

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

Deborah S. Yokoe, MD, MPH;¹ Deverick J. Anderson, MD, MPH;² Sean M. Berenholtz, MD, MHS;³ David P. Calfee, MD, MS;⁴ Erik R. Dubberke, MD, MSPH;⁵ Katherine Ellingson, PhD;⁶ Dale N. Gerding, MD;⁷ Janet Haas, PhD, RN;⁸ Keith S. Kaye, MD, MPH;⁹ Michael Klompas, MD, MPH;^{1,10} Evelyn Lo, MD;¹¹ Jonas Marschall, MD;^{5,12} Leonard A. Mermel, DO, ScM;¹³ Lindsay Nicolle, MD;¹⁴ Cassandra Salgado, MD, MS;¹⁵ Kristina Bryant, MD;¹⁶ David Classen, MD, MS;¹⁷ Katrina Crist, MBA;¹⁸ Nancy Foster;¹⁹ Eve Humphreys, MBA, CAE;²⁰ Jennifer Padberg, MPH;²¹ Kelly Podgorny, RN, MS, CPHQ;²² Margaret VanAmringe, MHS;²² Tom Weaver, DMD;¹⁸ Robert Wise, MD;²² Lisa L. Maragakis, MD, MPH²³

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. It is 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(5):455-459

INTRODUCTION

Much progress has been achieved since the publication of “A Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals”¹⁻⁷ in October 2008. In 2009, the US Department of Health and Human Services (HHS) released a national healthcare-associated infection (HAI) action plan⁸ 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-

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.⁹ 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.¹⁰ Based on HAI surveillance data collected

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. Weill Cornell Medical College, New York, New York; 5. Washington University School of Medicine, St. Louis, Missouri; 6. Centers for Disease Control and Prevention, Atlanta, Georgia; 7. Loyola University Chicago Stritch School of Medicine, Chicago, Illinois; 8. Westchester Medical Center and New York Medical College, Valhalla, New York; 9. Detroit Medical Center and Wayne State University, Detroit, Michigan; 10. Harvard Pilgrim Health Care Institute, Boston, Massachusetts; 11. St. Boniface General Hospital and University of Manitoba, Winnipeg, Manitoba, Canada; 12. Bern University Hospital and University of Bern, Bern, Switzerland; 13. Warren Alpert Medical School of Brown University and Rhode Island Hospital, Providence, Rhode Island; 14. Health Sciences Centre and University of Manitoba, Winnipeg, Manitoba, Canada; 15. Medical University of South Carolina, Charleston, South Carolina; 16. University of Louisville, Louisville, Kentucky; 17. University of Utah School of Medicine, Salt Lake City, Utah; 18. Association for Professionals in Infection Control and Epidemiology, Washington, DC; 19. American Hospital Association, Washington, DC; 20. Society for Healthcare Epidemiology of America, Arlington, Virginia; 21. Infectious Diseases Society of America, Arlington, Virginia; 22. The Joint Commission, Oakbrook Terrace, Illinois; 23. Johns Hopkins University School of Medicine, Baltimore, Maryland.

Received January 27, 2014; accepted January 29, 2014; electronically published April 7, 2014.

© 2014 by The Society for Healthcare Epidemiology of America. All rights reserved. 0899-823X/2014/3505-0001\$15.00. DOI: 10.1086/675819

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)¹³ and the Canadian Task Force on Preventive Health Care.¹⁴

by NHSN, substantial improvements have been achieved in preventing CLABSI and SSI within the last several years.¹¹

Continued progress in healthcare epidemiology and implementation science research has led to improvements in our understanding of effective strategies for HAI prevention. Despite these advancements, HAIs continue to affect about 1 out of every 20 hospitalized patients, leading to substantial morbidity, mortality, and excess healthcare expenditures,¹² and there are persistent gaps between what is recommended and what is practiced.

THE COMPENDIUM OF STRATEGIES TO PREVENT HEALTHCARE-ASSOCIATED INFECTIONS IN ACUTE CARE HOSPITALS

The major aim of the original documents published in 2008 and the 2014 updates 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 material included 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 hand hygiene and metrics to assess 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 grading of evidence rating (low, moderate, or high level of evidence) adapted from criteria utilized by the Grades of Recommendation, Assessment, Development, and Evaluation (GRADE) system¹³ and the Canadian Task Force on Preventive Health Care¹⁴ (Table 1).

Recommendations are categorized as either (1) basic prac-

tices 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, rank-

ing 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, RN, MS, CPHQ (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 Fishman, MD
 Donald Goldmann, MD
 John Jernigan, MD, MS
 Trish M. Perl, MD, MSc
 Edward Septimus, MD
 Robert Weinstein, MD

Compendium Section Leads

Evelyn Lo, MD (catheter-associated urinary tract infections [CAUTI])
 Lindsay Nicolle, MD (CAUTI)
 Erik R. Dubberke, MD, MSPH (*Clostridium difficile* infection [CDI])
 Dale N. Gerding, MD (CDI)
 Jonas Marschall, MD (central line-associated bloodstream infections [CLABSI])
 Leonard A. Mermel, DO, ScM (CLABSI)
 Kate Ellingson, PhD (hand hygiene)
 Janet Haas, PhD, RN (hand hygiene)
 David P. Calfee, MD, MS (methicillin-resistant *Staphylococcus aureus* [MRSA])
 Cassandra Salgado, MD, MS (MRSA)
 Deverick J. Anderson, MD, MPH (surgical site infections [SSI])
 Keith S. Kaye, MD, MPH (SSI)
 Michael Klompas, MD, MPH (ventilator-associated pneumonia [VAP])
 Sean M. Berenholtz, MD, MHS (VAP)

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. Organizations whose endorsement and support were pending at the time of publication will be added at a later date.

Endorsing Organizations

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 specifically 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 specifically 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)
 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)
 Infusion Nurses Society (INS; provided support specifically 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-Associated 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 Valerie Deloney, whose organizational expertise and tireless assistance has made this work possible.

Disclaimer. K.D.E.—The findings and conclusions in this report are those of the author 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. All authors report no conflicts of interest relevant to this article.

Address correspondence to Deborah S. Yokoe, MD, MPH, 181 Longwood Avenue, Boston, MA 02115 (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. Malpiedi PJ, Peterson KD, Soe MM, et al. 2011 national and state healthcare-associated infection standardized infection ratio report. Published February 11, 2013. <http://www.cdc.gov/hai/national-annual-sir/index.html>. Accessed December 31, 2013.
12. Kleven RM, Edwards JR, Richards CL, et al. Estimating health care-associated infections and deaths in US hospitals: 2002. *Public Health Rep* 2007;122:160–166.
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.