Appendix B

Catheter-Related Blood Stream Infections (CR-BSI) FACT SHEET

Bottom line

1. CR-BSIs are associated with increased morbidity, mortality and costs of care.
2. CR-BSIs are a preventable complication that causes as many as 11 deaths every day in the U.S.
3. The following interventions decrease the risk for CR-BSIs:
   - Appropriate hand hygiene,
   - Use of chlorhexidine for skin preparation,
   - Use of full-barrier precautions during central venous catheter insertion,
   - Subclavian vein placement as the preferred site, and
   - Removing unnecessary central venous catheters.

Base on our current performance, our opportunity to improve the care that we provide to patients if we eliminated CR-BSIs in our ICU*:

Current CR-BSI rate:	xx CR-BSIs / 1000 catheter days
Number of preventable CR-BSI	xx CR-BSIs per year
Number of preventable deaths	xx deaths per year
Excess Costs	$ xx per year

* To estimate the opportunity to improve we used mean published estimates (ranges): 18% (0-35%) mortality and extra costs of $45,254 ($34,508-$56,000) per CR-BSI. These estimates are consistent with those cited by the 2002 Guidelines for the Prevention of Intravascular Catheter-Related Infections. (O'Grady NP et al. MMWR Recomm Rep 2002; 51(No. RR-10):1-36)

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The following information is from the 2002 Centers for Disease Control and Prevention Guidelines for the Prevention of Intravascular Catheter-Related Infections. MMWR 2002;51(No. RR-10):1-36. Each recommendation is categorized on the basis of existing scientific data, theoretical rationale, applicability, and economic impact. **Category IA recommendations** are strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiologic studies.

APPROPRIATE HAND HYGIENE

Bottom Line: Proper hand hygiene is required before and after palpating catheter insertion sites, as well as before and after inserting, replacing, accessing, repairing, or dressing an intravascular catheter. In addition, the use of gloves does not obviate the need for hand hygiene. **Category IA**

Since 1977, at least 7 prospective studies have shown that improvement in hand hygiene *significantly* decreases a variety of infectious complications. Proper hand-hygiene procedures can be achieved through the use of either a waterless, alcohol-based product (*1*) or an antibacterial soap and water with adequate rinsing (*2*). Compared with peripheral venous catheters, CVCs carry a substantially greater risk for infection; therefore, the level of barrier precautions needed to prevent infection during insertion of CVCs should be more stringent than proper hand hygiene alone.

Ref:

1. Pittet D et al. Lancet 2000;356:1307–9

2. Larson EL et al. Am J Infect Control 1995;23:251–69

USE OF CHLORHEXIDINE FOR SKIN PREPARATION

Bottom Line: Disinfect clean skin with an appropriate antiseptic before catheter insertion and during dressing changes. A 2% chlorhexidine based preparation is the preferred solution. **Category IA**

In the United States, povidone iodine has been the most widely used antiseptic for cleansing arterial catheter and CVC insertion sites. However, in one study, preparation of central venous and arterial sites with a 2% aqueous chlorhexidine gluconate lowered BSI rates compared with site preparation with 10% povidone-iodine or 70% alcohol. (*3)* Commercially available products containing chlorhexidine have not been available until recently; in July 2000, the U.S. Food and Drug Administration (FDA) approved a 2% tincture of chlorhexidine preparation for skin antisepsis. Other preparations of chlorhexidine might not be as effective. Tincture of chlorhexidine gluconate 0.5% is no more effective in preventing CRBSI or CVC colonization than 10% povidone iodine, as demonstrated by a prospective, randomized study of adults. *(4)* No published trials have compared a 1% chlorhexidine preparation to povidone-iodine.

Ref:

3. Maki DG et al. Lancet 1991;338:339–43.

4. Humar A et al. Clin Infect Dis 2000;31:1001–7.

USE OF FULL-BARRIER PRECAUTIONS DURING CVC INSERTION

Bottom Line: Maintain aseptic technique for the insertion of intravascular catheters. **Category IA**

Maximal sterile barrier precautions (e.g., cap, mask, sterile gown, sterile gloves, and large sterile drape) during the insertion of CVCs substantially reduces the incidence of CRBSI compared with standard precautions (e.g., sterile gloves and small drapes). *(5,6)*

Ref:

5. Mermel LA et al. Am J Med 1991;91(suppl):S197–S205.

6. Raad II et al. Infect Control Hosp Epidemiol 1994;15:231–8.

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SUBCLAVIAN VEIN PLACEMENT AS THE PREFERRED SITE

Bottom Line: A subclavian site is preferred for infection control purposes, although other factors (e.g., the potential for non-infectious and catheter-operator skill) should be considered when deciding where to place the catheter. **Category IA**

The site at which a catheter is placed influences the subsequent risk for catheter-related infection and phlebitis. For adults, lower extremity insertion sites are associated with a higher risk for infection than are upper extremity sites. *(7-9)* As a result, authorities recommend that CVCs be placed in a subclavian site instead of a jugular or femoral site to reduce the risk for infection.

Unfortunately, there have no randomized trials to satisfactorily compare infection rates for catheters placed in jugular, subclavian, and femoral sites. Nevertheless, observational studies have found that catheters inserted into an internal jugular vein are associated with higher risk for infection than those inserted into a subclavian or femoral vein. *(10-12)* In addition, femoral catheters have been demonstrated to have relatively high colonization rates when used in adults. (*13*) Therefore, femoral catheters should be avoided, when possible, because they are associated with a higher risk for deep venous thrombosis than are internal jugular or subclavian catheters *(14-18)* and because of a presumption that such catheters are more likely to become infected.

Ref:

7. Bansmer G et al. JAMA 1958;167:1606–11.
8. Crane C. N Engl J Med 1960;262:947–51.
9. Indar R. Lancet 1959;1:284–6.
10. Mermel LA et al. Am J Med 1991;91(suppl):S197–S205.
11. Heard SO et al. Arch Intern Med 1998;158:81–7.
12. Richet H et al. J Clin Microbiol 1990;28:2520–5.
13. Goetz AM et al. Infect Control Hosp Epidemiol 1998;19:842–5.
14. Joynt GM et al. Chest 2000;117:178–83.
15. Mian NZ et al. Acad Emerg Med 1997;4:1118–21
16. Durbec O et al. Crit Care Med 1997;25:1986–9.
17. Trottier SJ et al. Crit Care Med 1995;23:52–9.
18. Merrer J et al. JAMA 2001;286:700–7.

REMOVING UNNECESSARY CENTRAL VENOUS CATHETERS

Bottom Line: Promptly remove any intravascular catheter that is no longer essential. **Category IA**

One of the most effective strategies for preventing CR-BSIs is to eliminate, or at least reduce, exposure to central venous catheters. The decision regarding the need for a catheter however is complex and therefore difficult to standardize into a practice guideline. Nonetheless, to reduce exposure to central venous catheters, the ICU team should adopt a strategy to systematically evaluate daily whether any catheters or tubes can be removed.

Ref: none