

# Infection Control Hospital Epidemiology



**APRIL 2020** 



# Medicine Books and Journals from

Cambridge University Press

The Cambridge Medicine programme focuses its book publishing in a defined set of core clinical areas with our great strength in the clinical brain sciences. Other specialties of significant focus include reproductive medicine/obstetrics and gynaecology, anaesthesia and critical care, emergency medicine and pathology.

Our journals programme covers a broad spectrum of medical disciplines including emergency and disaster medicine, epidemiology and infectious diseases, biomedical science, genetics, nutrition, mental health and psychiatry, and neuroscience.

We partner with many learned societies including The Society for Healthcare Epidemiology of America, the Neuroscience Education Institute, and the Royal College of Obstetricians and Gynaecologists.

For further details visit: cambridge.org/core-medicine





Volume 41

2020

Number 4

# CONTENTS

## **Original Articles**

- 385 Serosurvey on healthcare personnel caring for patients with Ebola virus disease and Lassa virus in the United States Colleen S. Kraft, Aneesh K. Mehta, Jay B. Varkey, G. Marshall Lyon III, Sharon Vanairsdale, Sonia Bell, Eileen M. Burd, Mary Elizabeth Sexton, Leslie Anne Cassidy, Patricia Olinger, Kalpana Rengarajan, Vanessa N. Raabe, Emily Davis, Scott Henderson, Paula DesRoches, Yongxian Xu, Mark J. Mulligan, and Bruce S. Ribner on behalf of the Serious Communicable Diseases Unit (SCDU)
- **391** Comparative evaluation of the microbicidal activity of low-temperature sterilization technologies to steam sterilization *William A. Rutala, Maria F. Gergen, Emily E. Sickbert-Bennett and David J. Weber*
- **396** Oxygen nipple and nut (Christmas tree) adaptor contamination rates and decontamination with disinfecting wipes *Nicole A. Colandrea, Michael L. Cleary, David R. Peaper, Linda K. Sullivan, Richard A. Martinello and Thomas S. Murray*
- **400** The validity of validation: A practical assessment *Eric C. Stone, Vickie Miller, Heidi J. Shedenhelm, Walter C. Hellinger and John C. O'Horo*

**404** Evaluation of the National Healthcare Safety Network standardized infection ratio risk adjustment for healthcare-facility-onset *Clostridioides difficile* infection in intensive care, oncology, and hematopoietic cell transplant units in general acute-care hospitals *Christopher R. Polage, Kathleen A. Quan, Keith Madey, Frank E. Myers, Debbra A. Wightman, Sneha Krishna, Jonathan D. Grein, Laurel Gibbs, Deborah Yokoe, Shannon C. Mabalot, Raymond Chinn, <i>Amy Hallmark, Zachary Rubin, Michael Fontenot, Stuart Cohen, David Birnbaum, Susan S. Huang and Francesca J. Torriani* 

- The impact of an electronic medical record nudge on reducing testing for hospital-onset *Clostridioides difficile* infection
  Jessica R. Howard-Anderson, Mary Elizabeth Sexton, Chad Robichaux, Zanthia Wiley, Jay B. Varkey, Sujit Suchindran, Benjamin Albrecht, K. Ashley Jones, Scott K. Fridkin and Jesse T. Jacob
- **418** Spatiotemporal clustering of in-hospital *Clostridioides difficile* infection *Shreyas Pai, Philip M. Polgreen, Alberto Maria Segre, Daniel K. Sewell and Sriram V. Pemmaraju for the CDC MInD-Healthcare group*
- 425 Using VRE screening tests to predict vancomycin resistance in enterococcal bacteremia *Guillaume Butler-Laporte, Matthew P. Cheng, Emily G. McDonald and Todd C. Lee*

Cover image: Sir John Pringle, 1707-1782. Oil Painting. Credit: Wellcome Collection. CCBY.

- **430** Association between statewide adoption of the CDC's Core Elements of Hospital Antimicrobial Stewardship Programs and rates of methicillin-resistant *Staphylococcus aureus* bacteremia and *Clostridioides difficile* infection in the United States *Alessandra B. Garcia Reeves, James W. Lewis, Justin G. Trogdon, Sally C. Stearns, David J. Weber and Morris Weinberger*
- **438** Self-reported beta-lactam allergy and the risk of surgical site infection: A retrospective cohort study *Philip W. Lam, Payam Tarighi, Marion Elligsen, Keith Gunaratne, Avery B. Nathens, Jordan Tarshis and Jerome A. Leis*
- 444 Preoperative risk stratification of deep sternal wound infection after coronary surgery *Fausto Biancari, Giuseppe Gatti, Stefano Rosato, Giovanni Mariscalco, Aniello Pappalardo, Francesco Onorati, Giuseppe Faggian, Antonio Salsano, Francesco Santini, Vito G. Ruggieri, Andrea Perrotti, Giuseppe Santarpino, Theodor Fischlein, Matteo Saccocci, Francesco Musumeci, Antonino S. Rubino, Marisa De Feo, Ciro Bancone, Francesco Nicolini, Eeva-Maija Kinnunen, Till Demal, Paola D'Errigo, Tatu Juvonen, Magnus Dalén and Daniele Maselli*
- **452** Surveillance of external ventricular drainage-associated meningitis and ventriculitis in German intensive care units *Peter Bischoff, Christin Schröder, Petra Gastmeier and Christine Geffers*

#### Review

**458** A systematic review of economic evaluation in fecal microbiota transplantation *Thomas Stalder, Nathalie Kapel, Sophie Diaz, Frédéric Grenouillet, Stéphane Koch, Samuel Limat, Franck Daval, Lucine Vuitton and Virginie Nerich* 

#### **Concise Communications**

- Potential for the current National Healthcare Safety Network (NHSN) >3 days after admission definition of laboratory-identified, healthcare-facility–onset, *Clostridioides difficile* infection (HO-CDI) to overestimate rates
  Shruti Puri, Heather Y. Hughes, Monica D. McCrackin, Robert Williford, Mulugeta Gebregziabher, Cassandra D. Salgado and Scott R. Curry
- **469** Barriers and facilitators to standardization of ultrasound use and probe disinfection in the ambulatory setting *Angela Ai, Laura Anderson, Nasia Safdar and Daniel Shirley*
- **472** Identification of a norovirus outbreak on a hematopoietic stem cell transplant unit and development and implementation of a novel infection prevention algorithm for controlling transmission *Westyn Branch-Elliman, Roger V. Araujo-Castillo, Graham M. Snyder, Bernadette F. Sullivan, Carolyn D. Alonso and Sharon B. Wright*

### **Research Brief**

**477** Inappropriate antibiotic surgical prophylaxis in pediatric patients: A national point-prevalence study *Brian R. Lee, Alison C. Tribble, Jeffrey S. Gerber, Adam L. Hersh, Matthew P. Kronman and Jason G. Newland on behalf of the SHARPS Collaborative* 

- Association between use of diagnostic tests and antibiotic prescribing for pharyngitis in the United States *Daniel J. Shapiro, Laura M. King, Katherine E. Fleming-Dutra, Lauri A. Hicks and Adam L. Hersh*
- An evaluation of metrics for assessing catheter-associated urinary tract infections (CAUTIs): A statewide comparison Dana E. Pepe, Meghan Maloney, Vivian Leung, Adora Harizaj, David B. Banach, Louise-Marie Dembry and Sonali D. Advani

## Letter to the Editor

- Evaluation of a ceiling effect on the association of new resistance development to antipseudomonal beta-lactam exposure in the critically ill *Besu F. Teshome, Scott Martin Vouri, Nicholas B. Hampton, Marin H. Kollef and Scott T. Micek*
- Silent clonal spread of vancomycin-resistant *Enterococcus faecalis* ST6 and ST525 colonizing patients at hospital admission in Natal, Brazil *Emília S. de Oliveira, Ana R. Freitas, Luísa Peixe, Carla Novais and M. Celeste Melo*
- Ten to fifteen seconds are needed for complete skin coverage with alcoholic hand disinfectant *Sebastian Schulz-Stübner, Annika Unger, Michaela Berger, Winfried Ebner and Thomas Hauer*
- The varying specificity of urine cultures in different populations *Kirk M. Chan-Tack, Barbara W. Trautner and Daniel J. Morgan*
- The Hawthorne effect in observational studies: Threat or opportunity? *Mostafa Mostafazadeh-Bora*

# **MICROBIAL SURVEILLANCE TESTING MADE EASY**

Healthmark offers the One-Two Punch to Identify and Document the Efficacy of Your Endoscope Reprocessing



# AUDIT WITH THE **FLEXIBLE ENDOSCOPE SAMPLING KIT**

*Surveillance tool for the random testing of duodenoscopes in compliance with CDC guidelines - In association with Nelson Laboratories* 



A simple and complete kit. After flushing and brushing the lumen and elevator mechanism of a duodenoscope, simply follow the procedure to have the sample solution & brush heads quickly sent to Nelson

Laboratories - the leader in independent testing of flexible endoscopes. All tools are included for testing and shipment.



HEALTHMARK INDUSTRIES | WWW.HMARK.COM | 800.521.6224 | 33671 DOREKA DRIVE FRASER, MI 48026

# **INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY**

An Official Publication of the Society for Healthcare Epidemiology of America

#### EDITOR

Suzanne F. Bradley, MD • Ann Arbor, MI

**DEPUTY EDITOR** Carol Chenoweth, MD • Ann Arbor, MI

#### ASSOCIATE EDITORS

David P. Calfee, MD, MS • New York, NY Lindsay E. Nicolle, MD • Winnipeg, Manitoba Trevor C. Van Schooneveld, MD • Omaha, NE David Weber, MD, MPH • Chapel Hill, NC

#### STATISTICS CONSULTANTS

Jon P. Furuno, PhD • Portland, OR Jessina C. McGregor, PhD • Portland, OR

#### MANAGING EDITOR

Lindsay MacMurray • New York, NY

#### PAST EDITORS

Infection Control • Portland, OR Richard P. Wenzel, MD, 1980-1987 (vols. 1-8) Infection Control & Hospital Epidemiology Richard P. Wenzel, MD, 1988-1992 (vols. 9-13) 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

Deverick Anderson, MD, MPH • Durham, NC Anucha Apisarnthanarak, MD • Pratumthani, Thailand-Lennox Archibald, MD, FRCP • Alachua, FL 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 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 Mohamad Fakih, MD, MPH • Grosse Pointe Woods, MI 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 Haiduven, 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 Mini Kamboj, MD • New York, NY Carol A. Kauffman, MD • Ann Arbor, MI 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 • Philadelphia, PA Didier Pittet, MD, MS • Geneva, Switzerland Isaam 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 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 & Hospital Epidemiology* (ISSN 0899-823X) is published monthly by Cambridge University Press, One Liberty Plaza, New York, NY 10006, USA.

#### **Editorial Office**

Communications should be addressed to the Editor, *Infection Control & Hospital Epidemiology*, One Liberty Plaza, New York, NY 10006 (email: iche.managingeditor@cambridge.org. Contributors should consult the Instructions for Contributors, which is available at the journal's Web site.

#### Advertising

Please direct advertising inquiries to M. J. Mrvica Associates, 2 West Taunton Avenue, Berlin, NJ 08009 (e-mail: mjmrvica@mrvica.com; telephone: 856-768-9360, fax: 856-753-0064). Publication of an advertisement in *Infection Control & Hospital Epidemiology* does not imply endorsement of its claims by the Society for Healthcare Epidemiology of America, by the Editor, or by Cambridge University Press.

#### 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, email: info@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 Cambridge University Press. Full details may be found at: www.cambridge.org/about-us/rights-permissions.

#### **Subscriptions**

The individual subscription rate for 2020 is \$287. Individuals have the option to order directly from Cambridge University Press. Institutional print + electronic and e-only subscriptions are available from Cambridge University Press and include unlimited online access; rates are tiered according to an institution's type and research output and may be reviewed at the journal's homepage on Cambridge Core: cambridge.org/ICHE.

Please direct subscription inquiries and requests for back issues to Customer Services at Cambridge University Press, e-mail: subscriptions\_newyork@ cambridge.org (USA, Canada, and Mexico) or journals@cambridge.org (outside of USA, Canada, and Mexico).

**Postmaster:** Send address changes to *Infection Control & Hospital Epidemiology*, Cambridge University Press, One Liberty Plaza, New York, NY 10006 USA.

### About the cover:



Since 2015, the cover format of each volume of *Infection Control and Hospital Epidemiology* has been changed to honor one of the many professionals throughout history who recognized not only how disease might be spread but also how those principles could be applied to reduce healthcare-associated infections.

Sir John Pringle (1707–1782) was born into a prominent Scottish family. He initially studied the classics and philosophy followed by 1 year of medical study at the University of Edinburgh. He planned to leave medicine for a mercantile career. While in the Netherlands, Pringle met Boerhaave, and his interest in medicine was re-energized. He received his medical degree in 1730 from the University of Leyden. In 1734, he assumed a chair in the Faculty of Arts in "Pneumatical and Ethical Philosophy" and practiced medicine at the University of Edinburgh.

At the age of 35, Pringle was appointed surgeon to the British Forces, which had formed an alliance with the Habsburg Dynasty against France. In 1745, as Physician General of the Army, Pringle played a role in assuring the humane treatment of prisoners of war and neutrality for

military hospitals hundreds of years before the Geneva Convention and the formation of the Red Cross.

In 1748, Pringle returned to London and published his experiences in military hospitals. He recognized that hospital fever and jail fever were spread from person to person and that both syndromes were due to typhus. He mandated that prisoners be washed, that their clothing burnt, and that clean clothes be provided at public expense. He understood that hospitals were a major cause of patient sickness: crowding, filth, and lack of hygiene facilitated the spread of disease. Decades before Florence Nightingale, Pringle advocated for fresh air, cleanliness, and hygiene. He observed that fomites contaminated with body fluids, like bedding, spread sepsis. He adopted microscopy and understood that the mites he saw caused scabies. Many years before Lister and Semmelweis, Pringle used acids and distilled spirits to reduce the spread of sepsis, and the first use of the term "antisepsis" was attributed to him.

During his lifetime, Pringle was recognized for his work as President of the Royal College of Physicians (RCP), Member of the Academy of Sciences, and receipt of the prestigious Copley Gold Medal. He was made a Baronet in 1766 and physician to the King in 1774. By 1780, he retired from medicine and returned to Scotland, but the cold climate did not agree with him. Pringle returned to London, but not before he gifted 10 volumes of his Medical and Physical Observations to the RCP (Edinburgh) with the understanding that they would never be published or lent out. He died 4 months later.

The major advances in infection control that Pringle made to the field have too often been attributed to others, and few reminders of him survive to this day. His birthplace was demolished and his grave destroyed during World War II; 2 paintings remain. A memorial to Sir John Pringle can be found in Westminster Abbey albeit in Poets' Corner; this location is ironic, as one friend noted that an inadequate appreciation of English poetry was one of Pringle's few failings.

Cover image: Sir John Pringle, 1707-1782. Oil Painting. Credit: Wellcome Collection. CCBY.