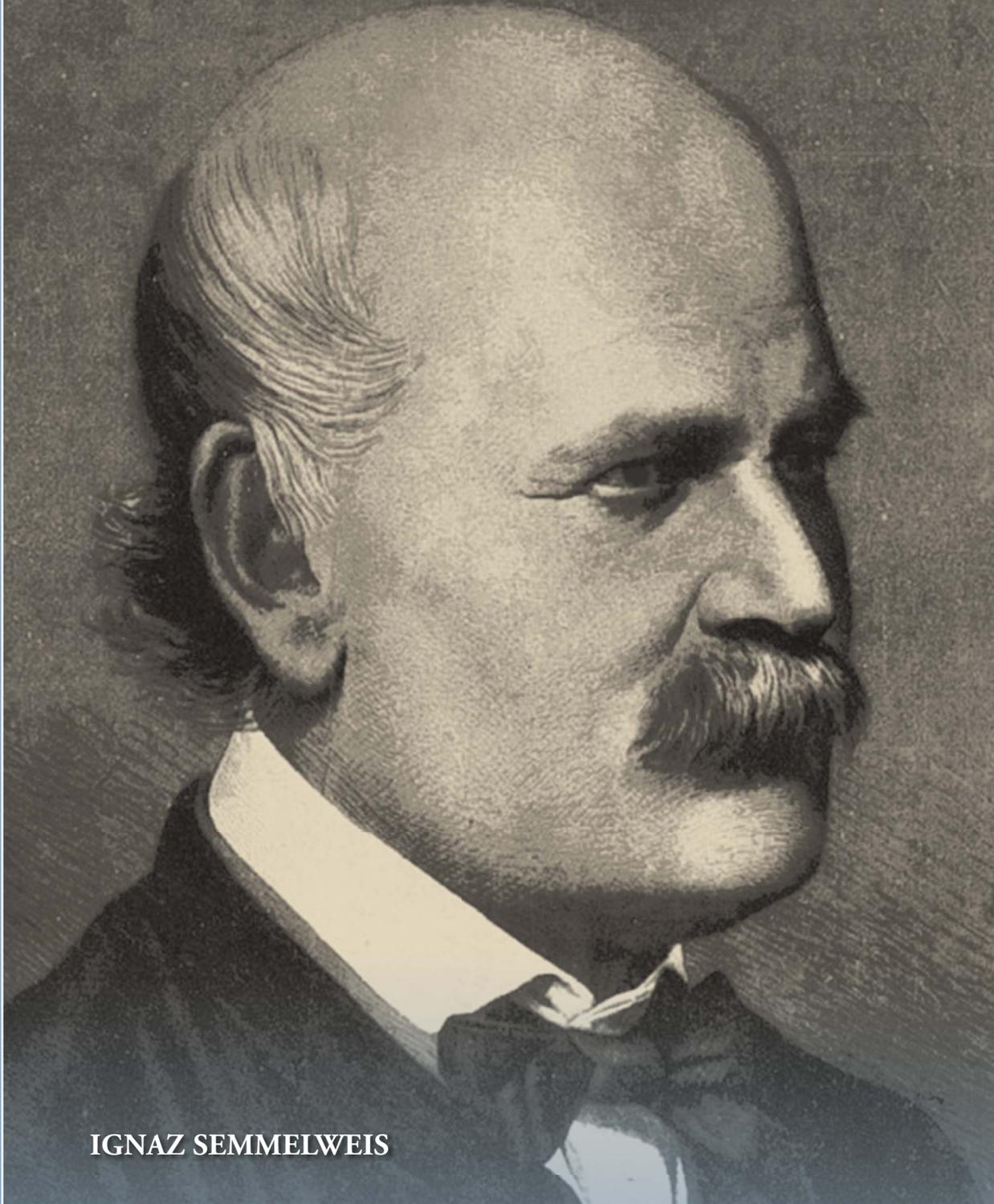


Volume 36, No 9

ICHE



IGNAZ SEMMELWEIS



October 7-11 • San Diego, CA • [www.idweek.org](http://www.idweek.org)



# IDWeek<sup>2015</sup><sup>TM</sup>

**Advancing Science, Improving Care**

**Register by September 4 and Save!**

Earn up to 42 CME credits

**A JOINT MEETING OF**



## CONTENTS

## Original Articles

- 999** Building and Validating a Computerized Algorithm for Surveillance of Ventilator-Associated Events  
*Tal Mann, Joseph Ellsworth, Najia Huda, Anupama Neelakanta, Thomas Chevalier, Kristin L. Sims, Sorabh Dhar, Mary E. Robinson and Keith S. Kaye*
- 1004** Natural Language Processing for Real-Time Catheter-Associated Urinary Tract Infection Surveillance: Results of a Pilot Implementation Trial  
*Westyn Branch-Elliman, Judith Strymish, Valmeek Kudesia, Amy K. Rosen and Kalpana Gupta*
- 1011** Seasonal Variation of Common Surgical Site Infections: Does Season Matter?  
*Michael J. Durkin, Kristen V. Dicks, Arthur W. Baker, Sarah S. Lewis, Rebekah W. Moehring, Luke F. Chen, Daniel J. Sexton and Deverick J. Anderson*
- 1017** Evaluation of the Quality of Reprocessing of Gastrointestinal Endoscopes  
*Philippe Saviuc, Romain Picot-Guéraud, Jacqueline Shum Cheong Sing, Pierre Batailler, Isabelle Pelloux, Marie-Pierre Brenier-Pinchart, Valérie Dobremez and Marie-Reine Mallaret*
- 1024** Excess Length of Stay Attributable to *Clostridium difficile* Infection (CDI) in the Acute Care Setting: A Multistate Model  
*Vanessa W. Stevens, Karim Khader, Richard E. Nelson, Makoto Jones, Michael A. Rubin, Kevin A. Brown, Martin E. Evans, Tom Greene, Eric Slade and Matthew H. Samore*
- 1031** Hospital Transfer Network Structure as a Risk Factor for *Clostridium difficile* Infection  
*Jacob E. Simmering, Linnea A. Polgreen, David R. Campbell, Joseph E. Cavanaugh and Philip M. Polgreen*
- 1038** *Clostridium difficile* Infection Among Veterans Health Administration Patients  
*Yinong Young-Xu, Jennifer L. Kuntz, Dale N. Gerding, Julia Neily, Peter Mills, Erik R. Dubberke, Margaret A. Olsen, Ciarán P. Kelly and Cédric Mahé*
- 1046** Low Yield of Methicillin-Resistant *Staphylococcus aureus* Screening in Hemodialysis Patients: 10 Years' Experience  
*H. M. Gebreselassie, T. Kaspar, S. Droz and J. Marschall*
- 1050** Transmission of Methicillin-Resistant *Staphylococcus aureus* (MRSA) to Healthcare Worker Gowns and Gloves During Care of Nursing Home Residents  
*Mary-Claire Roghmann, J. Kristie Johnson, John D. Sorkin, Patricia Langenberg, Alison Lydecker, Brian Sorace, Lauren Levy and Lona Mody*
- 1058** Whole Genome Sequencing in Real-Time Investigation and Management of a *Pseudomonas aeruginosa* Outbreak on a Neonatal Intensive Care Unit  
*Rebecca J. Davis, Slade O. Jensen, Sebastiaan Van Hal, Björn Espedido, Adrienne Gordon, Rima Farhat and Raymond Chan*
- 1065** Factors Influencing Antibiotic-Prescribing Decisions Among Inpatient Physicians: A Qualitative Investigation  
*Daniel Livorsi, Amber Comer, Marianne S. Matthias, Eli N. Perencevich and Matthew J. Bair*

## Review Articles

- 1073** Healthcare Laundry and Textiles in the United States: Review and Commentary on Contemporary Infection Prevention Issues  
*Lynne M. Sehulster*

- 1089** The Magnitude of Time-Dependent Bias in the Estimation of Excess Length of Stay Attributable to Healthcare-Associated Infections  
*Richard E. Nelson, Scott D. Nelson, Karim Khader, Eli L. Perencevich, Marin L. Schweizer, Michael A. Rubin, Nicholas Graves, Stephan Harbarth, Vanessa W. Stevens and Matthew H. Samore*

#### Concise Communications

- 1095** Chlorhexidine Only Works If Applied Correctly: Use of a Simple Colorimetric Assay to Provide Monitoring and Feedback on Effectiveness of Chlorhexidine Application  
*Laura Supple, Monika Kumaraswami, Sirisha Kundrapu, Venkata Sunkesula, Jennifer L. Cadnum, Michelle M. Nerandzic, Myreen Tomas and Curtis J. Donskey*
- 1098** Prospective Validation of Central Line–Days Derived From an Electronic Medical Record System  
*John M. Boyce, George Paci, Carl Feidner, Lori Hubbard, Laurie Devin, Lenore Reilly, Anthony Gentile, Jonathan M. Siner*
- 1100** The Use of Channel-Purge Storage for Gastrointestinal Endoscopes Reduces Microbial Contamination  
*Philippe Saliou, Franck Cholet, Julien Jézéquel, Michel Robaszekiewicz, Hervé Le Bars and Raoul Baron*
- 1103** Evaluation of Outpatient Parenteral Antimicrobial Therapy at a Veterans Affairs Hospital  
*Emily Sydnor Spivak, Brian Kendall, Patricia Orlando, Christian Perez, Marina De Amorim, Matthew Samore, Andrew T. Pavia and Adam L. Hersh*

#### Research Briefs

- 1106** Secular Trends in Central Line-Associated Bloodstream Infection: Microbiological Pattern of Pathogens after Preventive Measures  
*Priscila Gonçalves, Fernando G. Menezes, Alexandra R. Toniolo, Claudia V. Silva, Maria Fatima S. Cardoso, Julia Y. Kawagoe, Camila M. Santos, Helena Maria F. Castagna, Marines D. V. Martino and Luci Correa*
- 1108** Impact of Contact Isolation Precautions on Multi-Drug Resistant *Acinetobacter baumannii* in the Pediatric Intensive Care Unit  
*Adam Tawney, Lynn Semproch, Paul Lephart, Kevin Valentine, Ronald Thomas, Basim I. Asmar, Teena Chopra and Eric J. McGrath*

#### Letters to the Editor

- 1111** Central-Line–Associated Bloodstream Infection Caused by *Sporobolomyces salmonicolor*  
*Hung-Jen Tang, Chih-Cheng Lai and Chien-Ming Chao*
- 1112** Emergence of a Novel Binary Toxin–Positive Strain of *Clostridium difficile* Associated With Severe Diarrhea That Was Not Ribotype 027 and 078 in China  
*Chunhui Li, Sidi Liu, Pengcheng Zhou, Juping Duan, Qingya Dou, Rui Zhang, Hong Chen, Ying Cheng and Anhua Wu*
- 1114** Methicillin-Resistant *Staphylococcus aureus*: More Attention Should Be Paid in Mainland China  
*Hui Peng, Qiang Hu, Xiu-Bin Tao and Ying-Shui Yao*
- 1115** Importance of Air Particle Counts in Hospital Infection Control: Insights From a Cancer Center in Eastern India  
*Ramkrishna Bhalchandra, Sanjay Bhattacharya, Jeeva Ratnam Soundaranayagam, Subrata Garai and Mammen Chandy*
- 1117** Procalcitonin Is Not Useful to Discriminate Between Infectious and Noninfectious CRP Elevation in Patients with Non–Small Cell Lung Cancer  
*Katrin Scheinplug, Enrico Schalk, Elske Grabert and H. Jost Achenbach*
- 1118** The Slippery Slope of Mandatory Quarantine for Healthcare Workers with Exposure to Ebola—Let’s Do the Math  
*Gary P. Wormser and Eugene D. Shapiro*
- 1119** Short- and Long-Term Effects of a Challenge Dose of Hepatitis B Vaccine in Individuals With and Without Residual Anti-HBs  
*Vladimir Gilca, Nicole Boulianne, Donald Murphy and Gaston De Serres*

*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 CONSULTANTS

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

## SECTION EDITOR FOR GUIDELINES, POSITION PAPERS, AND INVITED REVIEWS

Eli Perencevich, MD, MS • Iowa City, IA

## MANAGING EDITOR

Meighan Schreiber, MSSA • New York, NY

## PAST EDITORS

### *Infection Control*

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  
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 Fakhri, 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 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 • 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. Schulster, 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 & Hospital Epidemiology* (ISSN 0899-823X) is published monthly by Cambridge University Press, 32 Avenue of the Americas, New York, NY 10013, USA.

## Editorial Office

Communications should be addressed to the Editor, *Infection Control & Hospital Epidemiology*, 32 Avenue of the Americas, New York, NY 10013 (email: [mshreiber@cambridge.org](mailto:mshreiber@cambridge.org); telephone: 212-337-5954, fax: 212-337-5959). 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](mailto: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](mailto: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](http://www.cambridge.org/about-us/rights-permissions).

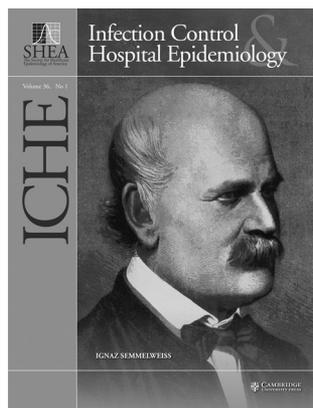
## Subscriptions

The individual subscription rate for 2015 is \$224. 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 CJO homepage: <http://journals.cambridge.org/ICE>.

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

**Postmaster:** Send address changes to *Infection Control & Hospital Epidemiology*, Cambridge University Press, 100 Brook Hill Drive, West Nyack, NY 10994-2133, USA.

## About the cover:



Starting in 2015, the cover format of each volume of Infection Control & Hospital Epidemiology will highlight one of the many professionals throughout history who not only recognized how disease might be spread, but also how epidemiological principles could be applied to reduce healthcare associated infections.

Ignaz Semmelweis (1818-1865) was a Hungarian physician who was appointed an assistant in obstetrics at the Allgemeines Krankenhaus in Vienna. He recognized that women delivered by midwife trainees were significantly less likely to die of puerperal fever than those delivered by physicians or medical students. He hypothesized that puerperal fever could be spread to mothers at the time of delivery by the hands of obstetricians that became contaminated while performing autopsies on women who had died in the maternity ward. Controlled trials of hand washing with chloride of lime solution and disinfection of instruments showed that he could reduce infections among the women cared for by physicians by almost 20-fold. Unfortunately, he did not publish his findings which contributed to the lack of acceptance of antisepsis among senior staff;

Semmelweis' academic appointment was not renewed. He left for Budapest, but his beliefs failed to gain traction among colleagues in Hungary. Semmelweis' increasingly erratic and angry behavior led to commitment to an asylum; he died there within a few short weeks at the age of 47 years. Contrary to legend, Semmelweis' autopsy suggests that he did not die of streptococcal gangrene, but rather of trauma related to beatings inflicted by the guards at the asylum and an early Alzheimer-type dementia.

### Correction Notice:

One of our loyal readers of Infection Control & Hospital Epidemiology recently notified us that the traditional spelling of the surname of Ignaz Semmelweiss is actually Semmelweis. Although instances exist with alternate versions of his surname being spelled (Semmelweiss vs. Semmelweis), upon review the dominant majority of references use the traditional spelling. Cambridge would like to apologize for this oversight that we introduced and we have updated the cover and text accordingly. Our thanks to the reader for bringing this to our attention.

ADVERTISEMENT

**Request for Proposals –  
BIOPATCH<sup>®</sup> Protective Disk  
with CHG**

Ethicon, Inc. is interested in receiving proposals for investigating the use of BIOPATCH<sup>®</sup> Protective Disk with CHG for use on Peripheral IV insertion sites. We are able to consider clinical study proposals with funding requests below US \$100,000.00.

We are specifically interested in proposals investigating the use of BIOPATCH<sup>®</sup> in the adoption of clinically indicated replacement for Peripheral IVs.

If you have interest in this area of research, please contact us for further information. Proposals under this program will only be accepted until September 30, 2015.

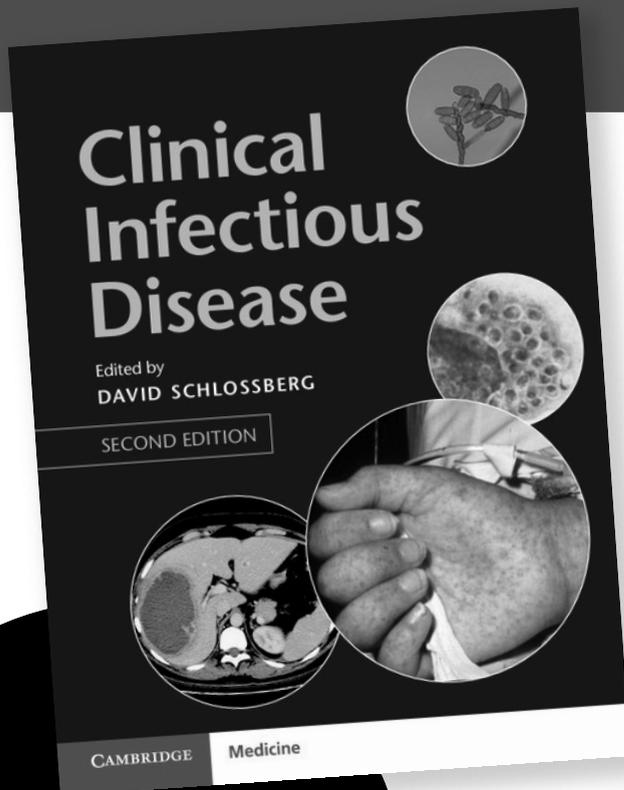
Interested parties should contact Ethicon, Inc. at [gsgiis@its.jnj.com](mailto:gsgiis@its.jnj.com) for further information.

CAMBRIDGE

Medicine

**NOW AVAILABLE!**

The new edition of the popular and clinically oriented user-friendly text...



Edited by **David Schlossberg, MD**  
Temple University, Philadelphia, USA

A fully updated version of this popular, clinically oriented, user-friendly text on infectious disease, with even more helpful graphics, tables, algorithms and images. It is packed full of information on diagnosis, differential diagnosis and therapy. In addition to the traditional organization of organ-system and pathogen-related information, this text also includes clinically helpful sections on the susceptible host (with individual chapters, for example, on the diabetic, the elderly, the injection drug user and the neonate), infections related to travel, infections related to surgery and trauma, nosocomial infection and bioterrorism. Positioned between the available encyclopedic tomes and the smaller pocket guides, this is a convenient, comprehensive, and highly practical reference for all those practicing in infectious diseases as well as internal or general medicine.

- Fully updated and user-friendly
- Abundantly illustrated with high-quality images and tables
- Bridges the gap between the available encyclopedic tomes and smaller pocket guides

**Hardback | 1608 pages | 114 b/w illus | 236 color illus | 522 tables  
9781107038912 | May 2015**

Order now and save 20% off the list price!

**ORDER NOW  
AND SAVE 20%**

For more details, including table of contents, list of contributors, and price, visit [www.cambridge.org](http://www.cambridge.org) and follow instructions here to get a **20% discount off the list price!**

Order direct from the publisher by visiting [www.cambridge.org](http://www.cambridge.org) or calling toll free at **1-800-872-7423** and use discount code **Schloss20** to save 20%. (Offer expires 7/31/2015.)

Download a free QR code app on your SmartPhone and scan this code to go straight to our website



**CAMBRIDGE  
UNIVERSITY PRESS**  
[www.cambridge.org](http://www.cambridge.org)

32 Avenue of the Americas  
New York, NY 10013