A compendium of strategies to prevent healthcare-associated infections in acute care hospitals: 2014 updates

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Executive Summary: A Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals: 2014 Updates

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A Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals: 2014 Updates

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EXECUTIVE SUMMARY

Much progress has been achieved since the publication of “A Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals” in 2008. In 2009, the US Department of Health and Human Services released a national healthcare-associated infection (HAI) action plan focused on preventing central line–associated bloodstream infections (CLABSI), catheter-associated urinary tract infections (CAUTI), surgical site infections (SSI), methicillin-resistant Staphylococcus aureus (MRSA) bloodstream infections, and Clostridium difficile infections (CDI) in October 2008. Since the publication of “A Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals” in 2008, prevention of healthcare-associated infections (HAIs) has become a national priority. Despite improvements, preventable HAIs continue to occur. The 2014 updates to the Compendium were created to provide acute care hospitals with up-to-date, practical, expert guidance to assist in prioritizing and implementing their HAI prevention efforts. They are the product of a highly collaborative effort led by the Society for Healthcare Epidemiology of America (SHEA), the Infectious Diseases Society of America (IDSA), the American Hospital Association (AHA), the Association for Professionals in Infection Control and Epidemiology (APIC), and The Joint Commission, with major contributions from representatives of a number of organizations and societies with content expertise, including the Centers for Disease Control and Prevention (CDC), the Institute for Healthcare Improvement (IHI), the Pediatric Infectious Diseases Society (PIDS), the Society for Critical Care Medicine (SCCM), the Society for Hospital Medicine (SHM), and the Surgical Infection Society (SIS).
Preventing CLABSI and SSI within the last several years. Based on HAI surveillance data collected by NHSN, substantial improvements have been achieved in understanding of US healthcare. Also in 2011, HHS launched a public-private initiative called the Partnership for Patients: Better Care, Lower Costs, aimed at improving the quality, safety, and affordability of US healthcare. Based on HAI surveillance data collected by NHSN, substantial improvements have been achieved in preventing CLABSI and SSI within the last several years.

Continued progress in healthcare epidemiology and implementation science research has led to improvements in our understanding of effective HAI prevention strategies. Despite these advancements, HAIs continue to affect about 1 out of every 25 hospitalized patients, leading to substantial morbidity, mortality, and excess healthcare expenditures, and there are persistent gaps between recommendations and practice.

The following is a summary of the strategies to prevent HAIs in acute care hospitals presented in the 2014 Compendium updates. Criteria for classifying recommendations as basic practices versus special approaches and for grading the quality of supporting evidence are described below. Each infection prevention recommendation was assigned a quality-of-evidence rating (high = I, moderate = II, or low = III) adapted from criteria utilized by the Grades of Recommendation, Assessment, Development, and Evaluation (GRADE) system and the Canadian Task Force on Preventive Health Care (Table 1).

### Strategies to Prevent CAUTI

1. Basic practices for preventing CAUTI: recommended for all acute care hospitals
   A. Provide appropriate infrastructure for preventing CAUTI
   B. Perform surveillance for CAUTI if indicated on the basis of facility risk assessment or regulatory requirements

   1. Identify the patient groups or units in which to conduct surveillance on the basis of risk assessment, considering frequency of catheter use and potential risk (eg, types of surgery, obstetrics, critical care; quality of evidence: III).
   2. Use standardized criteria, such as NHSN definitions, to identify patients who have a CAUTI (numerator data; quality of evidence: III).
   3. Collect information on catheter-days and patient-days (denominator data) and indications for catheter insertion for all patients in the patient groups or units being monitored (quality of evidence: III).
   4. Calculate CAUTI rates and/or standardized infection ratio (SIR) for target populations (quality of evidence: III).

### Table 1: Grading of the Quality of Evidence

<table>
<thead>
<tr>
<th>Grade</th>
<th>Definition</th>
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<tbody>
<tr>
<td>I. High</td>
<td>Highly confident that the true effect lies close to that of the estimated size and direction of the effect. Evidence is rated as high quality when there is a wide range of studies with no major limitations, there is little variation between studies, and the summary estimate has a narrow confidence interval.</td>
</tr>
<tr>
<td>II. Moderate</td>
<td>The true effect is likely to be close to the estimated size and direction of the effect, but there is a possibility that it is substantially different. Evidence is rated as moderate quality when there are only a few studies and some have limitations but not major flaws, there is some variation between studies, or the confidence interval of the summary estimate is wide.</td>
</tr>
<tr>
<td>III. Low</td>
<td>The true effect may be substantially different from the estimated size and direction of the effect. Evidence is rated as low quality when supporting studies have major flaws, there is important variation between studies, the confidence interval of the summary estimate is very wide, or there are no rigorous studies, only expert consensus.</td>
</tr>
</tbody>
</table>

**Note:** Based on Grades of Recommendation, Assessment, Development, and Evaluation (GRADE) and the Canadian Task Force on Preventive Health Care.
5. Use surveillance methods for case finding that are documented to be valid and appropriate for the institution (quality of evidence: III).
C. Provide education and training
1. Educate healthcare personnel (HCP) involved in the insertion, care, and maintenance of urinary catheters about CAUTI prevention, including alternatives to indwelling catheters, and procedures for catheter insertion, management, and removal (quality of evidence: III).
D. Use appropriate technique for catheter insertion
1. Insert urinary catheters only when necessary for patient care and leave in place only as long as indications remain (quality of evidence: II).
2. Consider other methods for bladder management, such as intermittent catheterization, where appropriate (quality of evidence: II).
3. Practice hand hygiene (based on CDC or World Health Organization [WHO] guidelines) immediately before insertion of the catheter and before and after any manipulation of the catheter site or apparatus (quality of evidence: III).
4. Insert catheters following aseptic technique and using sterile equipment (quality of evidence: III).
5. Use sterile gloves, drape, and sponges; a sterile or antiseptic solution for cleaning the urethral meatus; and a sterile single-use packet of lubricant jelly for insertion (quality of evidence: III).
6. Use as small a catheter as possible consistent with proper drainage, to minimize urethral trauma (quality of evidence: III).
E. Ensure appropriate management of indwelling catheters
1. Properly secure indwelling catheters after insertion to prevent movement and urethral traction (quality of evidence: III).
3. Replace the catheter and the collecting system using aseptic technique when breaks in aseptic technique, disconnection, or leakage occur (quality of evidence: III).
4. For examination of fresh urine, collect a small sample by aspirating urine from the needleless sampling port with a sterile syringe/cannula adaptor after cleansing the port with disinfectant (quality of evidence: III).
5. Obtain larger volumes of urine for special analyses aseptically from the drainage bag (quality of evidence: III).
7. Employ routine hygiene; cleaning the meatal area with antiseptic solutions is unnecessary (quality of evidence: III).
II. Special approaches for preventing CAUTI
1. Implement an organization-wide program to identify and remove catheters that are no longer necessary using one or more methods documented to be effective (quality of evidence: II).
2. Develop a protocol for management of postoperative urinary retention, including nurse-directed use of intermittent catheterization and use of bladder scanners (quality of evidence: II).
3. Establish a system for analyzing and reporting data on catheter use and adverse events from catheter use (quality of evidence: III).

Strategies to Prevent CDI
I. Basic practices for prevention and monitoring of CDI: recommended for all acute care hospitals
1. Encourage appropriate use of antimicrobials (quality of evidence: II).
2. Use contact precautions for infected patients, single-patient room preferred (quality of evidence: III for hand hygiene, II for gloves, III for gowns, III for single-patient room).
4. Implement a laboratory-based alert system to provide immediate notification to infection prevention and control and clinical personnel about newly diagnosed CDI patients (quality of evidence: III).
6. Educate HCP, environmental service personnel, and hospital administration about CDI (quality of evidence: III).
7. Educate patients and their families about CDI as appropriate (quality of evidence: III).
8. Measure compliance with CDC or WHO hand hygiene and contact precaution recommendations (quality of evidence: III).
II. Special approaches for preventing CDI
A. Approaches to minimize C. difficile transmission by HCP
1. Intensify the assessment of compliance with process measures (quality of evidence: III).
2. During outbreaks or in settings with hyperendemic CDI, perform hand hygiene with soap and water as the preferred method before exiting the room of a patient with CDI (quality of evidence: III).
3. Place patients with diarrhea under contact precautions while C. difficile testing is pending (quality of evidence: III).
4. Prolong the duration of contact precautions after the patient becomes asymptomatic until hospital discharge (quality of evidence: III).
B. Approaches to minimize *C. difficile* transmission from the environment
1. Assess the adequacy of room cleaning (quality of evidence: III).
2. Use an Environmental Protection Agency–approved sporcidal disinfectant or diluted sodium hypochlorite for environmental cleaning and disinfection. Implement a system to coordinate with environmental services if it is determined that sodium hypochlorite is needed for environmental disinfection (quality of evidence: III).

C. Approaches to reduce the risk of CDI if *C. difficile* is acquired
1. Initiate an antimicrobial stewardship program (quality of evidence: II).

Strategies to Prevent SSI

I. Basic practices for preventing SSI: recommended for all acute care hospitals
1. Administer antimicrobial prophylaxis according to evidence-based standards and guidelines (quality of evidence: I).
2. Do not remove hair at the operative site unless the presence of hair will interfere with the operation. Do not use razors (quality of evidence: II).
3. Control blood glucose during the immediate postoperative period for cardiac surgery patients (quality of evidence: I) and noncardiac surgery patients (quality of evidence: II).
4. Maintain normothermia (temperature of 35.5°C or more) during the perioperative period (quality of evidence: I).
5. Optimize tissue oxygenation by administering supplemental oxygen during and immediately following surgical procedures involving mechanical ventilation (quality of evidence: I).
6. Use alcohol-containing preoperative skin preparatory agents if no contraindication exists (quality of evidence: I).
8. Use a checklist based on the WHO checklist to ensure compliance with best practices to improve surgical patient safety (quality of evidence: I).
10. Increase the efficiency of surveillance through utilization of automated data (quality of evidence: II).
11. Provide ongoing feedback of SSI rates to surgical and perioperative personnel and leadership (quality of evidence: II).
12. Measure and provide feedback to providers regarding rates of compliance with process measures (quality of evidence: III).

II. Special approaches for preventing SSI
1. Screen for *S. aureus* and decolonize surgical patients with an antistaphylococcal agent in the preoperative setting for high-risk procedures, including some orthopedic and cardiothoracic procedures (quality of evidence: II).
4. Observe and review operating room personnel and the environment of care in the operating room (quality of evidence: III).
5. Observe and review practices in the postanesthesia care unit, surgical intensive care unit (ICU), and/or surgical ward (quality of evidence: II).

Strategies to Prevent CLABSI

I. Basic practices for preventing and monitoring CLABSI: recommended for all acute care hospitals
A. Before insertion
1. Provide easy access to an evidence-based list of indications for central venous catheter (CVC) use to minimize unnecessary CVC placement (quality of evidence: III).
2. Require education of HCP involved in insertion, care, and maintenance of CVCs about CLABSI prevention (quality of evidence: II).
3. Bathe ICU patients over 2 months of age with a chlorhexidine preparation on a daily basis (quality of evidence: I).
B. At insertion
1. Have a process in place to ensure adherence to infection prevention practices at the time of CVC insertion in ICU and non-ICU settings, such as a checklist (quality of evidence: II).
2. Perform hand hygiene prior to catheter insertion or manipulation (quality of evidence: II).
3. Avoid using the femoral vein for central venous access in obese adult patients when the catheter is placed under planned and controlled conditions (quality of evidence: I).
4. Use an all-inclusive catheter cart or kit (quality of evidence: II).
5. Use ultrasound guidance for internal jugular catheter insertion (quality of evidence: II).
6. Use maximum sterile barrier precautions during CVC insertion (quality of evidence: II).
C. After insertion
1. Ensure appropriate nurse-to-patient ratio and limit the use of float nurses in ICUs (quality of evidence: I).
2. Disinfect catheter hubs, needleless connectors, and injection ports before accessing the catheter (quality of evidence: II).
4. For nontunneled CVCs in adults and children, change transparent dressings and perform site care with a chlorhexidine-based antiseptic every 5–7 days or immediately if the dressing is soiled, loose, or damp; change gauze dressings every 2 days or earlier if the dressing is soiled, loose, or damp (quality of evidence: II).
5. Replace administration sets not used for blood, blood products, or lipids at intervals not longer than 96 hours (quality of evidence: II).
6. Use antimicrobial ointments for hemodialysis catheter-insertion sites (quality of evidence: I).

II. Special approaches for preventing CLABSI
1. Use antiseptic- or antimicrobial-impregnated CVCs in adult patients (quality of evidence: I).
2. Use chlorhexidine-containing dressings for CVCs in patients over 2 months of age (quality of evidence: I).
3. Use an antiseptic-containing hub/connector cap/port protector to cover connectors (quality of evidence: I).
4. Use silver zeolite–impregnated umbilical catheters in preterm infants (in countries where it is approved for use in children; quality of evidence: II).
5. Use antimicrobial locks for CVCs (quality of evidence: I).
6. Use recombinant tissue plasminogen activating factor once weekly after hemodialysis in patients undergoing hemodialysis through a CVC (quality of evidence: II).

Strategies to Prevent MRSA
I. Basic practices for preventing MRSA transmission and infection: recommended for all acute care hospitals
2. Implement an MRSA monitoring program (quality of evidence: III).
3. Promote compliance with CDC or WHO hand hygiene recommendations (quality of evidence: II).
4. Use contact precautions for MRSA-colonized and MRSA-infected patients (quality of evidence: II).
5. Ensure cleaning and disinfection of equipment and the environment (quality of evidence: II).
7. Implement a laboratory-based alert system that notifies HCP of new MRSA-colonized or MRSA-infected patients in a timely manner (quality of evidence: III).
8. Implement an alert system that identifies readmitted or transferred MRSA-colonized or MRSA-infected patients (quality of evidence: III).
9. Provide MRSA data and outcome measures to key stakeholders, including senior leadership, physicians, nursing staff, and others (quality of evidence: III).

II. Special approaches
A. Active surveillance testing (AST)
1. Implement an MRSA AST program as part of a multifaceted strategy to control and prevent MRSA (quality of evidence: II).
2. Screen HCP for MRSA infection or colonization if they are epidemiologically linked to a cluster of MRSA infections (quality of evidence: III).
B. MRSA decolonization therapy
1. Provide targeted decolonization therapy to MRSA-colonized patients in conjunction with an AST program (quality of evidence: II).
2. Provide universal decolonization to ICU patients (quality of evidence: I).

C. Use of gowns and gloves for all contact with patients and the patient care environment
1. Use gowns and gloves when providing care to or entering the room of adult ICU patients (quality of evidence: II).

Strategies to Prevent Ventilator-Associated Pneumonia (VAP)

Adult Patients
I. Basic practices to prevent VAP and other ventilator-associated events in adult patients: interventions with little risk of harm that decrease duration of mechanical ventilation, length of stay, mortality, and/or costs
A. Avoid intubation if possible
1. Use noninvasive positive pressure ventilation (NIPPV) whenever feasible (quality of evidence: I).
B. Minimize sedation
1. Manage ventilated patients without sedatives whenever possible (quality of evidence: II).
2. Interrupt sedation once a day (spontaneous awakening trials) for patients without contraindications (quality of evidence: I).
3. Assess readiness to extubate once a day (spontaneous breathing trials) in patients without contraindications (quality of evidence: I).
4. Pair spontaneous breathing trials with spontaneous awakening trials (quality of evidence: I).
C. Maintain and improve physical conditioning
D. Minimize pooling of secretions above the endotracheal tube cuff
1. Provide endotracheal tubes with subglottic secretion
drainage ports for patients likely to require greater than 48 or 72 hours of intubation (quality of evidence: II).

E. Elevate the head of the bed
   1. Elevate the head of the bed to 30°–45° (quality of evidence: III).

F. Maintain ventilator circuits
   1. Change the ventilator circuit only if visibly soiled or malfunctioning (quality of evidence: I).

II. Special approaches
A. Interventions that decrease duration of mechanical ventilation, length of stay, and/or mortality but for which insufficient data on possible risks are available
   1. Use selective decontamination of the oropharynx to decrease the microbial burden of the aerodigestive tract (quality of evidence: I).

B. Interventions that may lower VAP rates but for which there are insufficient data at present to determine their impact on duration of mechanical ventilation, length of stay, and mortality
   5. Instill saline before tracheal suctioning (quality of evidence: III).

Neonatal Patients
I. Basic practices for preterm neonates: interventions with minimal risk of harm that may lower VAP rates
   A. Avoid intubation if possible
      1. Consider nasal continuous positive airway pressure ventilation with or without nasal intermittent mechanical ventilation as an alternative to intubation (quality of evidence: I).
   B. Minimize the duration of mechanical ventilation
      1. Manage patients without sedation whenever possible (quality of evidence: III).
      5. Minimize breaks in the ventilator circuit (extrapolated from studies in adults, no data in preterm neonates; quality of evidence: III).
   C. Elevate the head of the bed unless medically contraindicated (quality of evidence: III).
   D. Maintain ventilator circuits
      1. Change ventilator circuits only if visibly soiled or malfunctioning (extrapolated from studies in adults and children, no data in preterm neonates; quality of evidence: III).

II. Special approaches for preterm neonates
A. Interventions with minimal risks of harm but unknown impact on VAP rates

Pediatric Patients
I. Basic practices for pediatric patients: interventions with minimal risk of harm and some data that they lower VAP rates
   A. Avoid intubation if possible
      1. Use NIPPV in selected populations whenever feasible (quality of evidence: II).
   B. Minimize the duration of mechanical ventilation
      1. Assess readiness to extubate daily in patients without contraindications (quality of evidence: II).
   C. Provide regular oral care
   D. Elevate the head of the bed
      1. Elevate the head of the bed unless medically contraindicated (quality of evidence: III).
   E. Maintain ventilator circuits
      1. Change ventilator circuits only when visibly soiled or malfunctioning (quality of evidence: II).
      2. Remove condensate from the ventilator circuit frequently (quality of evidence: III).
   F. Endotracheal tube selection and maintenance
      1. Use cuffed endotracheal tubes (quality of evidence: III).
      2. Maintain cuff pressure and volume at the minimal occlusive settings to prevent clinically significant air leaks around the endotracheal tube, typically 20 cm of water (quality of evidence: III).

II. Special approaches for pediatric patients
A. Interventions with evidence of benefit in adult patients and minimal risks of harm but limited data in pediatric populations
   1. Interrupt sedation once a day (quality of evidence: II).
II. Special approaches for hand hygiene practices and the 2014 Compendium updates 15-21 is to provide acute care hospitals with up-to-date, practical, relatively concise evidence-based strategies to improve and assess hand hygiene performance. In addition, a new segment has been added to each of the Compendium articles that briefly describes examples of published implementation strategies and provides references that hospitals can access for more detailed information.

Seven Compendium articles are now included, with six focused on specific types of HAIs and one new section focused on hand hygiene improvement strategies. Each section contains a statement of concern, a brief summary of previously described detection and prevention approaches, recommended infection prevention strategies, proposed performance measures, and examples of implementation strategies for consideration.

Each infection prevention recommendation was assigned a quality-of-evidence rating (high = I, moderate = II, or low = III) adapted from criteria utilized by the GRADE system15 and the Canadian Task Force on Preventive Health Care14 (Table 1).

Recommendations are categorized as either (1) basic practices that should be adopted by all acute care hospitals or (2) special approaches that can be considered for use in locations...
and/or populations within hospitals when HAIs are not controlled after full implementation of basic practices. The decisions to categorize a recommendation as a basic practice versus a special approach were made through consensus of the section writing panel with input from expert panel members based on the quality of evidence and the balance between desirable and potentially undesirable effects of various interventions. Basic practices include recommendations where the potential to impact HAI risk clearly outweighs the potential for undesirable effects.

Special approaches include recommendations where the intervention is likely to reduce HAI risk but where there is concern about the risks for undesirable outcomes, where the quality of evidence is low, or where evidence supports the impact of the intervention in select settings (e.g., during outbreaks) or for select patient populations. Hospitals can prioritize their efforts by initially focusing on implementation of the prevention approaches listed as basic practices. If HAI surveillance or other risk assessment suggests that there are ongoing opportunities for improvement, hospitals should then consider adopting some or all of the prevention strategies listed as special approaches. These can be implemented in specific locations or patient populations or can be implemented hospital-wide, depending on outcome data, risk assessment, and/or local requirements.

Methods
SHEA and the IDSA Standards and Practice Guidelines Committee recruited two experts in the prevention of HAIs to be section panel leads for each Compendium article. Additional section panel members representing SHEA, IDSA, CDC, The Joint Commission, APIC, PIDS, and SCCM were selected as appropriate to their areas of expertise. Expert panel members with broad healthcare epidemiology and infection prevention expertise were convened to review draft manuscripts and to provide input to each section panel. An advisory group consisting of representatives from the five major partnering organizations (SHEA, IDSA, APIC, The Joint Commission, and AHA) provided broad oversight over the Compendium writing process (see Compendium Leadership section at end of text). All participants complied with the SHEA and IDSA policies on conflict of interest disclosure. In addition, the 5 partnering organizations as well as a number of stakeholder organizations provided comments, support, and endorsement (see Endorsing and Supporting Organizations section at end of text). Finally, the guidance documents were reviewed and approved by the SHEA Guidelines Committee, the IDSA Standards and Practice Guidelines Committee, and the board of directors of SHEA, IDSA, APIC, and The Joint Commission before dissemination.

Disclosure of Conflicts of Interest
All members of the Compendium section panels, expert panel, and advisory group complied with the IDSA and SHEA policies on conflicts of interest, which require disclosure of any financial or other interest within the past 2 years that might be construed as constituting an actual, potential, or apparent conflict. All participants were provided with the SHEA conflicts of interest disclosure statement and were asked to identify ties to companies developing products that might be affected by promulgation of the Compendium. Information was requested regarding employment, consultancies, stock ownership, honoraria, research funding, expert testimony, and membership on company advisory committees, and participants with potential conflicts were required to submit a plan detailing the process that would be used to avoid conflicts. Decisions were made by the Compendium co-chairs and a disclosure review committee on a case-by-case basis as to whether an individual’s role should be limited as a result of a conflict. Potential conflicts are listed in the Acknowledgments of each section.

Mechanism for Updating the Compendium
At annual intervals, the SHEA Guidelines Committee, in collaboration with IDSA, AHA, APIC, and The Joint Commission, will determine the need for revisions to the Compendium on the basis of an examination of the current literature. If necessary, the section leads and other content experts will be consulted to discuss the need for changes.
EXECUTIVE SUMMARY: 2014 COMPENDIUM UPDATES

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Infectious Diseases Society of America (IDSA)
American Hospital Association (AHA)
Association for Professionals in Infection Control and Epidemiology (APIC)
The Joint Commission

**ENDORSING AND SUPPORTING ORGANIZATIONS**

Endorsing organizations reviewed and approved the 2014 updates to the Compendium. Supporting organizations provided general nonfinancial support for these updates.

**Endorsing Organizations**

American Association for Respiratory Care (AARC)
American Association of Critical-Care Nurses (AACN)
American Organization of Nurse Executives (AONE)
Council of State and Territorial Epidemiologists (CSTE)
European Society of Clinical Microbiology and Infectious Diseases (ESCMID); provided endorsement for the “Strategies to Prevent Catheter-Associated Urinary Tract Infections in Acute Care Hospitals: 2014 Update” and the “Strategies to Prevent Healthcare-Associated Infections through Hand Hygiene: 2014 Update” portions of the Compendium)
HCA Health System
Infusion Nurses Society (INS; provided endorsement for the “Strategies to Prevent Central Line–Associated Bloodstream Infections in Acute Care Hospitals: 2014 Update” and the “Strategies to Prevent Healthcare-Associated Infections through Hand Hygiene: 2014 Update” portions of the Compendium)
Institute for Healthcare Improvement (IHI)
National Foundation for Infectious Diseases (NFID)
Pedicure Infectious Diseases Society (PIDS)
Society for Critical Care Medicine (SCCM)
Society for Hospital Medicine (SHM)
Surgical Infection Society (SIS)

**Supporting Organizations**

American Society of Healthcare Risk Management (ASHRM)
American Medical Association (AMA)
Johns Hopkins Medicine
Partners HealthCare
Society of Infectious Diseases Pharmacists (SIDP)
Trust for America’s Health (TFAH)

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**REFERENCES**


