likely it is to become colonized.

Infection:

- is the major complication associated with long term intravascular catheters
- can have serious consequences such as metastatic infection and death
- is divided clinically into local (exit site or tunnel infection) and bloodstream infections, but these may coexist
- begins with colonisation of either the external surface or catheter lumen, the latter being more common in long-term device infection

Please refer to the Central Venous Access Devices (CVADS) Care and Management Policy PAT/T23

### Clinical Presentation

- history of rigors, chills or fever after use of the line is highly suggestive
- symptoms of CRBSI: fever, rigors, chills, general malaise, anorexia, vomiting
- patients with tunnel infection usually complain of pain along the tract
- exit site infection may complain of pain and/or discharge from the exit site

### Causative organisms

- Coagulase-negative staphylococci (commonest)
- *Staphylococcus aureus*
- *Candida species*
- *Enterococcus species*
- Gram-negative bacilli
- Alpha-haemolytic streptococci (particularly in patients with haematological malignancy)
- *Mycobacterium species*

## Investigations

- **Paired blood cultures (within 15 min of each other)** :

  -via the catheter and the same volume of blood from a peripheral vein
  -if the catheter has more than one lumen, then through each lumen in addition to the peripheral set
  -blood culture from dialysis circuit if patient is on haemodialysis

- **If the line is being removed**: send the distal 5cm of the line tip plus a peripheral blood culture

- **Skin swab:** if exit site is red, painful or discharging pus

***** Only staff who have completed a competency based package from clinical skills should access any CVAD device

## Diagnostic Criteria for CRBSI

- **same organism recovered from** :

  **-**peripheral blood culture **AND** from quantitative (>15 colony-forming units) culture of the catheter tip

  **OR**

  - peripheral **AND** a catheter lumen blood culture, with growth detected 2 hours sooner (ie, 2 hours less incubation) in the latter

**Empiric antimicrobial treatment** (before the pathogen is known)

| Clinical Condition | Agents | Alternative |
|---|---|---|
| **Low –Moderate risk of sepsis**<br>***( as per Trust Sepsis IPOC )*** | IV Teicoplanin 400mg BD for first 3 doses then 400mg OD<br>Except for patients on dialysis then IV Vancomycin<br>(refer to the dialysis protocol ) | If allergy to teicoplanin or vancomycin then discuss with the Microbiologist |
| **High risk sepsis**<br>***(as per Trust Sepsis IPOC )*** | IV Teicoplanin 400mg BD for 3 doses, then 400mg OD<br>**PLUS**<br>IV Temocillin 2g BD | *If non-life threatening allergy to penicillin:*<br>IV Aztreonam 1g TDS<br>**PLUS**<br>IV Teicoplanin 400mg BD for 3 doses then 400mg OD<br><br>*If life threatening allergy to penicillin*<br>IV Ciprofloxacin 400mg BD<br>**PLUS**<br>Teicoplanin 400mg bd for 3 doses then 400mg OD |
| **Neutropenic sepsis** | IV Teicoplanin 400mg BD for 3 doses then 400mg OD<br>**PLUS**<br>IV Piperacillin + tazobactam 4.5g QDS | *If non-life threatening allergy to penicillin:*<br>IV Teicoplanin 400mg BD for 3 doses, then 400mg OD<br>**PLUS**<br>IV Meropenem 1g TDS<br><br>*If life threatening allergy to penicillin*<br>IV Ciprofloxacin 400mg BD<br>**PLUS**<br>Teicoplanin 400mg bd for 3 doses then 400mg OD |
| **Exit site infection** | Oral flucloxacillin 500mg – 1g QDS | *If penicillin allergy then:*<br>Oral clarithromycin 500mg BD or oral clindamycin 450mg QDS |

**Other measures**

- **Catheters should also be removed in the following situations:**

  **-<u>Long-term catheters(in situ for ≥14 days):</u>**

  **Severe sepsis**
  **Suppurative thrombophlebitis**
  **Infective endocarditis**
  **Bacteremia persistent after >72hrs of antibiotics for whch the organism is susceptible**
  **Infections due to Staphylococcus aureus, Pseudomonas aeruginosa, fungi, Mycobacteria**

  **-<u>Short-term catheters(in situ for <14 days):</u>**

  **Infections due to Gram negative bacilli, Staphylococcus aureus, Enterococcus, Fungi, Mycobacteria**

  **-<u>Both long-term catheters and short-term catheters:</u>**

  **Due to less virulent organisms that are difficult to eradicate such as Bacillus sp, Micrococcus sp and Propionibacteria, catheters should generally be removed after ruling out blood culture contamination**

- **Catheter removal alone may be sufficient for intravascular catheters colonised by low-grade pathogens, such as coagulase-negative staphylococci**

- **Decision to remove the catheter should involve the managing consultant or registrar OR nutrition support team (bleep 1812) before arranging removal of the catheter OR the relevant Intestinal Failure centre if the DBH NST are not available**

- **Intravascular catheter salvage**

  Should be discussed with a Microbiologist and considered when:

  - the risk of replacing catheter is high [e.g. coagulopathy]
  - alternative vascular access sites are limited/not available
  -due to pathogens <u>other than</u> S.aureus, P.aeruginosa, Bacillus sp, Micrococcus sp, Propionibacteria, fungi and Mycobacteria in <u>uncomplicated CRBSI involving long-term catheters</u>

# Confirmed CRBSI

## Complicated

**Short term** central venous catheter (CVC) or arterial catheter (AC) infection – related bloodstream infection.

- Suppurative thrombophlebitis endocarditis or osteomyelitis, etc.
  - Remove catheter and treat with systemic antibiotic for 4-6 weeks; 6-8 weeks for osteomyelitis in adults

**Long term** central venous catheter (CVC – or port (P) – related bacteraemia or fungemia

- Septic thrombosis, endocarditis, osteomyelitis
  - Remove catheter and treat with systemic antibiotic for 4-6 weeks; 6-8 weeks for osteomyelitis in adults
- Tunnel infection, port abscess
  - Remove CVC/P and treat with antibiotics for 7-10 days

## Uncomplicated

**Uncomplicated** (bloodstream infection and fever resolved with 72hra in a patent who has no intravascular hardware and no evidence of endocarditis or supportive thrombophlebitis and for *S. aureus* is also without active malignancy or immunosuppression.

### Coagulase-negative staphylococci

**Short term:**

- Remove catheter & treat with systemic antibiotic for 5-7 days
- If catheter is retained, treat with system antibiotic + antibiotic lock therapy for 10-14 days

**Long term:**

- May retain CVC/P & use systemic antibiotic for 10-14 days + antibiotic lock therapy for 10-14 days
- Remove CVC/P if there is clinical deterioration, persisting or relapsing bacteraemia, work-up for complicated infection and treat accordingly.

### *Staphylococcus aureus*

**Short term:**

- Remove catheter & treat with systemic antibiotic for ≥14 days

**Long term:**

- Remove the infected catheter and then treat for ≥14 days **UNLESS** complicated, in which case treat accordingly

### *Enterococcus*

**Short term:**

- Remove catheter & treat with systemic antibiotic for 7-14 days

**Long term:**

- May retain CVC/P & use systemic antibiotic for 7-14 days + antibiotic lock therapy for 7 – 14 days
- Remove CVC/P if there is clinical deterioration persisting or relapsing bacteraemia, work-up for complicated infection and treat accordingly.

### Gram – negative bacilli

**Short term:**

- Remove catheter & treat with systemic antibiotic for 7 - 14 days

**Long term:**

- Remove CVC/P & treat for 7-14 days
- For CVC/P salvage, use systemic & antibiotic lock therapy for 10-14 days; if no response, remove CVC/ P, rule out endocarditis or suppurative thrombophlebitis, and if not present treat with antibiotic for 10-14 days.

### *Candida* Spp.

**Short term:**

- Remove catheter & treat with antifungal therapy for 14 days after the first negative blood culture.

**Long term:**

- Remove CVC/P & treat with antifungal therapy for 14 days after the first negative blood culture.

Short term catheter = **<14 days in situ**
Long term catheter = **≥14 days in situ**

**Antibiotic options should be discussed with Microbiology and directed based on sensitivity results.**

## Antibiotic Lock Therapy

- **Please discuss with the Microbiologist before lock therapy is commenced.**
- Indicated for long-term catheter CRBSI with no signs of exit site or tunnel infection for whom catheter salvage is the goal, **in conjunction** with systemic antimicrobial therapy
- Is not recommended for infections for infections with Staphylococcus aureus or Candida unless there are unusual extenuating circumstances
- If the catheter is being used for parenteral nutrition please contact the nutrition support team within working hours (or Intestinal Failure Centre for patients on Home parenteral Nutrition outside of working hours).

**ANTIBIOTIC AGENTS AND CONCENTRATION**

- Vancomycin 10mg/ml in sodium chloride 0.9%
- Teicoplanin 10mg/ml in sodium chloride 0.9%
- Gentamicin 5mg/ml in sodium chloride 0.9%

| ***TYPE OF CVC CATHETER*** | ***VOLUME*** | ***DWELL TIME*** | ***DURATION*** |
|---|---|---|---|
| Picc | 1 ml per lumen | 24 – 48 hrs | 7-14 days |
| Hickman | 2 ml per lumen | | |
| Vascath | 2 ml per lumen | | |

**OTHER COMMENTS**

- Addition of heparin is not usually recommended. There is poor evidence of the role of heparin in reducing central venous catheter thrombosis.
- The line should not be used between locks but if necessary the lock must be removed before infusion of the next dose of antibiotic, other intravenous medication or solution.
- Take surveillance blood culture 48-72h after completing the course of antibiotic line locks to check for clearance