

2014

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

Erik R. Dubberke  
*Washington University School of Medicine in St. Louis*

Follow this and additional works at: [https://digitalcommons.wustl.edu/open\\_access\\_pubs](https://digitalcommons.wustl.edu/open_access_pubs)

---

### **Recommended Citation**

Dubberke, Erik R., "A compendium of strategies to prevent healthcare-associated infections in acute care hospitals: 2014 updates." *Infection Control and Hospital Epidemiology*. 35,5. 967-977. (2014).  
[https://digitalcommons.wustl.edu/open\\_access\\_pubs/3451](https://digitalcommons.wustl.edu/open_access_pubs/3451)

This Open Access Publication is brought to you for free and open access by Digital Commons@Becker. It has been accepted for inclusion in Open Access Publications by an authorized administrator of Digital Commons@Becker. For more information, please contact [vanam@wustl.edu](mailto:vanam@wustl.edu).



CHICAGO JOURNALS



---

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

Author(s): Deborah S. Yokoe, MD, MPH; Deverick J. Anderson, MD, MPH; Sean M. Berenholtz, MD, MHS; David P. Calfee, MD, MS; Erik R. Dubberke, MD, MSPH; Katherine D. Ellingson, PhD; Dale N. Gerding, MD; Janet P. Haas, PhD, RN, CIC; Keith S. Kaye, MD, MPH; Michael Klompas, MD, MPH; Evelyn Lo, MD; Jonas Marschall, MD; Leonard A. Mermel, DO, ScM; Lindsay E. Nicolle, MD; Cassandra D. Salgado, MD, MS; Kristina Bryant, MD; David Classen, MD ...

Source: *Infection Control and Hospital Epidemiology*, Vol. 35, No. 8 (August 2014), pp. 967-977

Published by: [The University of Chicago Press](#) on behalf of [The Society for Healthcare Epidemiology of America](#)

Stable URL: <http://www.jstor.org/stable/10.1086/677216>

Accessed: 08/11/2014 13:58

---

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <http://www.jstor.org/page/info/about/policies/terms.jsp>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.



*The University of Chicago Press and The Society for Healthcare Epidemiology of America are collaborating with JSTOR to digitize, preserve and extend access to Infection Control and Hospital Epidemiology.*

<http://www.jstor.org>

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

Deborah S. Yokoe, MD, MPH;<sup>1</sup> Deverick J. Anderson, MD, MPH;<sup>2</sup> Sean M. Berenholtz, MD, MHS;<sup>3,4</sup> David P. Calfee, MD, MS;<sup>5</sup> Erik R. Dubberke, MD, MSPH;<sup>6</sup> Katherine D. Ellingson, PhD;<sup>7</sup> Dale N. Gerding, MD;<sup>8</sup> Janet P. Haas, PhD, RN, CIC;<sup>9</sup> Keith S. Kaye, MD, MPH;<sup>10</sup> Michael Klompas, MD, MPH;<sup>1,11</sup> Evelyn Lo, MD;<sup>12</sup> Jonas Marschall, MD;<sup>6,13</sup> Leonard A. Mermel, DO, ScM;<sup>14</sup> Lindsay E. Nicolle, MD;<sup>15</sup> Cassandra D. Salgado, MD, MS;<sup>16</sup> Kristina Bryant, MD;<sup>17</sup> David Classen, MD, MS;<sup>18</sup> Katrina Crist, MBA;<sup>19</sup> Valerie M. Deloney, MBA;<sup>20</sup> Neil O. Fishman, MD;<sup>21</sup> Nancy Foster;<sup>22</sup> Donald A. Goldmann, MD;<sup>23</sup> Eve Humphreys, MBA, CAE;<sup>20</sup> John A. Jernigan, MD, MS;<sup>7,24</sup> Jennifer Padberg, MPH;<sup>25</sup> Trish M. Perl, MD, MSc;<sup>4</sup> Kelly Podgorny, DNP, MS, RN;<sup>26</sup> Edward J. Septimus, MD;<sup>27</sup> Margaret VanAmringe, MHS;<sup>26</sup> Tom Weaver, DMD;<sup>19</sup> Robert A. Weinstein, MD;<sup>28</sup> Robert Wise, MD;<sup>26</sup> Lisa L. Maragakis, MD, MPH<sup>4</sup>

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).

*Infect Control Hosp Epidemiol* 2014;35(8):967-977

## EXECUTIVE SUMMARY

Much progress has been achieved since the publication of “A Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals”<sup>1-7</sup> in October 2008. In 2009, the US Department of Health and Human Services

(HHS) released a national healthcare-associated infection (HAI) action plan<sup>8</sup> 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* in-

Affiliations: 1. Brigham and Women’s Hospital and Harvard Medical School, Boston, Massachusetts; 2. Duke University Medical Center, Durham, North Carolina; 3. Bloomberg School of Public Health, Johns Hopkins University, Baltimore, Maryland; 4. Johns Hopkins University School of Medicine, Baltimore, Maryland; 5. Weill Cornell Medical College, New York, New York; 6. Washington University School of Medicine, St. Louis, Missouri; 7. Centers for Disease Control and Prevention, Atlanta, Georgia; 8. Edward Hines Jr. Veterans Affairs Hospital, Hines, Illinois, and Loyola University Chicago Stritch School of Medicine, Chicago, Illinois; 9. Westchester Medical Center and New York Medical College, Valhalla, New York; 10. Detroit Medical Center and Wayne State University, Detroit, Michigan; 11. Harvard Pilgrim Health Care Institute, Boston, Massachusetts; 12. St. Boniface General Hospital and University of Manitoba, Winnipeg, Manitoba, Canada; 13. Bern University Hospital and University of Bern, Bern, Switzerland; 14. Warren Alpert Medical School of Brown University and Rhode Island Hospital, Providence, Rhode Island; 15. Health Sciences Centre and University of Manitoba, Winnipeg, Manitoba, Canada; 16. Medical University of South Carolina, Charleston, South Carolina; 17. University of Louisville, Louisville, Kentucky; 18. University of Utah School of Medicine, Salt Lake City, Utah; 19. Association for Professionals in Infection Control and Epidemiology, Washington, DC; 20. Society for Healthcare Epidemiology of America, Arlington, Virginia; 21. University of Pennsylvania Health System, Philadelphia, Pennsylvania; 22. American Hospital Association, Washington, DC; 23. Institute for Healthcare Improvement, Cambridge, Massachusetts, and Boston Children’s Hospital and Harvard Medical School, Boston, Massachusetts; 24. Emory University School of Medicine, Atlanta, Georgia; 25. Infectious Diseases Society of America, Arlington, Virginia; 26. The Joint Commission, Oakbrook Terrace, Illinois; 27. Texas A&M Health Science Center College of Medicine, Houston, Texas, and Hospital Corporation of America, Nashville, Tennessee; 28. Stroger Hospital and Rush University Medical Center, Chicago, Illinois.

Received May 13, 2014; accepted May 13, 2014; electronically published July 16, 2014.

© 2014 by The Society for Healthcare Epidemiology of America. All rights reserved. 0899-823X/2014/3508-0005\$15.00. DOI: 10.1086/677216

TABLE 1. Grading of the Quality of Evidence

Grade	Definition
I. High	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.
II. Moderate	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.
III. Low	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.

NOTE. Based on Grades of Recommendation, Assessment, Development, and Evaluation (GRADE)<sup>13</sup> and the Canadian Task Force on Preventive Health Care.<sup>14</sup>

fections (CDI) in acute care hospitals. In 2011, the Centers for Medicare and Medicaid Services (CMS) began requiring acute care hospitals to report specific types of HAI data to CMS through the Centers for Disease Control and Prevention's (CDC's) National Healthcare Safety Network (NHSN) in order to receive their full annual reimbursement updates, vastly expanding the breadth of hospitals contributing surveillance information into the NHSN national repository of HAI data.<sup>9</sup> 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.<sup>10</sup> Based on HAI surveillance data collected by NHSN, substantial improvements have been achieved in preventing CLABSI and SSI within the last several years.<sup>11</sup>

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,<sup>12</sup> 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<sup>13</sup> and the Canadian Task Force on Preventive Health Care<sup>14</sup> (Table 1).

### Strategies to Prevent CAUTI

- I. Basic practices for preventing CAUTI: recommended for all acute care hospitals
  - A. Provide appropriate infrastructure for preventing CAUTI

1. Provide and implement written guidelines for catheter use, insertion, and maintenance (quality of evidence: III).
  2. Ensure that only trained, dedicated personnel insert urinary catheters (quality of evidence: III).
  3. Ensure that supplies necessary for aseptic technique for catheter insertion are available and conveniently located (quality of evidence: III).
  4. Implement a system for documenting the following in the patient record: physician order for catheter placement, indications for catheter insertion, date and time of catheter insertion, name of individual who inserted catheter, nursing documentation of placement, daily presence of a catheter and maintenance care tasks, and date and time of catheter removal. Record criteria for removal and justification for continued use (quality of evidence: III).
  5. Ensure that there are sufficient trained personnel and technology resources to support surveillance for catheter use and outcomes (quality of evidence: III).
- 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).

5. Use surveillance methods for case finding that are documented to be valid and appropriate for the institution (quality of evidence: III).
  6. Consider providing unit-specific feedback (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).
  2. Assess healthcare professional competency in catheter use, catheter care, and maintenance (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).
  2. Maintain a sterile, continuously closed drainage system (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).
  6. Maintain unobstructed urine flow (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).
  3. Ensure cleaning and disinfection of equipment and the environment (quality of evidence: III for equipment, III for environment).
  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).
  5. Conduct CDI surveillance and analyze and report CDI data (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 sporicidal 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).
  7. Use impervious plastic wound protectors for gastrointestinal and biliary tract surgery (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).
  9. Perform surveillance for SSI (quality of evidence: II).
  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).
  13. Educate surgeons and perioperative personnel about SSI prevention (quality of evidence: III).

- 14. Educate patients and their families about SSI prevention as appropriate (quality of evidence: III).
- 15. Implement policies and practices aimed at reducing the risk of SSI that align with evidence-based standards (eg, CDC, Association for periOperative Registered Nurses, and professional organization guidelines; quality of evidence: II).
- 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).
  2. Perform antiseptic wound lavage (quality of evidence: II).
  3. Perform an SSI risk assessment (quality of evidence: III).
  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).
    7. Use an alcoholic chlorhexidine antiseptic for skin preparation (quality of evidence: I).



### 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).
3. Remove nonessential catheters (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).
7. Perform surveillance for CLABSI in ICU and non-ICU settings (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
  1. Conduct an MRSA risk assessment (quality of evidence: III).
  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).
  6. Educate HCP about MRSA (quality of evidence: III).
  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).
10. Educate patients and their families about MRSA (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
    1. Provide early exercise and mobilization (quality of evidence: II).
  - 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).
  2. Follow CDC/Healthcare Infection Control Practices Advisory Committee guidelines for sterilization and disinfection of respiratory care equipment (quality of evidence: II).
- 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
    1. Perform oral care with chlorhexidine (quality of evidence: II).
    2. Administer prophylactic probiotics (quality of evidence: II).
    3. Use ultrathin polyurethane endotracheal tube cuffs (quality of evidence: III).
    4. Provide automated control of endotracheal tube cuff pressure (quality of evidence: III).
    5. Instill saline before tracheal suctioning (quality of evidence: III).
    6. Provide mechanical tooth brushing (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).
    2. Assess readiness to extubate daily (quality of evidence: III).
    3. Avoid unplanned extubations and reintubations (quality of evidence: III).
    4. Provide regular oral care with sterile water (extrapolated from studies in adults, no data in preterm neonates; quality of evidence: III).
    5. Minimize breaks in the ventilator circuit (extrap-

lated from studies in adults, no data in preterm neonates; quality of evidence: III).

- 6. Change the ventilator circuit 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
    1. Lateral recumbent positioning (quality of evidence: III).
    2. Reverse Trendelenburg positioning (quality of evidence: III).
    3. Closed/in-line suctioning (quality of evidence: III).

### 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).
    2. Avoid unplanned extubations and reintubations (quality of evidence: III).
  - C. Provide regular oral care
    1. Provide regular oral care (quality of evidence: III).
  - 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).
    3. Suction oral secretions before each position change (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).
    2. Administer prophylactic probiotics (quality of evidence: III).
    3. Use endotracheal tubes with subglottic secretion drainage ports (quality of evidence: III).



## Strategies to Prevent HAIs through Hand Hygiene

- I. Basic practices for hand hygiene: recommended for all acute care hospitals
  1. Select appropriate products (quality of evidence: II).
  2. Provide convenient access to hand hygiene equipment and products by placing them strategically and assuring that they are refilled routinely as often as required (quality of evidence: III).
  3. Involve HCP in choosing products (quality of evidence: III).
  4. Perform hand hygiene with an alcohol-based hand rub or, alternatively, an antimicrobial or nonantimicrobial soap for the following indications (quality of evidence: II).
  5. Perform hand hygiene with antimicrobial or nonantimicrobial soap when hands are visibly soiled (quality of evidence: II).
  6. Assess unit- or institution-specific barriers to hand hygiene with frontline HCP for the purpose of identifying interventions that will be locally relevant (quality of evidence: III).
  7. Implement a multimodal strategy (or “bundle”) for improving hand hygiene adherence to directly address the organization’s most significant barriers (quality of evidence: II).
  8. Educate, motivate, and ensure competency of HCP (anyone caring for the patient on the institution’s behalf) about proper hand hygiene (quality of evidence: III).
  9. Measure hand hygiene adherence via direct observation (human observers), product volume measurement, or automated monitoring (quality of evidence: II).
  10. Provide feedback to HCP on hand hygiene performance (quality of evidence: III).
- II. Special approaches for hand hygiene practices
  1. During norovirus outbreaks, in addition to contact precautions requiring the use of gloves, consider preferential use of soap and water after caring for patients with known or suspected norovirus infection (quality of evidence: III).
  2. During *C. difficile* outbreaks or in settings with hyperendemic CDI, in addition to contact precautions requiring the use of gloves, consider preferential use of soap and water after caring for patients with known or suspected CDI (quality of evidence: III).

## INTRODUCTION

The major aim of the original documents published in 2008 and the 2014 Compendium updates<sup>15-21</sup> is to provide acute care hospitals with up-to-date, practical, relatively concise expert guidance to assist in prioritizing and implementing HAI prevention efforts. These articles are the products 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 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).

Consistent with the 2008 version of the Compendium, the recommendations within the updated documents are largely based on previously published HAI prevention guidelines available from a number of organizations, including the Healthcare Infection Control Practices Advisory Committee (HICPAC), the CDC, SHEA, IDSA, and APIC, as well as other relevant published literature and the consensus of the content experts who served as section panel members. The Compendium does not reflect a complete systematic review of the medical literature and is not meant to supplant previously published guidelines and systematic reviews but instead aims to provide acute care hospitals with a summary of practical, relatively concise guidance based largely on these documents. An expert review panel evaluated each article in detail to assess the included material and to ensure that the level of evidence assigned to each recommendation was appropriate.

## MAJOR CHANGES TO THE COMPENDIUM

In addition to updated recommendations in each of the articles, major changes in the 2014 updates to the Compendium include a new guidance document that reviews 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 system<sup>13</sup> and the Canadian Task Force on Preventive Health Care<sup>14</sup> (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 (eg, 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 the text). All participants complied with the SHEA and IDSA policies on conflict of interest disclosure.

### Literature Review and Analysis

Section panel members reviewed previously published guidelines, systematic reviews, and meta-analyses as well as relevant literature published since 2008.

### Consensus Development

Section panel members for each Compendium article met as needed via teleconference to discuss recommendations, ranking of the quality of evidence for these recommendations, and classification as basic practices, special approaches, or

unresolved issues. Section leads assigned responsibilities to panel members. Compendium article drafts were reviewed and final versions were approved by the respective section panel members.

### Review and Approval Process

A critical stage in the development process is peer review. Peer reviewers are relied on for expert, critical, and unbiased scientific appraisals of the documents. SHEA and IDSA employed a process that included multilevel review and approval. Comments were obtained from the expert panel members who 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.

## COMPENDIUM LEADERSHIP

**Society for Healthcare Epidemiology of America (SHEA)  
Co-Lead**

Deborah S. Yokoe, MD, MPH

**Infectious Diseases Society of America (IDSA) Co-Lead**

Lisa L. Maragakis, MD, MPH

**Compendium Advisory Group**

Eve Humphreys, MBA, CAE (SHEA)  
Valerie Deloney, MBA (SHEA)  
Kristina Bryant, MD (SHEA Guidelines Committee chair)  
Jennifer Padberg, MPH (IDSA)  
Nancy Foster (AHA)  
Katrina Crist, MBA (APIC)  
Tom Weaver, DMD (APIC)  
Kelly Podgorny, DNP, MS, RN (The Joint Commission)  
Margaret VanAmringe, MHS (The Joint Commission)  
Robert Wise, MD (The Joint Commission)  
David Classen, MD, MS (2008 Compendium co-lead)

**Compendium Expert Panel**

Neil O. Fishman, MD  
Donald A. Goldmann, MD  
John A. Jernigan, MD, MS  
Trish M. Perl, MD, MSc  
Edward J. Septimus, MD  
Robert A. Weinstein, MD

**Compendium Section Leads and Panel Members***Catheter-associated urinary tract infections (CAUTIs)*

Evelyn Lo, MD (section co-lead)  
Lindsay E. Nicolle, MD (section co-lead)  
Susan E. Coffin, MD, MPH  
Carolyn Gould, MD, MS  
Jennifer Meddings, MD, MSc  
David A. Pegues, MD  
Ann Marie Pettis, RN, BSN, CIC  
Sanjay Saint, MD, MPH

*Clostridium difficile infections (CDIs)*

Erik R. Dubberke, MD, MSPH (section co-lead)  
Dale N. Gerding, MD (section co-lead)  
Philip Carling, MD  
Ruth Carrico, PhD, RN, CIC  
Curtis J. Donskey, MD  
Vivian G. Loo, MD, MSc  
L. Clifford McDonald, MD  
Thomas J. Sandora, MD, MPH  
David J. Weber, MD, MPH

*Central line-associated bloodstream infections (CLABSIs)*

Jonas Marschall, MD (section co-lead)  
Leonard A. Mermel, DO, ScM (section co-lead)  
Mohamad Fakih, MD, MPH  
Lynn Hadaway, MEd, RN, BC, CRNI  
Alexander Kallen, MD, MPH  
Naomi P. O'Grady, MD  
Ann Marie Pettis, RN, BSN, CIC  
Mark E. Rupp, MD  
Thomas Sandora, MD, MPH

*Hand hygiene*

Katherine Ellingson, PhD (section co-lead)  
Janet Haas, PhD, RN, CIC (section co-lead)  
Allison E. Aiello, PhD  
Linda Kusek MPH, RN, CIC  
Russell N. Olmsted, MPH, CIC  
Eli Perencevich, MD, MS  
Philip M. Polgreen, MD  
Marin L. Schweizer, PhD  
Polly Trexler, MS, CIC  
Margaret VanAmringe, MHS

*Methicillin-resistant Staphylococcus aureus (MRSA)*

David P. Calfee, MD, MS (section co-lead)  
Cassandra D. Salgado, MD, MS (section co-lead)  
Aaron M. Milstone, MD  
Anthony D. Harris, MD, MPH  
David T. Kuhar, MD  
Julia Moody, MS  
Kathy Aureden, MS, MT, CIC  
Susan S. Huang, MD, MPH

*Surgical site infections (SSIs)*

Deverick J. Anderson, MD, MPH (section co-lead)  
Keith S. Kaye, MD, MPH (section co-lead)  
Kelly Podgorny, DNP, MS, RN  
Sandra I. Berríos-Torres, MD  
Dale W. Bratzler, DO, MPH  
E. Patchen Dellinger, MD  
Linda Greene, RN, MPS, CIC  
Ann-Christine Nyquist, MD, MSPH  
Lisa Saiman, MD, MPH

*Ventilator-associated pneumonia (VAP)*

Michael Klompas, MD, MPH (section co-lead)  
Sean M. Berenholtz, MD, MHS (section co-lead)  
Richard Branson, MSc, RRT  
Eric C. Eichenwald, MD  
Linda R. Greene, RN, MPS, CIC  
Michael D. Howell, MD, MPH  
Grace Lee, MD  
Shelley S. Magill, MD, PhD

Gregory P. Priebe, MD  
Kathleen Speck, MPH

#### COMPENDIUM PARTNERS

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

#### ENDORISING 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 Blood-  
stream 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)  
Pediatric 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)  
Infusion Nurses Society (INS; provided support for the  
“Strategies to Prevent Surgical Site Infections in Acute  
Care Hospitals: 2014 Update,” the “Strategies to Prevent  
*Clostridium difficile* Infections in Acute Care Hospitals:  
2014 Update,” the “Strategies to Prevent Catheter-Asso-  
ciated Urinary Tract Infections in Acute Care Hospitals:

2014 Update,” the “Strategies to Prevent Methicillin-  
Resistant *Staphylococcus aureus* Infections in Acute Care  
Hospitals: 2014 Update,” and the “Strategies to Prevent  
Ventilator-Associated Infections in Acute Care Hospitals:  
2014 Update” portions of the Compendium)

Johns Hopkins Medicine  
Partners HealthCare  
Society of Infectious Diseases Pharmacists (SIDP)  
Trust for America’s Health (TFAH)

#### ACKNOWLEDGMENTS

We thank the many individuals who, on behalf of the partnering and endorsing organizations, reviewed the Compendium articles and submitted comments. We appreciate their work and careful consideration to ensure the quality of the 2014 Compendium updates.

*Disclaimer.* K.D.E. and J.A.J.—The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

*Financial support.* Support for this Compendium was provided by the Society for Healthcare Epidemiology of America.

*Potential conflicts of interest.* Authors report the following. E.R.D.—advisor/consultant: Sanofi Pasteur, Merck, Pfizer; research grants/contracts: Sanofi Pasteur, ViroPharma, Optimer, Merck, Rebiotix. D.N.G.—advisor/consultant: Merck, Cubist, Novartis, Cangene, Actelion, ViroPharma, Rebiotix, Sanofi Pasteur; honoraria: Robert Michael; patent/license (no royalties): ViroPharma; research grant/contract: GOJO Industries. J.H.—research grant/contract: 3M. K.S.K.—grant support and advisor/consultant: Sage Products. M.K.—honoraria: Premier Healthcare Alliance. E.L.—research grants/contract: Cangene Corporation, antibody responses to *C. difficile*-associated diarrhea. J.M.—honorarium: Gilead Sciences, Switzerland. L.A.M.—advisor/consultant: ICU Medical, Fresenius Medical Care, Bard Access Systems, Marvao Medical Devices, CareFusion, 3M Healthcare, Catheter Connections, Semprus Biosciences, Sharklet Technologies. L.N.—advisor/consultant: Cerena, Johnson & Johnson. K.B.—honorarium: Pfizer; research grants/contracts: Pfizer, Med-Immune, Novartis. N.F.—financial relationships/income (stocks/bonds): Pfizer, GE. T.M.P.—research grant/contract: Merck. D.S.Y., D.J.A., S.M.B., D.C., K.D.E., C.S., D.P.C., K.C., E.H., J.P., K.P., M.V.A., T.W., R.A.W., N.F., and L.L.M. have no conflicts to disclose. Management plans, where authors indicated the method by which the section members and they would manage their disclosure(s) if applicable, are posted here: <http://www.shea-online.org/PriorityTopics/CompendiumofStrategiestoPreventHAIs.aspx>.

Address correspondence to Deborah S. Yokoe, MD, MPH, 181 Longwood Avenue, Boston, MA 02115 ([dyokoe@partners.org](mailto:dyokoe@partners.org)).

#### REFERENCES

1. Yokoe DS, Mermel LA, Anderson DJ, et al. Executive summary: a Compendium of strategies to prevent healthcare-associated infections in acute care hospitals. *Infect Control Hosp Epidemiol* 2008;29(suppl 1):S12–S21.
2. Marschall J, Mermel LA, Classen D, et al. Strategies to prevent central line-associated bloodstream infections in acute care hospitals. *Infect Control Hosp Epidemiol* 2008;29(suppl 1):S22–S30.
3. Coffin SE, Klompas M, Classen D, et al. Strategies to prevent ventilator-associated pneumonia in acute care hospitals. *Infect Control Hosp Epidemiol* 2008;29(suppl 1):S31–S40.
4. Lo E, Nicolle L, Classen D, et al. Strategies to prevent catheter-associated urinary tract infections in acute care hospitals. *Infect Control Hosp Epidemiol* 2008;29(suppl 1):S41–S50.

5. Anderson DJ, Kaye KS, Classen D, et al. Strategies to prevent surgical site infections in acute care hospitals. *Infect Control Hosp Epidemiol* 2008;29(suppl 1):S51–S61.
6. Calfee DP, Salgado CD, Classen D, et al. Strategies to prevent transmission of methicillin-resistant *Staphylococcus aureus* in acute care hospitals. *Infect Control Hosp Epidemiol* 2008;29(suppl 1):S62–S80.
7. Dubberke ER, Gerding DN, Classen D, et al. Strategies to prevent *Clostridium difficile* infections in acute care hospitals. *Infect Control Hosp Epidemiol* 2008;29(suppl 1):S81–S92.
8. US Department of Health and Human Services. National action plan to prevent health care–associated infections: road map to elimination. <http://www.hhs.gov/ash/initiatives/hai/actionplan/>. Accessed December 31, 2013.
9. Centers for Medicare and Medicaid Services. Acute inpatient PPS. <https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/index.html?redirect=/AcuteInpatientPPS/FR2012/list.asp>. Accessed December 31, 2013.
10. Centers for Medicare and Medicaid Services. Partnership for patients. <http://partnershipforpatients.cms.gov/>. Accessed December 31, 2013.
11. Centers for Disease Control and Prevention. National and state healthcare associated infections progress report. <http://www.cdc.gov/HAI/pdfs/progress-report/hai-progress-report.pdf>. Accessed April 8, 2014.
12. Magill SS, Edwards JR, Bamberg W, et al. Multistate point-prevalence survey of health care–associated infections. *N Engl J Med* 2014;370:1198–1208.
13. Guyatt GH, Oxman AD, Vist GE, et al. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ* 2008;336(7650):924–926.
14. GRADE. Canadian Task Force on Preventive Health Care website. <http://canadiantaskforce.ca/methods/grade/>. Accessed December 31, 2013.
15. Lo E, Nicolle LE, Coffin SE, et al. Strategies to prevent catheter-associated urinary tract infections in acute care hospitals: 2014 update. *Infect Control Hosp Epidemiol* 2014;35:464–479.
16. Anderson DJ, Podgorny K, Berríos-Torres SI, et al. Strategies to prevent surgical site infections in acute care hospitals: 2014 update. *Infect Control Hosp Epidemiol* 2014;35:605–627.
17. Dubberke ER, Carling P, Carrico R, et al. Strategies to prevent *Clostridium difficile* infections in acute care hospitals: 2014 update. *Infect Control Hosp Epidemiol* 2014;35:628–645.
18. Marschall J, Mermel LA, Fakih M, et al. Strategies to prevent central line–associated bloodstream infections in acute care hospitals: 2014 update. *Infect Control Hosp Epidemiol* 2014;35:753–771.
19. Calfee DP, Salgado CD, Milstone AM, et al. Strategies to prevent methicillin-resistant *Staphylococcus aureus* transmission and infection in acute care hospitals: 2014 update. *Infect Control Hosp Epidemiol* 2014;35:772–796.
20. Klompas M, Branson R, Eichenwald EC, et al. Strategies to prevent ventilator-associated pneumonia in acute care hospitals: 2014 update. *Infect Control Hosp Epidemiol* 2014;35:915–936.
21. Ellingson K, Haas JP, Aiello AE, et al. Strategies to prevent healthcare-associated infections through hand hygiene. *Infect Control Hosp Epidemiol* 2014;35:937–960.