Scottish Intensive Care Society Audit Group

NHS National Services Scotland

Central Line Insertion Bundle

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Contents

Introduction

The Central Venous Catheter (CVC) insertion bundle and associated tools were first jointly published by SICSAG and HPS in May 2007. A review of the content against the current available guidelines and evidence has now been undertaken by Infection Control Team, Health Protection Scotland to ensure that the key recommendations are still accurate for safe insertion of CVCs, primarily aimed at the prevention of healthcare associated infections.

CVCs are the leading cause of device-related bacteraemia or catheter related blood stream infection (CRBSI), which are a major cause of morbidity, increased severity of illness and prolonged hospital stay. The Scottish National HAI Prevalence Survey (2007) reported 3.2% of patients have CVCs in situ. This is much higher in Critical Care where 31% of admissions to High Dependency Units and 68% of admissions to Intensive Care Units have a CVC in situ (SICSAG data 2010).

The aim of this care bundle is to improve practices, alongside documented evidence of compliance with evidence based practice aimed at improving patient outcomes. This care bundle has been agreed by experts in intensive care and infection control, from around Scotland who have considerable experience in their own areas of care bundle application and infection control through surveillance. The Scottish Patient Safety Programme (SPSP) support the implementation of these recommendations http://www.scottishpatientsafetyprogramme.scot.nhs.uk/programme/resources.

Recommending best practice of this type requires compromise and pragmatism.

The following pages explain the rationale and detail each bundle element that can be measured against, however local adaptation may be deemed appropriate.

Auditing compliance with bundle elements should be undertaken and describing any account of valid clinical exclusions is essential. The full evidence base used to create this bundle can be found at http://www.hps.scot.nhs.uk/haiic/ic/evidenceforcarebundles.aspx.

Critical care aspects related to CVC insertion include: ensuring the CVC is clinically required, antisepsis at site of insertion to minimise the risk of microbial seeding at the external surface of the CVC as it is inserted, surgical scrub and use of aseptic technique, barrier precautions and sterile dressings.

Central Line Insertion Bundle

There are five key aspects to this bundle which if addressed together should minimise the risk of catheter related bloodstream infection.

1. **Insertion Checklist and Documentation**
2. **Hand Hygiene and Maximal Barrier Precautions**
3. **Catheter Site Selection**
4. **Skin Antisepsis**
5. **Dressing**

1. Insertion Checklist and Documentation

The operator should be trained to undertake the procedure, be competent, aware of the knowledge and skills required on an ongoing basis, and importantly know the documentation available to record CVC insertion information. This supports improvement of patient safety/culture change, and it is clear that there are ways to make it easy for healthcare workers to adhere to these requirements.

The recommendation that details of insertion are documented in records (including date, location, catheter lot number and signature and name of operator undertaking insertion) is based on good practice. It is also beneficial in ensuring that other evidence based CVC care actions can be supported i.e. review of clinical need and requirement for dressing changes.

Measurement criteria:

- Ensure information on the insertion procedure is fully documented, preferably using a sticker in the case notes (See Appendix 1).

Reference

DH. High Impact Intervention: Central venous catheter care bundle. 2011. http://hcai.dh.gov.uk/whatdoido/high-impact-interventions.

2. Hand Hygiene and Maximal Barrier Precautions

The operator inserting a central venous catheter should adhere to strict aseptic technique (with surgical scrub performed immediately before donning gloves and gown). Sterile gloves, gown, theatre hat and surgical mask should be worn as well as a sterile drape, with compliance against these recommendations monitored and recorded.

Measurement criteria:

- Ensure that a surgical scrub is performed immediately before donning maximal sterile barrier precautions (i.e. gloves and gown)
- Ensure that maximal sterile barrier precautions are used by the healthcare workers, including headwear, mask, sterile gown and sterile gloves and a sterile body drape for the patient.

References

Raad, Hohn et al: Prevention of CVC related infections by use of maximal barrier precautions during insertion. Infect.Control Hosp.Epidemiol. 1994 15 231-238.

Tanner J. Surgical hand antisepsis: the evidence. J Perioper Pract 2008 Aug;18(8):330-4, 339.

O'Grady NP, Alexander M, Burns LA, Dellinger EP, Garland J, Heard SO, et al. Guidelines for the Prevention of Intravascular Catheter-related Infections. Clin Infect Dis 2011 Apr 1.

3. Catheter Site Selection

In adult patients there is some evidence that the subclavian site has a lower risk of catheter related blood stream infections. Guidelines recommend that 'unless medically contraindicated, use the subclavian site in preference to the jugular or femoral sites for non-tunnelled catheter placement'. However it is also recommended that the risks and benefits of placing a central venous device at a recommended site to reduce infectious complications are weighed up against the risk for mechanical complications. Therefore, the decision needs to take into account the skill of staff undertaking the procedure.

Experience is usually greater with insertion at the internal jugular site and therefore can be safer. The subclavian, or internal jugular route, are undoubtedly the preferred sites for preventing avoidable infections.

Measurement criteria:

- Ensure that the subclavian site or internal jugular vein is used if possible (the femoral site should be **avoided** whenever possible).

Additional related good practice considerations:

- the coagulation status
- the site of other lines
- the potential for pneumothorax
- operator skill and the use of ultrasound guidance.

References

Pratt RJ, Pellowe CM, Wilson JA, Loveday HP, Harper PJ, Jones SR, et al. epic2: National evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England. J Hosp Infect 2007 Feb;65 Suppl 1:S1-64.

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Deshpande KS, et al. The incidence of infectious complications of central venous catheters at the subclavian, internal jugular, and femoral sites in an intensive care population. Crit Care Med. 2005;33:13-20.

Ruesch S, et al. Complications of central venous catheters: Internal jugular versus subclavian access - A systematic review. Crit Care Med 2002; 30:454-460.

4. Skin Antisepsis

Infection can arise from microorganisms which are present on the patient's skin. Antisepsis of the insertion site is therefore crucial in minimising the risk of microbial seeding the external surface of the CVC as it is inserted or of migrating down the lumen post insertion and resulting in biofilm production leading to infection.

This can involve the use of antiseptics such as chlorhexidine and povidone-iodine. Chlorhexidine is known to have a persistent effect and combined with alcohol which is fast drying make 2% chlorhexidine in 70% isopropyl alcohol a suitable product. There is consensus from the evidence base that chlorhexidine in alcohol is suitable for the purpose of skin disinfection for CVC insertion. It can be concluded that the combination of actions of the chlorhexidine and the alcohol may provide not only a residual effect from the chlorhexidine but that the rapid action of alcohol makes this suitable for this purpose.

There is no specific evidence within the literature with regards to the method of application or the time that an antiseptic product is allowed to dry prior to insertion. However it is generally recommended that manufacturer's guidance is referred to.

Measurement criteria:

- Ensure that 2% chlorhexidine in 70% isopropyl alcohol is used for skin preparation of the insertion site and allowed to dry, before CVC insertion/skin puncture (do not wipe or blot dry).

Additional related good practice considerations:

- A fresh site rather than a guide wire change should be applied whenever possible
- There is strong association between the number of needle passes and complications (though not infection related). Aim to keep the number of needle passes to less than three
- After skin preparation the patient should be covered as much as possible with sterile drapes allowing only a small opening at the site of insertion.

References

Chaiyakunapruk N, et al. Chlorhexidine Compared with Povidone-Iodine Solution for Vascular Catheter-Site Care: A Meta-Analysis. Ann Intern Med. 2002;136:792-801

Maiwald M, Widmer AF, Rotter ML. Chlorhexidine is not the main active ingredient in skin antiseptics that reduce blood culture contamination rates. Infect Control Hosp Epidemiol 2010 Oct;31(10):1095-6.

Assadian O. Skin antiseptic in reducing the risk of central venous catheter-related infections. Critical Care Medicine 2004 Mar;32(3):887-8.

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O'Grady NP, Alexander M, Burns LA, Dellinger EP, Garland J, Heard SO, et al. Guidelines for the Prevention of Intravascular Catheter-related Infections. Clin Infect Dis 2011 Apr 1.

Adams D, Elliot TS. Skin antiseptics used prior to intravascular catheter insertion. [Review] [27 refs]. British Journal of Nursing 2007 Mar 8;16(5):278-80.

5. Dressing

Micro-organisms can gain entry at any manipulation site, i.e. hub/access port/connection, or insertion site itself. One of the key recommendations is therefore the use of sterile dressings. The use of a sterile, semi-permeable, transparent dressing is generally recommended allowing observation of insertion site when the site is not bleeding or oozing when a sterile gauze dressing would be recommended.

Measurement criteria:

- Ensure a sterile, transparent, semi-permeable dressing is used to cover the catheter site.

Additional related good practice considerations:

- Consider use of chlorhexidine impregnated dressings or sponges based on local infection rates.

References

Pratt RJ, Pellowe CM, Wilson JA, Loveday HP, Harper PJ, Jones SR, et al. epic2: National evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England. J Hosp Infect 2007 Feb; 65 Suppl 1:S1-64.

O'Grady NP, Alexander M, Burns LA, Dellinger EP, Garland J, Heard SO, et al. Guidelines for the Prevention of Intravascular Catheter-related Infections. Clin Infect Dis 2011 Apr 1.

Gillies D, O'Riordan L, Carr D, Frost J, Gunning R, O'Brien I. Gauze and tape and transparent polyurethane dressings for central venous catheters. Cochrane Database Syst Rev 2010;(4):CD003827.

Appendix 1 CVC Insertion Sticker

A sticker placed in the notes is helpful to document the procedure and to assess compliance with the elements of the bundle. Two examples are shown below:

Example 1. Adapted from Ninewells Hospital ICU

CENTRAL LINE INSERTION

Place in notes after procedure

Type of catheter/no. of lumens (e.g. central, dialysis) _____

Catheter lot number _____ Date of insertion _____

Is this a new line? _____

Is this procedure Elective / Emergency / Re-position

Site selected _____

BEFORE PROCEDURE

Scrub hands? ☐ Use Sonosite if appropriate? ☐

Prep procedure site with 2% Chlorhexidine in 70% alcohol ☐

DURING PROCEDURE

Use sterile drapes to cover patient? ☐ Wear sterile gloves and gown? ☐

Wear hat and mask? ☐ Maintain sterile field? ☐

AFTER PROCEDURE

Was sterile technique used to apply dressing? _____

Sterile, transparent, semi-permeable dressing applied to catheter site Y ☐ N ☐

Doctors Signature _____

Print Name _____

Example 2. Adapted from Forth Valley Royal Infirmary ICU/HDU

Central line insertion check list

Type of catheter: **central / PA / CVVHF** *Catheter Lot number:*

Number of lumen: **2 / 3 / 4 / 5.**

Position: **R / L** Site: **Subclavian / Jugular / Femoral**

Elective / emergency. **Fresh site / catheter exchange?**

If line *exchange* – why _____

Date inserted _____ By _____ *(name/signature/Grade)*

CXR requested: Y / N **CXR reviewed:** Y/ N

Sited in: **A & E / Theatre / SHDU / MHDU / ITU**

Procedure

Hands scrubbed: **Y / N** Siterite: **Y / N**

Sterile drapes: **Y / N** Sterile gown & gloves: **Y / N**

Hat & mask: **Y / N** Sterile field maintained: **Y / N**

Skin prep: *2% Chlorhexidine in 70% isopropyl alcohol*

Sutured: **Y / N** Suture applied under sterile conditions: **Y / N**

Dressing applied under sterile conditions: **Y / N**

Dressing transparent and semi-permeable: ***Y / N***

Note

These examples have been adapted to include any new recommendations following the 2011/12 literature review.

Appendix 2 CVC Maintenance

While not part of a Central Line Insertion bundle, maintenance and care of the line should be seen as equally important:

Key recommendations:

- Ensure that the need for the CVC in situ is reviewed and recorded today (on a daily basis)
- Ensure that the CVC dressing is intact
- Ensure that the CVC dressing has been changed in the last seven days
- Ensure that 2% chlorhexidine gluconate in 70% isopropyl alcohol is used for cleaning the insertion site during dressing changes
- Ensure that hand hygiene is performed immediately before accessing the line/site (WHO Moment 2)
- Ensure that an antiseptic containing 70% isopropyl alcohol is used to clean the access hub prior to accessing – rub the access hub for at least 15 seconds ('scrub the hub').

Additional related good practice considerations:

- Maintain sterile technique when using the line
- Assess patient daily to determine continued necessity for the central line. Document this on the central line bundle sticker. Lines should be removed as soon as possible
- Do not routinely replace lines
- Blood should not be drawn from the line for sampling etc.

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