



CDC Guidelines for use of Antimicrobial Catheters

CLINICAL EVIDENCE

The following is a summary of the CDC guidelines for central line associated blood stream infection prevention and antimicrobial catheter use followed by clinical evidence supporting the use of central line bundles and education. Additionally, this piece summarizes the clinical data available for the market leading chlorhexidine silver-sulfadiazine coated antimicrobial catheter. The data presented in this packet comes from clinical studies published in medical journals.

What are the CDC 1A Recommendations?

There is no individual solution to prevent bloodstream infections; the CDC recommends a holistic platform of interventions to reduce the occurrence of central line associated blood stream infections (CLABSI). Specifically, the CDC suggests that the following 1A recommendations should be attempted to reduce CLABSI, some of which should be used before implementation of an antimicrobial catheter:

- Educate healthcare personnel regarding intravascular catheter use and maintenance
- Periodically assess staff knowledge and adherence to guidelines
- Designate trained personnel to insert central intravascular catheters
- Avoid the use of steel needles and administration of fluids that may cause tissue necrosis
- Weigh the risks and benefits of placing a central venous device at a recommended site to reduce infectious complications against the risk of mechanical complications
- Avoid using the femoral vein for central venous access in adults
- Avoid the subclavian site in hemodialysis patients and patients with advanced kidney disease
- Use a fistula or graft in patients with chronic renal failure instead of a central venous catheter (CVC)
- Promptly remove any intravascular catheter that is no longer essential
- Sterile gloves should be worn during insertion
- Prepare skin with > 0.5% chlorhexidine preparation with alcohol before placement
- Cover the catheter site with sterile gauze or other sterile, transparent, semipermeable dressing
- Chlorhexidine-impregnated dressings with an FDA-cleared label that specifies a clinical indication for reducing catheter-related bloodstream infection (CRBSI) or CLABSI are recommended to protect the insertion site of short-term, non-tunneled central venous catheters.

The CDC recommendation for antimicrobial catheters is below with emphasis that use of antimicrobial catheters should only be implemented after an attempt in the use of the level 1A recommendations has been met.¹

“Use a chlorhexidine/silver sulfadiazine or minocycline/rifampin -impregnated CVC in patients whose catheter is expected to remain in place > 5 days if, after successful implementation of a comprehensive strategy to reduce rates of CLABSI, the CLABSI rate is not decreasing. The comprehensive strategy should include at least the following three components: educating persons who insert and maintain catheters, use of maximal sterile barrier precautions, and a >0.5% chlorhexidine preparation with alcohol for skin antisepsis during CVC insertion” — **CDC Prevention Guideline, 2011¹**

Do Studies Support Use of Central Line Bundles?

At the frontier of infection prevention strategies are bundles and kits that simplify and standardize care. Various studies exist describing the use of the most important and stringent aspects of the 1A recommendations; use of education, maximal sterile barrier precautions, and chlorhexidine preparation. The studies on page three note statistically significant reductions in CLABSI rates with the implementation and use of full barrier bundles.²⁻⁵ It is easy to overlook the CDC 1A recommendations when novel technology becomes available. In contemporary clinical practice, there is a trend toward a reliance on antimicrobial catheters, despite the existence of multi-center, high value, statistically significant studies that analyze the use and effectiveness of full barrier central line bundles.²⁻⁵

Author	Type of Intervention Bundle	Study Type	Results*	Conclusion
Marsteller et al., 2012² https://www.ncbi.nlm.nih.gov/pubmed/22890251	The comprehensive strategy of the study included the three main components listed in the CDC 1A Recommendations on page 1.	19 month multi-center, randomized, control trial 45 ICU's.	Bundle Group Pre-Intervention CLABSI rate: 4.48 Control Group: 2.71 Bundle Group Post-Intervention CLABSI rate: 1.33 Control Group: 2.16 p = 0.003	Use of a CLABSI prevention bundle significantly reduced CLABSI rates.
Pronovost et al., 2006³ https://www.nejm.org/doi/full/10.1056/NEJMoa061115	The comprehensive strategy of the study included the three main components listed in the CDC 1A Recommendations on page 1.	16 month multi-center, prospective, observational study of 103 ICU's.	CLABSI rate prior to bundle implementation: 7.7 CLABSI rate 16 months after bundle implementation: 1.4 p < 0.002	Use of a bundle of CLABSI prevention interventions may significantly reduce CLABSI rates over time.
CDC, 2005⁴ https://www.ncbi.nlm.nih.gov/pubmed/16224448	The comprehensive strategy of the study included the three main components listed in the CDC 1A Recommendations on page 1.	Four year multi-center, prospective, observational study of 32 hospital's ICU's.	CLABSI rate prior to bundle implementation: 4.13 CLABSI rate 16 months after bundle implementation: 1.36 p < 0.001	Use of a CLABSI prevention bundle may reduce CLABSI rates.
Drews et al., 2017⁵ https://www.ncbi.nlm.nih.gov/pubmed/28684127	The comprehensive strategy of the study included the three main components listed in the CDC 1A Recommendations on page 1.	29 month prospective, observational study at a single tertiary hospital.	CLABSI rate prior to bundle implementation: 2.21 CLABSI rate 16 months after bundle implementation: 0.0 P = 0.0005	Use of a central line maintenance kit significantly reduced CLABSI rates compared to the pre-intervention period.

*CLABSI rate presented as the number of CLABSIs per 1000 central line days

Is There Evidence That Second Generation CHSS Coated CVC Catheters Reduce CLABSI Rates?

The next page contains a list of studies utilizing the market leading, second generation chlorhexidine-silver sulfadiazine (CHSS) coated CVC with reference to any significant reduction in colonization, catheter related blood stream infections (CRBSI), and whether the study included education, full barrier kits, or cleaning with chlorhexidine preparation before insertion (i.e. minimum of the three main components of the CDC 1A recommendations listed on page one). Each study compared the use of second generation CHSS CVCs with non-antimicrobial CVCs. The majority of studies were unable to determine a statistically significant reduction in CRBSI rates.⁶⁻¹³ Although studies revealed a significant reduction in catheter colonization,⁶⁻⁸ whether this can be attributed to the use of CHSS coated catheters alone, and not the use of education, full barrier kits, or cleaning before insertion, has yet to be determined. More statistical proof lies within extensive multicenter studies that utilize these central line bundles.²⁻⁵ Additionally, no study exists comparing the clinical effectiveness of the second generation CHSS catheter in preventing CRBSIs compared to the original first generation catheter.¹⁴

Studies Comparing the use of Second Generation CHSS CVCs with Non-Antimicrobial CVCs:

Author	Study Type	Significant Reduction in Colonization*	Significant Reduction in Catheter Related Blood Stream Infections (CRBSI)*	Education? Full Barrier Kits? Cleaning with Chloroprep before insertion?
Brun-Buisson et al., 2004⁶ https://www.ncbi.nlm.nih.gov/pubmed/15060765	Randomized double-blind trial	Yes, Colonization in Standard CVC group: 11 Colonization in CHSS CVC group: 3.6 p = 0.01	No, CRBSI in Standard CVC group: 5.2 CRBSI in CHSS CVC group: 2 p = 0.10	Yes to all
Ostendorf et al., 2005⁷ https://www.ncbi.nlm.nih.gov/pubmed/15834740	Randomized control trial between Jan. 2000 and Sept. 2001	Yes, Catheter colonization differed significantly between both groups (p = 0.01).	No, although bloodstream episodes in patients with the CHSS catheters were lower than in patients with the control catheter, the difference was not statistically significant (p = 0.21).	Yes, Yes, 70% alcohol
Rupp et al., 2005⁸ https://www.ncbi.nlm.nih.gov/pubmed/16230723	Randomized, double-blind, controlled trial between 1998 and 2001	Yes, Colonization in Standard CVC group: 24.1 Colonization in CHSS CVC group: 13.3 p < 0.01	No, CRBSI in Standard CVC group: 1.24 CRBSI in CHSS CVC group: 0.42 p = 0.6	Yes, Yes, 10% povidone-iodine
Schuerer et al., 2007⁹ https://www.ncbi.nlm.nih.gov/pubmed/17883361	Observational study between 2002 and 2005	Not Studied	No, Catheter placed in ICU: CRBSI Pre Intervention: 3.3 CRBSI Post Intervention: 2.1 p = 0.16 Catheter placed outside ICU: CRBSI Pre Intervention: 4.2 CRBSI Post Intervention: 2.7 p = 0.15	Yes to all
Camargo et al., 2009¹⁰ https://www.ncbi.nlm.nih.gov/pubmed/19443078	Randomized trial conducted between 2002 and 2003	No, Colonization in Standard Group: 25.4 Colonization in CHSS Group: 19.5 p = 0.44	No, CRBSI standard CVC Group: 7.6 CRBSI CHSS CVC Group: 10.4 p = 0.81	Yes to all
Cherry-Bukowiec et al., 2011¹¹ https://www.ncbi.nlm.nih.gov/pubmed/21171811	Interrupted time-series design with implementation of routine use of CHSS CVCs between 2001 and 2006	Not Studied	No, CLABSI rate with bundle, but without CHSS CVC: 0.80 CLABSI rate with bundle and CHSS CVC: 0.70 p > 0.05	Yes to all
Lorente et al., 2014¹² https://www.ncbi.nlm.nih.gov/pubmed/24581021	Retrospective study	Not Studied	Yes, Pt with CHSS- impregnated catheters had a lower rate of CRBSI (1.4% vs 0%; p = 0.03)	Not specified
Beigmohammadi et al., 2016¹³ https://pdfs.semanticscholar.org/fd01/07bf3f12942f-2c5c6036fafa-8b83587ae8dc.pdf	Randomized, non-blind, prospective observational cohort study	No, compared to standard catheters, CHSS impregnated catheters had no significant effect on colonization (p = 0.480).	No, compared to standard catheters, CHSS impregnated catheters had no significant effect on blood stream infection prevention (p = 0.503).	Yes to all

*Rates presented as the number per 1000 central line days

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