

INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY

VOLUME 34, NUMBER 9

SEPTEMBER 2013

US PUBLIC HEALTH SERVICE GUIDELINE

- 875 Updated US Public Health Service Guidelines for the Management of Occupational Exposures to Human Immunodeficiency Virus and Recommendations for Postexposure Prophylaxis** • David T. Kuhar, MD; David K. Henderson, MD; Kimberly A. Struble, PharmD; Walid Heneine, PhD; Vasavi Thomas, RPh, MPH; Laura W. Cheever, MD, ScM; Ahmed Gomaa, MD, ScD, MSPH; Adelsa L. Panlilio, MD; for the US Public Health Service Working Group

ORIGINAL ARTICLES

- 893 Incidence Trends in Pathogen-Specific Central Line-Associated Bloodstream Infections in US Intensive Care Units, 1990–2010** • Ryan P. Fagan, MD, MPH; Jonathan R. Edwards, MStat; Benjamin J. Park, MD; Scott K. Fridkin, MD; Shelley S. Magill, MD, PhD
- 900 Electronic Documentation of Central Venous Catheter-Days: Validation Is Essential** • Sheri Chernetsky Tejedor, MD, SFHM; Gina Garrett, RN, BSN, CRNI; Jesse T. Jacob, MD; Ellen Meyer, MSN, RN; Mary Dent Reyes, MPH; Chad Robichaux, BA; James P. Steinberg, MD
- 908 The Risk of Bloodstream Infection Associated with Peripherally Inserted Central Catheters Compared with Central Venous Catheters in Adults: A Systematic Review and Meta-Analysis** • Vineet Chopra, MD, MSc; John C. O'Horo, MD; Mary A. M. Rogers, PhD; Dennis G. Maki, MD, MS; Nasia Safdar, MD, PhD
- 919 Automated Measures of Hand Hygiene Compliance among Healthcare Workers Using Ultrasound: Validation and a Randomized Controlled Trial** • Dale A. Fisher, FRACP; Theresa Seetoh, MSc; Helen Oh May-Lin, FRCP; Sivakumar Viswanathan, PhD; Yanling Toh, BEng; Wong Chiang Yin, MMed(PH); Loh Siw Eng; Tan Shire Yang; Steve Schiefen, MBA; Minkyu Je, PhD; Ruey Feng Peh, BEng; Fiona Wei Ling Loke, MS; Michael Dempsey, BSEE
- 929 Overcoming Patient Barriers to Discussing Physician Hand Hygiene: Do Patients Prefer Electronic Reminders to Other Methods?** • Kaarin Michaelsen, PhD; Jason L. Sanders, PhD; Shanta M. Zimmer, MD; Gregory M. Bump, MD
- 935 Issues in Understanding the Impact of the Needlestick Safety and Prevention Act on Hospital Sharps Injuries** • Elayne Kornblatt Phillips, RN, PhD; Mark Conaway, PhD; Ginger Parker, MBA; Jane Perry, MA; Janine Jagger, PhD
- 940 Secular Trends in Gram-Negative Resistance among Urinary Tract Infection Hospitalizations in the United States, 2000–2009** • Marya D. Zilberberg, MD, MPH; Andrew F. Shorr, MD, MPH
- 947 Predictors and Molecular Epidemiology of Community-Onset Extended-Spectrum β -Lactamase-Producing *Escherichia coli* Infection in a Midwestern Community** • Ritu Banerjee, MD, PhD; Jacob Strahilevitz, MD; James R. Johnson, MD; Payal P. Nagwekar; Donna M. Schora; Ilene Shevrin, MPH; Hongyan Du, MS; Lance R. Peterson, MD; Ari Robicsek, MD



THE OFFICIAL JOURNAL OF THE SOCIETY FOR HEALTHCARE EPIDEMIOLOGY OF AMERICA

CONTENTS CONTINUED INSIDE

3-5 October 2013 Cincinnati, Ohio USA

Global Conference on Prevention and Management of Surgical Infections

Presented by: **International Surgical Infections Study Group (ISIS)**

Meet the world's leading experts on surgical infections and take back strategies you can implement immediately to reduce infection and loss of life. We can change surgical outcomes now, one incision at a time.

The conference will focus on:

Surgical Site Infection Prevention

- Current Global Burden
- Regional Concerns
- Construction of Surveillance Programs
- SSI Prevention Techniques
- Is Culture Change the Answer?

Intra-abdominal and Soft Tissue Infections

- Disease Spectrum, Management and Results throughout the World

Microbiology of Infections in High, Middle, and Low-Income Countries



Partnerships for Safe Surgery.

The International Surgical Infections Study Group was started to develop strategies every health care worker can use to reduce the risks of surgical infection and loss of life, and to stretch limited medical resources by changing the part of the hospital that matters most:

Its safety culture.

We are focused on surgical issues in low- and middle-income countries. We are currently collaborating with the World Health Organization to develop guidelines for the prevention of surgical site infections. These guidelines will be a critical tool for implementing a more focused safety paradigm.

We are organizing a Safe Surgery Symposium focused on operative site and other surgical infections. We will discuss current practices, procedures, and outcomes in different regions of the world, and outline procedures for improving global patient safety.

The surgeons organizing this society are:

- Joseph Solomkin CINCINNATI, USA
- Narcisco Navarro MANILA, PHILIPPINES
- Edmundo Ferraz RECIFE, BRAZIL
- Jianan Ren NANJING, CHINA
- J. Wesley Alexander CINCINNATI, USA
- Emmanuel Ameh ZARIA, NIGERIA
- Daniel Poenaru ADDIS ABABA, ETHIOPIA
- Peter Nthumba KAJABI, KENYA
- Dietmar Wittmann SARASOTA, USA

isis-group.org



WHO
Clean Care is
Safer Care



CME credit is available through the University of Cincinnati

ISIS Group is a 501(c)(3) corporation

This activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education through the joint sponsorship of the University of Cincinnati and International Surgical Infections Study Group (ISIS). The University of Cincinnati is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians. The University of Cincinnati designates this live activity for a maximum of 17 AMA PRA Category 1 Credit(s)[™]. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

<https://doi.org/10.1017/S0195941700033658> Published online by Cambridge University Press

Practical Healthcare Epidemiology

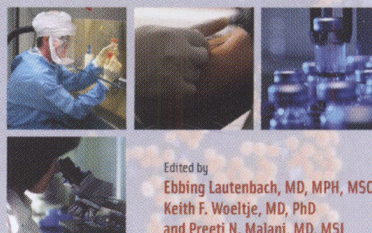
3rd edition

SHEA Textbook

The Society for Healthcare
Epidemiology of America

Practical Healthcare Epidemiology

3rd edition



Edited by
Ebbing Lautenbach, MD, MPH, MSCE
Keith F. Woeltje, MD, PhD
and Preeti N. Malani, MD, MSJ

"A handy desk reference and an up-to-date primer for trainees and experts alike."

— *The Journal of the American Medical Association*

Cloth: \$185
E-book: \$60
Cloth + E-book: \$200

Buy online:

www.press.uchicago.edu



CHICAGO JOURNALS

INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY

VOLUME 34, NUMBER 9

SEPTEMBER 2013

CONTENTS CONTINUED FROM COVER

- 954 **Prevalence and Risk Factors Associated with Vancomycin-Resistant *Staphylococcus aureus* Precursor Organism Colonization among Patients with Chronic Lower-Extremity Wounds in Southeastern Michigan** • Pritish K. Tosh, MD; Simon Agolory, MD; Bethany L. Strong, MD; Kerrie VerLee, MPH; Jennie Finks, DVM, MVPH; Kayoko Hayakawa, MD; Teena Chopra, MD; Keith S. Kaye, MD, MPH; Nicholas Gilpin, DO; Christopher F. Carpenter, MD; Nadia Z. Haque, PharmD, BCPS; Lois E. Lamarato, PhD; Marcus J. Zervos, MD; Valerie S. Albrecht, MPH; Sigrid K. McAllister, BS, MT; Brandi Limbago, PhD; Duncan R. MacCannell, PhD; Linda K. McDougal, MS; Alexander J. Kallen, MD, MPH; Alice Y. Guh, MD, MPH
- 961 **Detection of Mixed Populations of *Clostridium difficile* from Symptomatic Patients Using Capillary-Based Polymerase Chain Reaction Ribotyping** • Adam A. Behroozian, MPH; Jeffrey P. Chludzinski, BS; Eugene S. Lo; Sarah A. Ewing, BSE; Sheila Waslawski; Duane W. Newton, PhD; Vincent B. Young, PhD, MD; David M. Aronoff, MD; Seth T. Walk, PhD
- 967 **Prevalence and Predictors of Compliance with Discontinuation of Airborne Isolation in Patients with Suspected Pulmonary Tuberculosis** • Benjamin S. Thomas, MD; Erlaine F. Bello, MD; Todd B. Seto, MD, MPH

CONCISE COMMUNICATIONS

- 973 **Modification of Antimicrobial Prophylaxis Based on Rectal Culture Results to Prevent Fluoroquinolone-Resistant *Escherichia coli* Infections after Prostate Biopsy** • Nuntra Suwantararat, MD; Donald M. Dumford III, MD, MPH; Rafael Ponce-Terashima, MD; Sirisha Kundrapu, MD; Trina F. Zabarsky, RN; Hui Zhu, MD; Curtis J. Donskey, MD
- 977 **Commentary: Pokes, Pathogens, and Primum Non Nocere: Prudent Prophylaxis Protocols for Prostate Biopsy** • Sarah M. Drawz, MD, PhD; James R. Johnson, MD
- 980 **Early Onset versus Late Onset Peripherally Inserted Central Venous Catheter Infections: An Analysis of Risk Factors and Microbiology** • Paul Chittick, MD; Sobia Azhar, MD; Kalyani Movva, MD; Paula Keller, MS; Judith A. Boura, MS; Jeffrey Band, MD
- 984 **Comparison of Total Hospital-Acquired Bloodstream Infections to Central Line-Associated Bloodstream Infections and Implications for Outcome Measures in Infection Control** • Surbhi Leekha, MBBS, MPH; Shanshan Li, BS; Kerri A. Thom, MD, MS; Michael Anne Preas, RN, BSN, CIC; Brian S. Caffo, PhD; Daniel J. Morgan, MD, MS; Anthony D. Harris, MD, MPH
- 987 **Effect of Varying the Number and Location of Alcohol-Based Hand Rub Dispensers on Usage in a General Inpatient Medical Unit** • Benjamin P. Chan, MD; Karen Homa, PhD; Kathryn B. Kirkland, MD
- 990 **Can Matrix-Assisted Laser Desorption Ionization Time-of-Flight Mass Spectrometry (MALDI-TOF) Enhance Antimicrobial Stewardship Efforts in the Acute Care Setting?** • Pranita D. Tamma, MD, MHS; Kennard Tan, MD; Veronique R. Nussenblatt, MD, MHS; Alison E. Turnbull, DVM, MPH; Karen C. Carroll, MD; Sara E. Cosgrove, MD, MS

LETTERS TO THE EDITOR

- 996 **The Environment and Healthcare-Acquired Infections: Why Accurate Reporting and Evaluation of Biological Plausibility Are Important** • Stephan Harbarth, MD, MS; Matthias Maiwald, MD, PhD; Stephanie J. Dancer, MD, FRCPath

CONTENTS CONTINUED ON NEXT PAGE

INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY

VOLUME 34, NUMBER 9

SEPTEMBER 2013

CONTENTS CONTINUED FROM PREVIOUS PAGE

- 997 **Reply to Harbarth et al** • Cassandra D. Salgado, MD; Kent A. Sepkowitz, MD; Joseph F. John, MD; J. Robert Cantey, MD; Hubert H. Attaway, MS; Katherine D. Freeman, DrPH; Peter A. Sharpe, MBA; Harold T. Michels, PhD; Michael G. Schmidt, PhD
- 999 **Impact of the 2013 Revised Centers for Disease Control and Prevention Central Line–Associated Bloodstream Infection (CLABSI) Surveillance Definition on Inpatient Hospital CLABSI Rates: Is It Enough?** • Kerri Dutcher, MPH; Edith R. Lederman, MD, MPH; Stephanie Brodine, MD; Shilla Patel, OD, CIC

An Official Publication of the Society for Healthcare Epidemiology of America

EDITOR

Suzanne F. Bradley, MD • Ann Arbor, MI

DEPUTY EDITOR

Carol A. Kauffman, MD • Ann Arbor, MI

SENIOR ASSOCIATE EDITORS

C. Glen Mayhall, MD • Galveston, TX
Gina Pugliese, RN, MS • Chicago, IL
William Schaffner, MD • Nashville, TN

ASSOCIATE EDITORS

Carol Chenoweth, MD • Ann Arbor, MI
Ebbing Lautenbach, MD, MPH • Philadelphia, PA
David Weber, MD, MPH • Chapel Hill, NC

STATISTICS CONSULTANT

Rodney L. Dunn, MS • Ann Arbor, MI

SECTION EDITOR FOR GUIDELINES, POSITION PAPERS, AND INVITED REVIEWS

Eli Perencevich, MD, MS • Iowa City, IA

MANAGING EDITOR

Rob Blixt • Chicago, IL

PAST EDITORS

Infection Control

Richard P. Wenzel, MD, 1980–1990 (vols. 1–11)

Infection Control and Hospital Epidemiology

Richard P. Wenzel, MD, 1991–1992 (vols. 12 and 13)

Michael D. Decker, MD, 1993–2001 (vols. 14–22)

Barry M. Farr, MD, 2002–2004 (vols. 23–25)

William R. Jarvis, MD, 2005–2006 (vols. 26 and 27)

EDITORIAL ADVISORY BOARD

Miriam Alter, PhD, MD • Galveston, TX
Deverick Anderson, MD, MPH • Durham, NC
Anucha Apisarnthanarak, MD • Pratumthani, Thailand
Lennox Archibald, MD, FRCP • Alachua, FL
Hilary Babcock, MD • St. Louis, MO
Shailen Banerjee, PhD • Atlanta, GA
Elise M. Beltrami, MD, MPH • Atlanta, GA
Jo Anne Bennett, RN, PhD • New York, NY
David Birnbaum, PhD, MPH • Sidney, BC
Marc Bonten, MD • Utrecht, Netherlands
Christian Brun-Buisson, MD • Creteil, France
John P. Burke, MD • Salt Lake City, UT
David P. Calfee, MD, MS • New York, NY
Yehuda Carmeli, MD, MPH • Tel Aviv, Israel
Donald E. Craven, MD • Burlington, MA
Christopher Crnich, MD, MS • Madison, WI
Erika D'Agata, MD, MPH • Boston, MA
Daniel Diekema, MD • Iowa City, IA
Erik Dubberke, MD, MSPH • St. Louis, MO
Charles E. Edmiston, Jr., PhD • Milwaukee, WI
Theodore C. Eickhoff, MD • Denver, CO
Mohamad Fakih, MD, MPH • Grosse Pointe Woods, MI
Jon P. Furuno, PhD • Portland, OR
Petra Gastmeier, MD • Berlin, Germany
Jeffrey Gerber, MD, PhD • Philadelphia, PA
Dale N. Gerding, MD • Hines, IL
Donald A. Goldmann, MD • Boston, MA
Nicholas Graves, PhD • Brisbane, Australia
Donna Haiduvan, RN, PhD, CIC • Tampa, FL
Anthony D. Harris, MD, MPH • Baltimore, MD
Elizabeth Henderson, PhD • Calgary, AB
David K. Henderson, MD • Bethesda, MD
Loreen A. Herwaldt, MD • Iowa City, IA

Peter N. R. Heseltine, MD • Brea, CA

John A. Jernigan, MD, MS • Atlanta, GA

James T. Lee, MD, PhD • St. Paul, MN

L. Clifford McDonald, MD • Atlanta, GA

Allison McGeer, MD • Toronto, ON

Leonard A. Mermel, DO, ScM • Providence, RI

Robert R. Muder, MD • Pittsburgh, PA

Linda Mundy, MD • Collegeville, PA

Joseph M. Mylotte, MD, CIC • Buffalo, NY

Jan Evans Patterson, MD • San Antonio, TX

David A. Pegues, MD • Los Angeles, CA

Didier Pittet, MD, MS • Geneva, Switzerland

Issam Raad, MD • Houston, TX

Manfred L. Rotter, MD, DipBact • Vienna, Austria

William A. Rutala, PhD, MPH • Chapel Hill, NC

Lisa Saiman, MD, MPH • New York, NY

Sanjay Saint, MD, MPH • Ann Arbor, MI

Sorana Segal-Maurer, MD • Flushing, NY

Lynne M. Sehulster, PhD • Atlanta, GA

John A. Sellick, DO • Amherst, NY

Kent Sepkowitz, MD • New York, NY

Andrew E. Simor, MD • Toronto, ON

Philip W. Smith, MD • Omaha, NE

Kurt Stevenson, MD, MPH • Columbus, OH

Nimalie Stone, MD • Atlanta, GA

Thomas Talbot, MD, MPH • Nashville, TN

Paul Tambyah, MBBS • Singapore

William Trick, MD • Chicago, IL

Antoni Trilla, MD, PhD • Barcelona, Spain

Robert A. Weinstein, MD • Chicago, IL

Andreas Widmer, MD, MS • Basel, Switzerland

Marcus Zervos, MD • Detroit, MI

Infection Control and Hospital Epidemiology (ISSN 0899-823X) is published monthly by the University of Chicago Press, 1427 E. 60th St., Chicago, IL 60637-2954 (<http://www.journals.uchicago.edu/ICHE/>). The editorial office is in Chicago, Illinois.

Editorial Office

Communications should be addressed to the Editor, *Infection Control and Hospital Epidemiology*, 1427 E. 60th St., Chicago, IL 60637-2954 (e-mail: iche@press.uchicago.edu; telephone: 773-702-2538, fax: 773-753-4247). Contributors should consult the Information for Authors, which is available at the journal's Web site.

Advertising

Please direct advertising inquiries to Paul Tucker, Breuning Nagle Associates, 59 Grove Street, New Canaan, CT 06840 (e-mail: paul@bna1.com; telephone: 847-669-1096, fax: 203-801-0011). Publication of an advertisement in *Infection Control and Hospital Epidemiology* does not imply endorsement of its claims by the Society for Healthcare Epidemiology of America, by the Editor, or by the University of Chicago. Correspondence regarding advertising should be addressed to the advertising office in Chicago.

Permissions

Articles may be copied or otherwise reused without permission only to the extent permitted by Sections 107 and 108 of the US Copyright Law. Permission to copy articles for personal, internal, classroom, or library use may be obtained from the Copyright Clearance Center (<http://www.copyright.com>). For all other uses, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale, please contact the Permissions Coordinator, Journals Division, University of Chicago Press, 1427 E. 60th St., Chicago, IL 60637 (e-mail: journalpermissions@press.uchicago.edu; fax:

773-834-3489). Articles in the public domain may be used without permission, but it is customary to contact the author.

Subscriptions

The individual subscription rate for 2013 is \$191. Lower rates for fellows, residents, and students are available at <http://www.journals.uchicago.edu/ICHE>. Individuals have the option to order directly from the University of Chicago Press. Institutional print + electronic and e-only subscriptions are available through JSTOR's Current Scholarship Program and include unlimited online access; rates are tiered according to an institution's type and research output: \$455 to \$1,438 (print + electronic), \$364 to \$910 (e-only). Institutional print-only is \$455. Additional taxes and/or postage for non-U.S. subscriptions may apply. Subscription agent for Japan: Kinokuniya Company, Ltd. Free or deeply discounted access is available in most developing nations through the Chicago Emerging Nations Initiative (<http://www.journals.uchicago.edu/ceni/>).

Please direct subscription inquiries, requests for back issues, and address changes to Journals Division, University of Chicago Press, P.O. Box 37005, Chicago, IL 60637 (e-mail: subscriptions@press.uchicago.edu; telephone: 773-753-3347 or toll-free in the United States and Canada 877-705-1878; fax: 773-753-0811 or toll-free 877-705-1879).

Postmaster: Send address changes to *Infection Control and Hospital Epidemiology*, University of Chicago Press, P.O. Box 37005, Chicago, IL 60637-2954.

Periodicals postage paid at Chicago, Illinois, and at an additional mailing office.

Published by the University of Chicago Press, Chicago, Illinois. © 2013 by The Society for Healthcare Epidemiology of America. All rights reserved. This publication is printed on acid-free paper.

The **Chicago** Manual of Style

SIXTEENTH EDITION

“The Sixteenth Edition of *The Chicago Manual of Style* is here, and it’s hard for some of us to contain our excitement. . . . For those of us who spend our days worrying over words, there really is something thrilling—or at least comforting—about the arrival of the newest incarnation of this venerable guide.”

—*New Yorker Book Bench Blog*

Cloth \$65.00

The Chicago Manual of Style Online is available by annual subscription. Sign up for a thirty-day FREE trial at www.chicagomanualofstyle.org

The University of Chicago Press www.press.uchicago.edu