

Guidance for Product Selection Related to Prevention of Healthcare-Associated Infection

Introduction

This document contains excerpts from the SHEA-IDSAs *Compendium of Strategies to Prevent Healthcare-Associated Infections*, published in *Infection Control and Hospital Epidemiology*, October 2008 Supplement.

Note: The page number, paragraph and section number where the recommendation is located is noted for each one of the six separate documents that make up the complete Compendium.

The *Compendium* provides ranked recommendations based on strength and quality of relevant research data that may be helpful in selection of products related to prevention of healthcare associated infections (HAI).

These recommendations are only one source of information for the selection of products and practices to incorporate into infection prevention and control programs. Additional guidance with rankings for infection prevention practices and products selection is provided in the specific guidelines from the Centers for Disease Control and Prevention (CDC) for preventing HAI on a variety of topics, including, sterilization and disinfection, isolation, multi-drug resistant organisms (MDRO), environment, hand hygiene, and tuberculosis. More recent evidence-based recommendations may also be available from the scientific literature.

Each recommendation must be reviewed and prioritized with consideration of a number of factors for selection of a product or practice. These factors are specific for each healthcare facility and may include:

1) the type of patients (e.g., age, risk factors); 2) the setting (e.g., acute, pediatric, long-term care); 3) facility-specific infection surveillance data; 4) infection prevention program priorities based on risk assessments; 5) local antimicrobial resistance patterns; 6) available resources; and 7) previous experience or success with specific initiatives, interventions, or products.

The SHEA – IDSA Compendium and the CDC Guidelines are available for download on the Premier Safety Institute Web site at:

<http://www.premierinc.com/quality-safety/tools-services/safety/topics/guidelines>

Contents:

- Catheter-Associated Urinary Tract Infections (CAUTI)
- Surgical Site Infections (SSI)
- Ventilator-Associated Pneumonia (VAP)
- Central Line-Associated Blood Stream Infections (CLABSI)
- Methicillin-Resistant *Staphylococcus aureus* (MRSA)
- *Clostridium difficile*

Strength of Recommendation and Quality of Evidence

<u>Category/grade</u>	<u>Definition</u>
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Strength of recommendation

A	Good evidence to support a recommendation for use
B	Moderate evidence to support a recommendation for use
C	Poor evidence to support a recommendation

Quality of evidence

I.	Evidence from ≥ 1 properly randomized, controlled trial
II	Evidence from ≥ 1 well-designed clinical trial, without randomization; from cohort or case-control analytic studies (preferably from ≥ 1 center); from multiple time series; or from dramatic results from uncontrolled experiments
III	Evidence from opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees

CATHETER ASSOCIATED URINARY TRACT INFECTIONS (CAUTI)

Page 3- Updated literature

c. Catheter materials

- i. Reviews and meta-analyses of silver-coated and other antibacterial urinary catheters consistently conclude that evidence does not support a recommendation for the uniform use of such devices.^{26,31,32}
- ii. Silver-alloy catheters may decrease bacteriuria but have not been shown to decrease symptomatic infection or other undesirable outcomes.^{31,32}
 - (a) Some of the variability in outcomes reported in trials of silver catheters may be related to whether the comparator catheter is silicone or latex.³³
 - (b) A recent prospective crossover study comparing a silver-alloy, silicone-based hydrogel-coated catheter with a silicone-based hydrogel-coated catheter reported *no difference* in symptomatic or asymptomatic infection or in bloodstream infections attributable to a urinary source.³⁴

Practice

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D. Appropriate technique for catheter insertion

5. Use gloves, a drape, and sponges; a sterile or antiseptic solution for cleaning the urethral meatus; and a single-use packet of sterile lubricant jelly for insertion (A-III).

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E. Appropriate management of indwelling catheters

10. Cleaning the meatal area with *antiseptic solutions is unnecessary*; routine hygiene is appropriate (A-I).

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III. Approaches that should not be considered a routine part of CAUTI prevention

1. Do not routinely use silver-coated or other antibacterial catheters (A-I).

IV. Unresolved issues

1. Use of antiseptic solution versus sterile saline for meatal cleaning before catheter insertion
2. Use of antimicrobial-coated catheters for selected patients at high risk for infection

SURGICAL SITE INFECTIONS

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Section 3: Strategies to prevent SSI

1. Existing guidelines, recommendations, and requirements
 - c. Surgical Care Improvement Project
 - (a) Proper hair removal: no hair removal or hair removal with clippers or depilatory method is considered appropriate; *use of razors is considered inappropriate*

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2. Infrastructure requirements

- c. Computer-assisted decision support and automated reminders
 - i. Several institutions have successfully employed computer-assisted decision-support methodology to improve the rate of appropriate administration of antimicrobial prophylaxis (including redosing during prolonged cases).⁴²⁻⁴⁴
 - ii. Computer-assisted decision support, however, is potentially expensive, can be time consuming to implement, and, in a single study, was reported to initially increase the rate of adverse drug reactions.⁴⁵
 - iii. Institutions must appropriately validate computer- assisted decision-support systems after implementation.
- d. Utilization of automated data

- i. Install information technology infrastructure to facilitate data transfer, receipt, and organization to aid with the tracking of process and outcome measures.

Practice

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- 2. Do not remove hair at the operative site unless the presence of hair will interfere with the operation; do not use razors (A-II).
 - a. If hair removal is necessary, remove it by clipping or by use of a depilatory agent.
- 5. Implement policies and practices aimed at reducing the risk of SSI that meet regulatory and accreditation requirements and that are aligned with evidence-based standards (e.g., Centers for Disease Control and Prevention and professional organization guidelines) (A-II).^{5,35,36}
 - a. Policies and practices should include but are not limited to the following:
 - i. Reducing modifiable patient risk factors
 - ii. Optimal cleaning and disinfection of equipment and the environment
 - iii. Optimal preparation and disinfection of the operative site and the hands of the surgical team members
 - iv. Adherence to hand hygiene

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IV. Unresolved issues

- 1. Preoperative bathing with chlorhexidine-containing products
 - a. Preoperative showering with agents such as chlorhexidine has been shown to reduce bacterial colonization of the skin.⁵⁶ Several studies have examined the utility of preoperative showers, but none has definitively proven that they decrease SSI risk. A recent Cochrane review⁵⁷ *evaluated the evidence for preoperative bathing or showering with antiseptics for SSI prevention*. Six randomized, controlled trials evaluating the use of 4% chlorhexidine gluconate were included in the analysis, with no clear evidence of benefit noted. To gain the maximum antiseptic effect of chlorhexidine, it must be allowed to dry completely and not be washed off.
- 2. Routine screening for MRSA or routine attempts to decolonize surgical patients with an antistaphylococcal agent in the preoperative setting
 - a. A recent double-blinded, randomized, controlled trial involving more than 4,000 patients showed that intranasal application of mupirocin did not significantly reduce the *S. aureus* SSI rate.⁵⁸ In a secondary analysis of these data, however, the use of intranasal mupirocin was associated with an overall decreased rate of nosocomial *S. aureus* infection among the *S. aureus* carriers.⁵⁸ Mupirocin resistance has been documented.⁵⁹
 - b. In contrast, other studies have suggested that mupirocin may be effective for particular patient groups, including patients undergoing orthopedic^{60,61} or cardiothoracic^{62,63} surgery. However, these were not randomized controlled trials.
- 5. Preoperative intranasal and pharyngeal chlorhexidine treatment for patients undergoing cardiothoracic procedures⁷⁰
 - a. Although data exist from a randomized, controlled trial to support its usage, chlorhexidine nasal cream is neither approved by the US Food and Drug Administration nor commercially available in the United States.

VENTILATOR-ASSOCIATED PNEUMONIA

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2. General strategies that have been found to influence the risk of VAP

- b. Strategies to prevent aspiration
 - iv. Use a cuffed endotracheal tube with in-line or subglottic suctioning.^{52,57,81-86}
- c. Strategies to reduce colonization of the aerodigestive tract
 - i. Orotracheal intubation is preferable to nasotracheal

iii. Perform regular oral care^{57,100-103} with an antiseptic solution.^{101,104-108} The optimal frequency for oral care is unresolved.

Practice

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3. Perform regular antiseptic oral care in accordance with product guidelines (A-I).

II. Special approaches for the prevention of VAP

1. Use an endotracheal tube with in-line and subglottic suctioning for all eligible patients (B-II).

2. Ensure that all ICU beds used for patients undergoing ventilation have a built-in tool to provide continuous monitoring of the angle of incline (B-III).

IV. Unresolved issues

3. Use of antiseptic-impregnated endotracheal tubes.^{129,130}

CENTRAL LINE ASSOCIATED BLOODSTREAM INFECTIONS

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2. Perform hand hygiene before catheter insertion or manipulation (B-II).³⁰⁻³³

a. Use an alcohol-based waterless product or antiseptic soap and water.

i. Use of gloves does not obviate hand hygiene.

4. Use an all-inclusive catheter cart or kit (B-II).²³

a. A catheter cart or kit that contains all necessary components for aseptic catheter insertion is to be available and easily accessible in all units where CVCs are inserted.

5. Use maximal sterile barrier precautions during CVC insertion (A-I).³⁹⁻⁴²

a. Use maximal sterile barrier precautions.

i. A mask, cap, sterile gown, and sterile gloves are to be worn by all healthcare personnel involved in the catheter insertion procedure.

ii. The patient is to be covered with a large sterile drape during catheter insertion.

b. These measures must also be followed when exchanging a catheter over a guidewire.

6. Use a chlorhexidine-based antiseptic for skin preparation in patients older than 2 months of age (A-I).⁴³⁻⁴⁶

a. Before catheter insertion, apply an alcoholic chlorhexidine solution containing a concentration of chlorhexidine gluconate greater than 0.5% to the insertion site.

i. The antiseptic solution must be allowed to dry before making the skin puncture.

ii. Chlorhexidine products are *not approved by the US Food and Drug Administration for children younger than 2 months of age*; povidone-iodine can be used for children in this age group.

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C. After insertion

1. Disinfect catheter hubs, needleless connectors, and injection ports before accessing the catheter (B-II).⁴⁷⁻⁴⁹

a. Before accessing catheter hubs or injection ports, clean them with an alcoholic chlorhexidine preparation or 70% alcohol to reduce contamination

6. Use antimicrobial ointments for hemodialysis catheter insertion sites (A-I).⁵⁸⁻⁶²

a. Povidone-iodine or polysporin ointment should be applied to hemodialysis catheter insertion sites in patients with a history of recurrent *Staphylococcus aureus* CLABSI.

b. *Mupirocin ointment should not be applied to the catheter insertion site due to the risks of mupirocin resistance and damage to polyurethane catheters*

II. Special approaches for the prevention of CLABSI

1. Bathe ICU patients older than 2 months of age with a chlorhexidine preparation on a daily basis (B-II)⁶³
- a. Chlorhexidine products are not approved by the US Food and Drug Administration for children younger than 2 months of age but are used at some institutions for cleaning CVC insertion sites or as a sponge dressing for children in this age group.
- b. A povidone-iodine preparation should be used to clean CVC insertion sites for children younger than 2 months of age, especially low-birth-weight neonates.

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Special approaches for the prevention of CLABSI-continued

2. Use antiseptic- or antimicrobial-impregnated CVCs for adult patients (A-I).⁶⁴⁻⁷⁰
 - a. The risk of CLABSI is reduced with some currently marketed catheters impregnated with antiseptics (eg, chlorhexidine- silver sulfadiazine) or antimicrobials (eg, minocycline-rifampin). Consider the use of such catheters in the following circumstances:
 - i. Hospital units or patient populations have a CLABSI rate higher than the institutional goal, despite compliance with basic CLABSI prevention practices.
 - ii. Patients have limited venous access and a history of recurrent CLABSI.
 - iii. Patients are at heightened risk for severe sequelae from a CLABSI (eg, patients with recently implanted intravascular devices, such as a prosthetic heart valve or aortic graft).
 - b. These catheters are not approved by the US Food and Drug Administration for use in children.
 - i. Preliminary data suggest that antimicrobial-impregnated catheters appear to be safe and may hold promise for pediatric ICU patients.^{71,72}
3. Use chlorhexidine-containing sponge dressings for CVCs in patients older than 2 months of age (B-I).⁷³⁻⁷⁵
 - a. Consider the addition of such a dressing in the following circumstances:
 - i. Hospital units or patient populations have a CLABSI rate higher than the institutional goal, despite compliance with an evidence-based prevention bundle.
 - ii. Patients have limited venous access and a history of recurrent CLABSI.
 - iii. Patients are at heightened risk for severe sequelae from a CLABSI (e.g., patients with recently implanted intravascular devices, such as a prosthetic heart valve or aortic graft).
 - b. Do not use chlorhexidine-containing sponge dressings for low-birth-weight neonates.
4. Use antimicrobial locks for CVCs (A-I).⁷⁶⁻⁸⁰
 - a. Antibiotic locks are created by filling the lumen of the catheter with a supraphysiologic concentration of an antimicrobial solution and leaving the solution in place until the catheter hub is reaccessed. Such an approach can reduce the risk of CLABSI. Because of concerns regarding the potential for the emergence of resistance in exposed organisms and the potential for systemic toxicity from leakage of the lock solution into the bloodstream, use antimicrobial locks as a **preventative strategy only for the following:**
 - i. Prophylaxis for patients with limited venous access and a history of recurrent CLABSI.
 - ii. Patients who are at heightened risk for severe sequelae from a CLABSI (eg, patients with recently implanted intravascular devices such as a prosthetic heart valve or aortic graft).

III. Approaches that should not be considered a routine part of CLABSI prevention

Do not routinely use positive-pressure needleless connectors with mechanical valves before a thorough assessment of risks, benefits, and education regarding proper use (BII).⁸⁸⁻⁹¹

PREVENTION OF TRANSMISSION OF Methicillin-Resistant *Staphylococcus aureus* (MRSA)

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Infrastructure requirements

- ii. Information technology systems to allow rapid notification of clinical personnel and infection prevention and control personnel of new MRSA isolates, collection of data needed for MRSA surveillance and rate calculations, and identification of MRSA-colonized patients on readmission.

- iii. Sufficient supplies for hand hygiene and contact precautions (eg, gowns and gloves)
- iv. Resources to provide appropriate education and training to healthcare personnel, patients, and visitors
- v. Adequate laboratory support

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I. Basic practices for prevention of MRSA transmission: recommended for all acute care hospitals

- 4. Use contact precautions for MRSA-colonized or –infected patients (A-II).
 - ii. Wear a gown and gloves on entry into the patient’s room
- 5. Ensure cleaning and disinfection of equipment and the environment (B-III).
 - b. Develop and implement protocols for cleaning and disinfecting environmental surfaces.
 - i. Select appropriate cleaning and disinfecting agents for environmental surfaces. Recent guidelines have outlined environmental disinfection protocols.⁵¹ Routine cleaning and disinfection of the patient environment with US Environmental Protection Agency–registered hospital disinfectants (eg, quaternary ammonium compounds, sodium hypochlorite, iodophors, and phenolics) used in accordance with the manufacturers’ directions is adequate to reduce MRSA contamination.
 - iv. To reduce MRSA contamination, disinfect portable healthcare equipment, such as stethoscopes and otoscopes, with a 70% isopropyl alcohol swab or other disinfectant after each use.

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- d. Dedicate noncritical patient care items, such as blood pressure cuffs and stethoscopes, to a single patient when they are known to be colonized or infected with MRSA. When this is not possible, ensure adequate cleaning and disinfection of items between patient encounters.
- 7. Implement a laboratory-based alert system that immediately notifies infection prevention and control personnel and clinical personnel of new MRSA-colonized or –infected patients (B-III).

II. Special approaches for the prevention of MRSA transmission

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- e. Determine laboratory methods and assess resource requirements.
 - i. Identify the screening test method to be used.
 - ii. MRSA can be detected using culture-based methods or molecular diagnostic testing methods, such as polymerase chain reaction (PCR).

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- h. Assess the availability of personal protective equipment and other supplies.
- i. Ensure that gowns, gloves, and hand-hygiene products (eg, alcohol-based hand rubs, soap, and paper towels) are consistently available to healthcare personnel. The screening program will not be effective if healthcare personnel are not able to comply with contact precautions because of a lack of supplies

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C. Routine bathing with chlorhexidine (The use of chlorhexidine for routine patient cleansing outside of the adult ICU setting has not been studied)

- 1. Routinely bathe adult ICU patients with chlorhexidine (B-III).
 - a. Use chlorhexidine rather than regular soap and water or other nonmedicated cleansing regimens for routine patient cleansing.
 - b. A variety of chlorhexidine products that could be used for patient bathing are available. These include single use bottles of aqueous chlorhexidine that can be added to a basin of water and 2% chlorhexidine-impregnated cloths.

It should be noted that the *use of undiluted 4% aqueous chlorhexidine solution for skin cleansing has been associated with a relatively high rate of reversible adverse skin effects* (eg, skin fissures, itching, and burning of the skin).⁹⁷

- c. When using chlorhexidine, the manufacturer's recommendations should be followed. Care must be taken to avoid contact with the eyes and middle ear (eg, in patients with perforated tympanic membranes). Chlorhexidine is in US Food and Drug Administration Pregnancy Category C.
1. Provide decolonization therapy to MRSA-colonized patients in conjunction with an active surveillance testing program (B-III).
 - a. The ***optimal decolonization therapy regimen has not been determined***. Most experience has been with the use of 2% mupirocin administered intranasally with or without chlorhexidine bathing.

PREVENTION OF TRANSMISSION OF *Clostridium Difficile*

page 2

2. Identifying patients with CDI

Positive results of diarrheal stool tests for toxigenic *C. difficile* or its toxins are the most common methods used to identify patients with CDI.^{20-22,24}

- a. Positive results of diarrheal stool tests should automatically be sent to infection prevention and control professionals and to clinicians caring for the patient.
- b. Only diarrheal stools should be tested for *C. difficile* or its toxins. A positive result of a test for toxigenic *C. difficile* and/or its toxins in a patient with diarrhea is considered to be diagnostic for CDI. However, some centers permit *C. difficile* testing of nondiarrheal stools. In such cases, review of patient records is required to ensure that the patient has symptoms consistent with CDI

Section 3: strategies to prevent CDI

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- c. General strategies to prevent CDI, per previously published guidelines,^{22,24-27} include the following:
 - i. Methods of reducing the risk of CDI if the organism is encountered by the patient
 - (a) Follow antimicrobial usage restriction and stewardship guidelines.
 - ii. Methods of preventing the patient from being exposed to *C. difficile* (disinfection and barrier methods)
 - (a) ***Avoid*** the use of electronic thermometers; the handles become contaminated with *C. difficile*.
 - (b) Use dedicated patient care items and equipment if items must be shared, clean and disinfect the equipment between patients.
 - (c) Use full barrier precautions (gowns and gloves) for contact with patients with CDI and for contact with their body substances and environment (contact precautions).
 - (d) Place patients with CDI in private rooms, if available; give isolation preference to patients with fecal incontinence if room availability is limited.
 - (e) Perform meticulous hand hygiene based on Centers for Disease Control and Prevention or World Health Organization guidelines before and after entering the room of a patient with CDI, with soap and water or an alcohol-based hand-hygiene product (in routine settings or settings of endemicity).
 - (f) Perform environmental decontamination of rooms housing patients with CDI, using sodium hypochlorite (household bleach) diluted 1: 10 with water, ***in an outbreak setting or setting of hyperendemicity***.

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2. Ensure cleaning and disinfection of equipment and the environment (B-III for equipment and B-II for the environment).
 - c.
 - i. Recent guidelines have outlined environmental disinfection protocols.⁴⁰ There are no US Environmental Protection Agency-registered products specific for inactivating *C. difficile* spores. Data are conflicting as to whether inactivation of spores is necessary to prevent *C. difficile* transmission, especially in a setting of endemicity.

(NOTE from SI: In early April 2009 There was an announcement that EPA just approved a 6.15% Bleach from Chlorox - Ultra Chlorox)

- ii. Facilities should consider using a 1:10 dilution of sodium hypochlorite (household bleach) for environmental disinfection in outbreak settings and settings of hyperendemicity in conjunction with other infection prevention and control measures (see below: II. Special Approaches for the Prevention of CDI). The bleach solution should have a contact time of at least 10 minutes.⁴¹
- d. ii. Assess the adequacy of cleaning before changing to a new cleaning product (e.g., bleach). If cleaning is not adequate, address this before changing products (see below: II. Special Approaches for the Prevention of CDI).
- e. Dedicate noncritical patient care items, such as blood pressure cuffs, stethoscopes, and thermometers, to a single patient with CDI.
- i. When this is not possible, ensure adequate cleaning and disinfection of shared items between patient encounters. Ensure that the manufacturers' recommendations for contact time of disinfectants are followed

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- 7. Measure compliance with Centers for Disease Control and Prevention or World Health Organization hand-hygiene and contact precaution recommendations (B-III).
- b. Glove use when caring for patients with CDI or touching surfaces in their rooms has been shown to be effective at preventing the transmission of *C. difficile*.
- i. Area of controversy: There are concerns regarding reliance on alcohol-based hand-hygiene products, because alcohol is not sporicidal. Conversely, hand washing with soap and water is associated with much lower compliance. In settings where CDI is endemic, it appears the potential decrease in efficacy of alcohol-based hand-hygiene products for removing spores, compared with hand washing, may be offset by the increase in hand hygiene adherence with alcohol-based hand-hygiene products, if contact precautions are followed (i.e., if gloves and gowns are worn) when caring for patients with CDI.⁴⁵ (**NB: Need both soap and ABHR**)

II. Special approaches for the prevention of CDI

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- 2. Use sodium hypochlorite (bleach)-containing cleaning agents for environmental cleaning. Implement a system to coordinate with the housekeeping department if it is determined that sodium hypochlorite is needed for environmental disinfection (B-II).
- a. Area of controversy: ***Data on the ability of diluted sodium hypochlorite or other sporicidal agents used for environmental decontamination to control CDI have not been consistent.*** However, a beneficial effect has been reported when bleach has been used in outbreak settings or settings of hyperendemicity, typically in conjunction with other enhanced CDI control measures.^{40,50-5}
- c. When diluted sodium hypochlorite is used, it is important to address the following issues:
 - i. Avoid toxicity to patients and staff and damage to equipment and the environment from bleach use. Sodium hypochlorite can be corrosive and irritating to patients, housekeeping staff, and other healthcare personnel.
 - ii. The sodium hypochlorite solution must be mixed fresh daily.
- d. When sodium hypochlorite will be used only in the rooms of patients with CDI, a system will need to be created to identify these patients to the housekeeping staff