

INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY

VOLUME 33, NUMBER 4

APRIL 2012

SPECIAL TOPIC ISSUE: ANTIMICROBIAL STEWARDSHIP

- 319 **Introduction: Antimicrobial Stewardship 2012: Science Driving Practice** • Arjun Srinivasan, MD; Neil Fishman, MD

SHEA/IDSA/PIDS POLICY STATEMENT

- 322 **Policy Statement on Antimicrobial Stewardship by the Society for Healthcare Epidemiology of America (SHEA), the Infectious Diseases Society of America (IDSA), and the Pediatric Infectious Diseases Society (PIDS)** • Society for Healthcare Epidemiology of America; Infectious Diseases Society of America; Pediatric Infectious Diseases Society

APIC/SHEA POSITION PAPER

- 328 **Antimicrobial Stewardship: A Collaborative Partnership between Infection Preventionists and Health Care Epidemiologists** • Julia Moody, MS, SM(ASCP); Sara E. Cosgrove, MD, MS; Russell Olmsted, MPH, CIC; Edward Septimus, MD, FACP, FIDSA, FSHEA; Kathy Aureden, MS, MT (ASCP)SI, CIC; Shannon Oriola, BSN, RN, CIC, COHN; Gita Wasan Patel, RPh, PharmD, BCPS; Kavita K. Trivedi, MD

REVIEW ARTICLE

- 331 **Antimicrobial Stewardship—the State of the Art in 2011: Focus on Outcome and Methods** • John E. McGowan Jr, MD

ORIGINAL ARTICLES

- 338 **Antimicrobial Stewardship at a Large Tertiary Care Academic Medical Center: Cost Analysis Before, During, and After a 7-Year Program** • Harold C. Standiford, MD; Shannon Chan, PharmD; Megan Tripoli, BA; Elizabeth Weekes, PharmD; Graeme N. Forrest, MBBS
- 346 **Rates and Appropriateness of Antimicrobial Prescribing at an Academic Children's Hospital, 2007–2010** • E. R. Levy, MD; S. Swami, MD; S. G. Dubois, MD; R. Wendt, BA; R. Banerjee, MD, PhD
- 354 **Audit and Feedback to Reduce Broad-Spectrum Antibiotic Use among Intensive Care Unit Patients: A Controlled Interrupted Time Series Analysis** • Marion Elligsen, BScPhm; Sandra A. N. Walker, Sc, BScPhm, Pharm D, FCSHP; Ruxandra Pinto, PhD; Andrew Simor, MD, FRCPC; Samira Mubareka, MD, FRCPC; Anita Rachlis, MD, FRCPC; Vanessa Allen, MD, FRCPC; Nick Daneman, MD, MSc, FRCPC
- 362 **Parenteral to Oral Conversion of Fluoroquinolones: Low-Hanging Fruit for Antimicrobial Stewardship Programs?** • Makoto Jones, MD, MSCI; Benedikt Huttner, MD; Karl Madaras-Kelly, PharmD, MPH; Kevin Nechodom, BS; Christopher Nielson, MD; Matthew Bidwell Goetz, MD; Melinda M. Neuhauser, PharmD, MPH; Matthew H. Samore, MD; Michael A. Rubin, MD, PhD

CONTENTS CONTINUED INSIDE



THE OFFICIAL JOURNAL OF THE SOCIETY FOR HEALTHCARE EPIDEMIOLOGY OF AMERICA

THE UNIVERSITY OF CHICAGO PRESS

**More effective
than iodine-based
products at eliminating
skin microorganisms.**

Period.



**Chloraprep® products have been shown
to outperform iodine-based products.^{1,2}**

The evidence is in. When it comes to eliminating bacteria from the skin, there is a difference. Chloraprep® skin antiseptic is becoming a new standard of care for preoperative skin antisepsis.

References: 1. Saltzman MD, Nuber GW, Gryzlo SM, Marecek GS, Koh JL. Efficacy of surgical preparation solutions in shoulder surgery. *J Bone Joint Surg Am.* 2009;91(8):1949–1953. 2. Ostrander RV, Botte MJ, Brage ME. Efficacy of surgical preparation solutions in foot and ankle surgery. *J Bone Joint Surg Am.* 2005;87(5):980–985. 3. Fletcher N, Sofianos DM, Berkes MB, Obremskey WT. Prevention of perioperative infection. *J Bone Joint Surg Am.* 2007;89(7):1605–1618.

*“Chlorhexidine gluconate
is superior to povidone-
iodine for preoperative
antisepsis for the patient
and surgeon.”³*

carefusion.com/chloraprep | 800.523.0502

Chloraprep®

Patient Preoperative Skin Preparation
2% chlorhexidine gluconate (CHG) & 70% isopropyl alcohol (IPA)

© 2012 CareFusion Corporation or one of its subsidiaries. All rights reserved.
CHLORAPREP is a registered trademark of CareFusion Corporation or one of its subsidiaries. ADV-Period1211



CareFusion

INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY

VOLUME 33, NUMBER 4

APRIL 2012

CONTENTS CONTINUED FROM COVER

- 368 **Decreased Resistance of *Pseudomonas aeruginosa* with Restriction of Ciprofloxacin in a Large Teaching Hospital's Intensive Care and Intermediate Care Units** • G. Jonathan Lewis, DO; Xiangming Fang, PhD; Michael Gooch, RPh; Paul P. Cook, MD
- 374 **Evaluation of Postprescription Review and Feedback as a Method of Promoting Rational Antimicrobial Use: A Multicenter Intervention** • Sara E. Cosgrove, MD, MS; Susan K. Seo, MD; Maureen K. Bolon, MD, MS; Kent A. Sepkowitz, MD; Michael W. Climo, MD; Daniel J. Diekema, MD; Kathleen Speck, MPH; Vidhya Gunaseelan, MS; Gary A. Noskin, MD; Loreen A. Herwaldt, MD; Edward Wong, MD; Trish M. Perl, MD, MSc; for the CDC Prevention Epicenter Program
- 381 **Demonstration of the Weighted-Incidence Syndromic Combination Antibiogram: An Empiric Prescribing Decision Aid** • Courtney Hebert, MD; Jessica Ridgway, MD; Benjamin Vekhter, PhD; Eric C. Brown, PhD; Stephen G. Weber, MD; Ari Robicsek, MD

COMMENTARY

- 389 **The Economics of Antimicrobial Stewardship: The Current State of the Art and Applying the Business Case Model** • Kurt B. Stevenson, MD, MPH; Joan-Miquel Balada-Llasat, PharmD, PhD, D(ABMM); Karri Bauer, PharmD, BCPS; Meredith Deutscher, MD; Debra Goff, PharmD, FCCP; Mark Lustberg, MD, PhD; Preeti Pancholi, PhD, D(ABMM); Erica Reed, PharmD, BCPS; David Smeenk, RPh; Jeremy Taylor, PharmD, BCPS; Jessica West, MSPH

CONCISE COMMUNICATIONS

- 398 **Show Me the Money: Long-Term Financial Impact of an Antimicrobial Stewardship Program** • James R. Beardsley, PharmD; John C. Williamson, PharmD; James W. Johnson, PharmD; Vera P. Luther, MD; Rebekah H. Wrenn, PharmD; Christopher C. Ohl, MD
- 401 **Antimicrobial Stewardship at Transition of Care from Hospital to Community** • Nabin K. Shrestha, MD, MPH; Archana Bhaskaran, MD; Nikole M. Scalera, MD, MS; Steven K. Schmitt, MD; Susan J. Rehm, MD; Steven M. Gordon, MD
- 405 **Implementation of an Antimicrobial Stewardship Program at a 60-Bed Long-Term Acute Care Hospital** • Perry G. Pate, MD; Donald F. Storey, MD; Donna L. Baum, RPh
- 409 **Comparative Assessment of Antimicrobial Usage Measures in the Department of Veterans Affairs** • Patricia L. Schirmer, MD; Renee C. Mercier, PharmD; Russell A. Ryono, PharmD; Nancy Nguyen, PharmD; Cynthia A. Lucero, MD; Gina Oda, MS; Mark Holodniy, MD
- 412 **Implementation of a Clinical Decision Support System for Antimicrobial Stewardship** • Elizabeth D. Hermsen, PharmD, MBA; Trevor C. VanSchooneveld, MD; Harlan Sayles, MS; Mark E. Rupp, MD
- 416 **Constructing Unit-Specific Empiric Treatment Guidelines for Catheter-Related and Primary Bacteremia by Determining the Likelihood of Inadequate Therapy** • Megan E. Davis, PharmD, BCPS; Deverick J. Anderson, MD, MPH; Michelle Sharpe, PharmD; Luke F. Chen, MBBS, MPH, FRACP; Richard H. Drew, PharmD, MS, BCPS, FCCP
- 421 **Lack of Significant Variability among Different Methods for Calculating Antimicrobial Days of Therapy** • Christine J. Kubin, PharmD; Haomiao Jia, PhD; Luis R. Alba; E. Yoko Furuya, MD, MS

CONTENTS CONTINUED ON NEXT PAGE

INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY

VOLUME 33, NUMBER 4

APRIL 2012

CONTENTS CONTINUED FROM PREVIOUS PAGE

- 424 **Impact of the Use of Procalcitonin Assay in Hospitalized Adult Patients with Pneumonia at a Community Acute Care Hospital** • Janet L. Kook, PharmD; Stephanie R. Chao, PharmD; Jennifer Le, PharmD; Philip A. Robinson, MD

RESEARCH BRIEFS

- 427 **Antibiotic Stewardship for Intra-abdominal Infections: Early Impact on Antimicrobial Use and Patient Outcomes** • Yanina Dubrovskaya, PharmD; John Papadopoulos, PharmD; Marco R. Scipione, PharmD; Jerry Altshuler, PharmD; Michael Phillips, MD; Sapna A. Mehta, MD
- 429 **Attitudes of Housestaff toward a Prior-Authorization-Based Antibiotic Stewardship Program** • Ian A. Seemungal, MD; Christopher J. Bruno, MD

LETTERS TO THE EDITOR

- 432 **An Examination of Stewardship Interventions by Major Category in an Urban Academic Medical Center** • James Pellerin, MD; Michael Edmond, MD, MPH, MPA; Gonzalo Bearman, MD, MPH; Kimberly Lee, PharmD; Michael P. Stevens, MD, MPH
- 434 **The Impact of an Infectious Diseases Specialist-Directed Computerized Physician Order Entry Antimicrobial Stewardship Program Targeting Linezolid Use** • John Leander Po, MD, PhD; Bao Q. Nguyen, PharmD; Philip C. Carling, MD
- 435 **A Computer-Assisted Prescription System to Improve Antibacterial Surgical Prophylaxis** • Joana F. Rodrigues, PharmD; André Casado, MD; Carlos Palos, MD; Cláudia Santos, PharmD; Aida Duarte, PhD; Fernando Fernandez-Llimos, PhD

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

Ebbing Lautenbach, MD, MPH • Philadelphia, PA

Preeti N. Malani, MD, MSJ • Ann Arbor, MI

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**

Carol Chenoweth, MD • Ann Arbor, MI

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 Fakh, 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 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

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 • St. Louis, MO

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

Jan Evans Patterson, MD • San Antonio, TX

David A. Pegues, MD • Los Angeles, CA

Eli Perencevich, MD, MS • Iowa City, IA

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

Individual subscription rates for 2012 are \$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: \$425 to \$1,063 (print + electronic), \$340 to \$884 (e-only). Institutional print-only is \$425. 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. © 2012 by the Society for Healthcare Epidemiology of America. All rights reserved. This publication is printed on acid-free paper.

Find the latest in infection control research and practice information in **AJIC**



American Journal of Infection Control

EDITOR: **Elaine L. Larson, RN, PhD, FAAN, CIC**

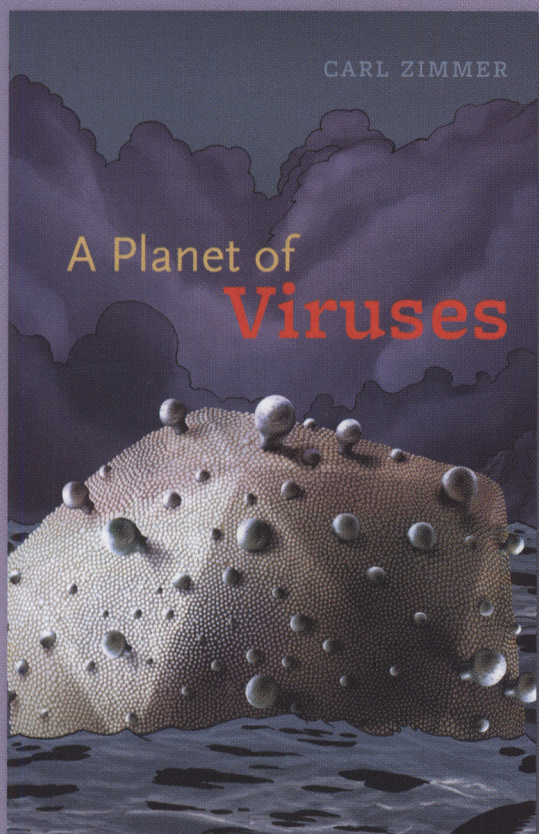
AJIC covers key topics and issues in infection control and epidemiology. Infection control professionals, including physicians, nurses, and epidemiologists, rely on **AJIC** for peer-reviewed articles covering clinical topics as well as original research. As the official publication of the *Association for Professionals in Infection Control and Epidemiology, Inc. (APIC)*, **AJIC** is the foremost resource on infection control, epidemiology, infectious diseases, quality management, occupational health, and disease prevention. **AJIC** also publishes relevant infection control guidelines. **AJIC** is included in Index Medicus and CINAHL.

**Official Publication
of the Association for
Professionals in
Infection Control and
Epidemiology, Inc.**

Register at ajicjournal.org to receive free access to
Tables of Contents and all article abstracts; free access to select
full text articles; free e-alerts and search personalization, and more!



Submit your manuscript at: <http://ees.elsevier.com/ajic/>



“An accessible and gripping narrative on a serious topic that manages to explain, in plain English, how viruses are changing the world.”—NATHAN WOLFE, founder and CEO of Global Viral Forecasting

A Planet of **Viruses** CARL ZIMMER

“*A Planet of Viruses* is an important primer on the viruses living within and around all of us—sometimes funny, other times shocking, and always accessible. Whether discussing the common cold and flu, little-known viruses that attack bacteria or protect oceans, or the world’s viral future as seen through our encounters with HIV or SARS, Zimmer’s writing is lively, knowledgeable, and graced with poetic touches.”

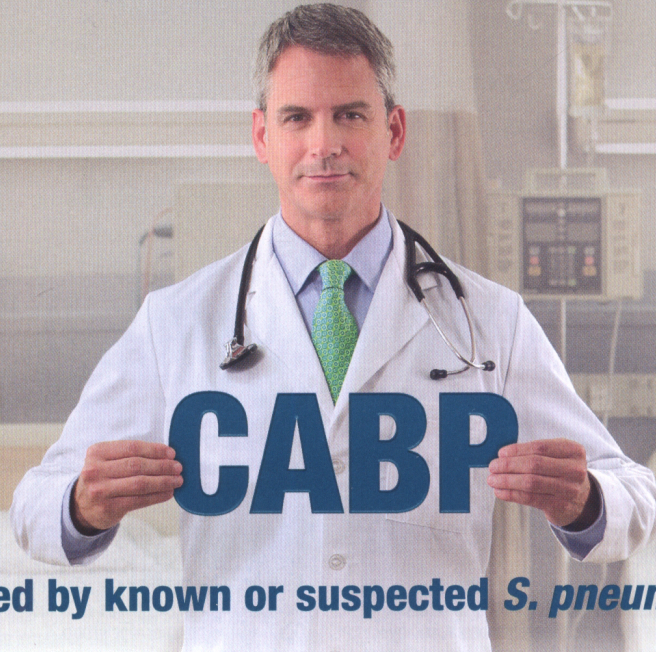
—REBECCA SKLOOT, author of *The Immortal Life of Henrietta Lacks*

Cloth \$20.00

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

Included in CMS/JCAHO
Core Measures for CAP*

An IV Cephalosporin Approved for



caused by known or suspected *S. pneumoniae*

USAGE

- To reduce the development of drug-resistant bacteria and maintain the effectiveness of TEFLARO® and other antibacterial drugs, TEFLARO should be used to treat only CABP that is proven or strongly suspected to be caused by susceptible bacteria.
- When culture and susceptibility information are available, they should be considered in selecting or modifying antibacterial therapy. In the absence of such data, local epidemiology and susceptibility patterns may contribute to the empiric selection of therapy.

INDICATION

- TEFLARO is indicated for the treatment of **community-acquired bacterial pneumonia (CABP)** caused by susceptible isolates of the following Gram-positive and Gram-negative microorganisms: *Streptococcus pneumoniae* (including cases with concurrent bacteremia), *Staphylococcus aureus* (methicillin-susceptible isolates only), *Haemophilus influenzae*, *Klebsiella pneumoniae*, *Klebsiella oxytoca*, and *Escherichia coli*.

IMPORTANT SAFETY INFORMATION

Contraindications

- TEFLARO is contraindicated in patients with known serious hypersensitivity to ceftaroline or other members of the cephalosporin class. Anaphylaxis and anaphylactoid reactions have been reported with ceftaroline.

Warnings and Precautions

Hypersensitivity Reactions

- Serious and occasionally fatal hypersensitivity (anaphylactic) reactions and serious skin reactions have been reported with beta-lactam antibacterials. Before therapy with TEFLARO is instituted, careful inquiry about previous hypersensitivity reactions to other cephalosporins, penicillins, or carbapenems should be made. If this product is to be given to a penicillin- or other beta-lactam-allergic patient, caution should be exercised because cross sensitivity among beta-lactam antibacterial agents has been clearly established.
- If an allergic reaction to TEFLARO occurs, the drug should be discontinued. Serious acute hypersensitivity (anaphylactic) reactions require emergency treatment with epinephrine and other emergency measures that may include airway management, oxygen, intravenous fluids, antihistamines, corticosteroids, and vasopressors as clinically indicated.

*TEFLARO (ceftaroline fosamil) is one of the recommended β -lactam antibiotics for Community-Acquired Pneumonia in Immunocompetent Patients—Non-ICU Patients. PN-6, 6ab-6. Specifications Manual for National Hospital Inpatient Quality Measures, Version 4.0. Discharges 01-01-12 (1Q12) through 06-30-12 (2Q12). Joint Commission on Accreditation of Healthcare Organizations (JCAHO) is now known as The Joint Commission. CMS=Centers for Medicare and Medicaid Services.

Please see additional Important Safety Information throughout and brief summary of Prescribing Information on last page of this advertisement.

Please also see full Prescribing Information at www.TEFLARO.com.

Teflaro 
(ceftaroline fosamil) for injection
600 mg • 400 mg

Broad-spectrum cephalosporin coverage



INDICATION AND USAGE

- TEFLARO is indicated for the treatment of **community-acquired bacterial pneumonia (CABP)** caused by susceptible isolates of the following Gram-positive and Gram-negative microorganisms: *Streptococcus pneumoniae* (including cases with concurrent bacteremia), *Staphylococcus aureus* (methicillin-susceptible isolates only), *Haemophilus influenzae*, *Klebsiella pneumoniae*, *Klebsiella oxytoca*, and *Escherichia coli*.
- To reduce the development of drug-resistant bacteria and maintain the effectiveness of TEFLARO and other antibacterial drugs, TEFLARO should be used to treat only CABP that is proven or strongly suspected to be caused by susceptible bacteria. Appropriate specimens for microbiological examination should be obtained in order to isolate and identify the causative pathogens and to determine their susceptibility to ceftaroline. When culture and susceptibility information are available, they should be considered in selecting or modifying antibacterial therapy. In the absence of such data, local epidemiology and susceptibility patterns may contribute to the empiric selection of therapy.

IMPORTANT SAFETY INFORMATION (continued)

Clostridium difficile-associated Diarrhea

- Clostridium difficile*-associated diarrhea (CDAD) has been reported for nearly all systemic antibacterial agents, including TEFLARO, and may range in severity from mild diarrhea to fatal colitis. Careful medical history is necessary because CDAD has been reported to occur more than 2 months after the administration of antibacterial agents. If CDAD is suspected or confirmed, antibacterials not directed against *C. difficile* should be discontinued, if possible.

Direct Coombs' Test Seroconversion

- Seroconversion from a negative to a positive direct Coombs' test result occurred in 120/1114 (10.8%) of patients receiving TEFLARO and 49/1116 (4.4%) of patients receiving comparator drugs in the four pooled Phase 3 trials. No adverse reactions representing hemolytic anemia were reported in any treatment group. If anemia develops during or after treatment with TEFLARO, drug-induced hemolytic anemia should be considered. If drug-induced hemolytic anemia is suspected, discontinuation of TEFLARO should be considered and supportive care should be administered to the patient if clinically indicated.

Development of Drug-Resistant Bacteria

- Prescribing TEFLARO in the absence of a proven or strongly suspected bacterial infection is unlikely to provide benefit to the patient and increases the risk of the development of drug-resistant bacteria.

Adverse Reactions

- In the four pooled Phase 3 clinical trials, serious adverse events occurred in 98/1300 (7.5%) of patients receiving TEFLARO and 100/1297 (7.7%) of patients receiving comparator drugs. Treatment discontinuation due to adverse events occurred in 35/1300 (2.7%) of patients receiving TEFLARO and 48/1297 (3.7%) of patients receiving comparator drugs with the most common adverse events leading to discontinuation being hypersensitivity for both treatment groups at a rate of 0.3% in the TEFLARO group and 0.5% in the comparator group.
- No adverse reactions occurred in greater than 5% of patients receiving TEFLARO. The most common adverse reactions occurring in >2% of patients receiving TEFLARO in the pooled Phase 3 clinical trials were diarrhea, nausea, and rash.

Drug Interactions

- No clinical drug-drug interaction studies have been conducted with TEFLARO. There is minimal potential for drug-drug interactions between TEFLARO and CYP450 substrates, inhibitors, or inducers; drugs known to undergo active renal secretion; and drugs that may alter renal blood flow.

Use in Specific Populations

- TEFLARO has not been studied in pregnant women. Therefore, TEFLARO should only be used during pregnancy if the potential benefit justifies the potential risk to the fetus.
- It is not known whether ceftaroline is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when TEFLARO is administered to a nursing woman.
- Safety and effectiveness in pediatric patients have not been established.
- Because elderly patients, those ≥ 65 years of age, are more likely to have decreased renal function and ceftaroline is excreted primarily by the kidney, care should be taken in dose selection in this age group and it may be useful to monitor renal function. Dosage adjustment for elderly patients should therefore be based on renal function.
- Dosage adjustment is required in patients with moderate ($\text{CrCl} > 30$ to ≤ 50 mL/min) or severe ($\text{CrCl} \geq 15$ to ≤ 30 mL/min) renal impairment and in patients with end-stage renal disease ($\text{CrCl} < 15$ mL/min).
- The pharmacokinetics of ceftaroline in patients with hepatic impairment have not been established.

Please see brief summary of Prescribing Information on following page.
Please also see full Prescribing Information at www.TEFLARO.com.



Forest Pharmaceuticals, Inc.
Subsidiary of Forest Laboratories, Inc.
St. Louis, Missouri 63045

© 2011 Forest Laboratories, Inc. 69-12000198-C 11/11

Teflaro 
(ceftaroline fosamil) for injection
600 mg • 400 mg

TEFLARO® (ceftaroline fosamil) injection for intravenous (IV) use
Brief Summary of full Prescribing Information
Initial U.S. Approval: 2010

Rx Only

INDICATIONS AND USAGE: Teflaro® (ceftaroline fosamil) is indicated for the treatment of patients with the following infections caused by susceptible isolates of the designated microorganisms. **Acute Bacterial Skin and Skin Structure Infections** - Teflaro is indicated for the treatment of acute bacterial skin and skin structure infections (ABSSSI) caused by susceptible isolates of the following Gram-positive and Gram-negative microorganisms: *Staphylococcus aureus* (including methicillin-susceptible and -resistant isolates), *Streptococcus pyogenes*, *Streptococcus agalactiae*, *Escherichia coli*, *Klebsiella pneumoniae*, and *Klebsiella oxytoca*. **Community-Acquired Bacterial Pneumonia** - Teflaro is indicated for the treatment of community-acquired bacterial pneumonia (CABP) caused by susceptible isolates of the following Gram-positive and Gram-negative microorganisms: *Streptococcus pneumoniae* (including cases with concurrent bacteremia), *Staphylococcus aureus* (methicillin-susceptible isolates only), *Haemophilus influenzae*, *Klebsiella pneumoniae*, *Klebsiella oxytoca*, and *Escherichia coli*. **Usage** - To reduce the development of drug-resistant bacteria and maintain the effectiveness of Teflaro and other antibacterial drugs, Teflaro should be used to treat only ABSSSI or CABP that are proven or strongly suspected to be caused by susceptible bacteria. Appropriate specimens for microbiological examination should be obtained in order to isolate and identify the causative pathogens and to determine their susceptibility to ceftaroline. When culture and susceptibility information are available, they should be considered in selecting or modifying antibacterial therapy. In the absence of such data, local epidemiology and susceptibility patterns may contribute to the empiric selection of therapy.

CONTRAINDICATIONS: Teflaro is contraindicated in patients with known serious hypersensitivity to ceftaroline or other members of the cephalosporin class. Anaphylaxis and anaphylactoid reactions have been reported with ceftaroline.

WARNINGS AND PRECAUTIONS: Hypersensitivity Reactions - Serious and occasionally fatal hypersensitivity (anaphylactic) reactions and serious skin reactions have been reported in patients receiving beta-lactam antibacterials. Before therapy with Teflaro is instituted, careful inquiry about previous hypersensitivity reactions to other cephalosporins, penicillins, or carbapenems should be made. If this product is to be given to a penicillin- or other beta-lactam-allergic patient, caution should be exercised because cross sensitivity among beta-lactam antibacterial agents has been clearly established. If an allergic reaction to Teflaro occurs, the drug should be discontinued. Serious acute hypersensitivity (anaphylactic) reactions require emergency treatment with epinephrine and other emergency measures, that may include airway management, oxygen, intravenous fluids, antihistamines, corticosteroids, and vasopressors as clinically indicated. **Clostridium difficile-associated Diarrhea** - *Clostridium difficile*-associated diarrhea (CDAD) has been reported for nearly all systemic antibacterial agents, including Teflaro, and may range in severity from mild diarrhea to fatal colitis. Treatment with antibacterial agents alters the normal flora of the colon and may permit overgrowth of *C. difficile*. *C. difficile* produces toxins A and B which contribute to the development of CDAD. Hypertoxin-producing strains of *C. difficile* cause increased morbidity and mortality, as these infections can be refractory to antimicrobial therapy and may require colectomy. CDAD must be considered in all patients who present with diarrhea following antibiotic use. Careful medical history is necessary because CDAD has been reported to occur more than 2 months after the administration of antibacterial agents. If CDAD is suspected or confirmed, antibacterials not directed against *C. difficile* should be discontinued, if possible. Appropriate fluid and electrolyte management, protein supplementation, antibiotic treatment of *C. difficile*, and surgical evaluation should be instituted as clinically indicated [see Adverse Reactions]. **Direct Coombs' Test Seroconversion** - Seroconversion from a negative to a positive direct Coombs' test result occurred in 120/1114 (10.8%) of patients receiving Teflaro and 49/1116 (4.4%) of patients receiving comparator drugs in the four pooled Phase 3 trials. In the pooled Phase 3 CABP trials, 51/520 (9.8%) of Teflaro-treated patients compared to 24/534 (4.5%) of ceftriaxone-treated patients seroconverted from a negative to a positive direct Coombs' test result. No adverse reactions representing hemolytic anemia were reported in any treatment group. If anemia develops during or after treatment with Teflaro, drug-induced hemolytic anemia should be considered. Diagnostic studies including a direct Coombs' test, should be performed. If drug-induced hemolytic anemia is suspected, discontinuation of Teflaro should be considered and supportive care should be administered to the patient (i.e. transfusion) if clinically indicated. **Development of Drug-Resistant Bacteria** - Prescribing Teflaro in the absence of a proven or strongly suspected bacterial infection is unlikely to provide benefit to the patient and increases the risk of the development of drug-resistant bacteria.

ADVERSE REACTIONS: The following serious events are described in greater detail in the Warnings and Precautions section: Hypersensitivity reactions; *Clostridium difficile*-associated diarrhea; Direct Coombs' test seroconversion. **Adverse Reactions from Clinical Trials** - Because clinical trials are conducted under widely varying conditions, adverse reaction rates observed in clinical trials of a drug cannot be compared directly to rates from clinical trials of another drug and may not reflect rates observed in practice. Teflaro was evaluated in four controlled comparative Phase 3 clinical trials (two in ABSSSI and two in CABP) which included 1300 adult patients treated with Teflaro (600 mg administered by IV over 1 hour every 12h) and 1297 patients treated with comparator (vancomycin plus aztreonam or ceftriaxone) for a treatment period up to 21 days. The median age of patients treated with Teflaro was 54 years, ranging between 18 and 99 years old. Patients treated with Teflaro were predominantly male (63%) and Caucasian (82%). **Serious Adverse Events and Adverse Events Leading to Discontinuation** - In the four pooled Phase 3 clinical trials, serious adverse events occurred in 98/1300 (7.5%) of patients receiving Teflaro and 100/1297 (7.7%) of patients receiving comparator drugs. The most common SAEs in both the Teflaro and comparator treatment groups were in the respiratory and infection system organ classes (SOC). Treatment discontinuation due to adverse events occurred in 35/1300 (2.7%) of patients receiving Teflaro and 48/1297 (3.7%) of patients receiving comparator drugs with the most common adverse events leading to discontinuation being hypersensitivity for both treatment groups at a rate of 0.3% in the Teflaro group and 0.5% in comparator group. **Most Common Adverse Reactions** - No adverse reactions occurred in greater than 5% of patients receiving Teflaro. The most common adverse

reactions occurring in > 2% of patients receiving Teflaro in the pooled phase 3 clinical trials were diarrhea, nausea, and rash. Table 4 in the full prescribing information lists adverse reactions occurring in ≥ 2% of patients receiving Teflaro in the pooled Phase 3 clinical trials (two in ABSSSI and two in CABP). The first value displays the percentage of patients in the pooled Teflaro trials (N=1300) and the second shows the percentage in the Pooled Comparators* trials (N=1297). **Gastrointestinal disorders:** Diarrhea (5%, 3%), Nausea (4%, 4%), Constipation (2%, 2%), Vomiting (2%, 2%); **Investigations:** Increased transaminases (2%, 3%); **Metabolism and nutrition disorders:** Hypokalemia (2%, 3%); **Skin and subcutaneous tissue disorders:** Rash (3%, 2%); **Vascular disorders:** Phlebitis (2%, 1%) * Comparators included vancomycin 1 gram IV every 12h plus aztreonam 1 gram IV every 12h in the Phase 3 ABSSSI trials, and ceftriaxone 1 gram IV every 24h in the Phase 3 CABP trials. **Other Adverse Reactions Observed During Clinical Trials of Teflaro** - Following is a list of additional adverse reactions reported by the 1740 patients who received Teflaro in any clinical trial with incidences less than 2%. Events are categorized by System Organ Class. **Blood and lymphatic system disorders** - Anemia, Eosinophilia, Neutropenia, Thrombocytopenia; **Cardiac disorders** - Bradycardia, Palpitations; **Gastrointestinal disorders** - Abdominal pain; **General disorders and administration site conditions** - Pyrexia; **Hepatobiliary disorders** - Hepatitis; **Immune system disorders** - Hypersensitivity, Anaphylaxis; **Infections and infestations** - *Clostridium difficile* colitis; **Metabolism and nutrition disorders** - Hypoglycemia, Hyperkalemia; **Nervous system disorders** - Dizziness, Convulsion; **Renal and urinary disorders** - Renal failure; **Skin and subcutaneous tissue disorders** - Urticaria.

DRUG INTERACTIONS: No clinical drug-drug interaction studies have been conducted with Teflaro. There is minimal potential for drug-drug interactions between Teflaro and CYP450 substrates, inhibitors, or inducers; drugs known to undergo active renal secretion; and drugs that may alter renal blood flow [see Clinical Pharmacology].

USE IN SPECIFIC POPULATIONS: Pregnancy Category B - Developmental toxicity studies performed with ceftaroline fosamil in rats at IV doses up to 300 mg/kg demonstrated no maternal toxicity and no effects on the fetus. A separate toxicokinetic study showed that ceftaroline exposure in rats (based on AUC) at this dose level was approximately 8 times the exposure in humans given 600 mg every 12 hours. There were no drug-induced malformations in the offspring of rabbits given IV doses of 25, 50, and 100 mg/kg, despite maternal toxicity. Signs of maternal toxicity appeared secondary to the sensitivity of the rabbit gastrointestinal system to broad-spectrum antibacterials and included changes in fecal output in all groups and dose-related reductions in body weight gain and food consumption at ≥ 50 mg/kg; these were associated with an increase in spontaneous abortion at 50 and 100 mg/kg. The highest dose was also associated with maternal morbidity and mortality. An increased incidence of a common rabbit skeletal variation, angulated hyoid alae, was also observed at the maternally toxic doses of 50 and 100 mg/kg. A separate toxicokinetic study showed that ceftaroline exposure in rabbits (based on AUC) was approximately 0.8 times the exposure in humans given 600 mg every 12 hours at 25 mg/kg and 1.5 times the human exposure at 50 mg/kg. Ceftaroline fosamil did not affect the postnatal development or reproductive performance of the offspring of rats given IV doses up to 450 mg/kg/day. Results from a toxicokinetic study conducted in pregnant rats with doses up to 300 mg/kg suggest that exposure was ≥ 8 times the exposure in humans given 600 mg every 12 hours. There are no adequate and well-controlled trials in pregnant women. Teflaro should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus. **Nursing Mothers** - It is not known whether ceftaroline is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when Teflaro is administered to a nursing woman. **Pediatric Use** - Safety and effectiveness in pediatric patients have not been established. **Geriatric Use** - Of the 1300 patients treated with Teflaro in the Phase 3 ABSSSI and CABP trials, 397 (30.5%) were ≥ 65 years of age. The clinical cure rates in the Teflaro group (Clinically Evaluable [CE] Population) were similar in patients ≥ 65 years of age compared with patients < 65 years of age in both the ABSSSI and CABP trials. The adverse event profiles in patients ≥ 65 years of age and in patients < 65 years of age were similar. The percentage of patients in the Teflaro group who had at least one adverse event was 52.4% in patients ≥ 65 years of age and 42.8% in patients < 65 years of age for the two indications combined. Ceftaroline is excreted primarily by the kidney, and the risk of adverse reactions may be greater in patients with impaired renal function. Because elderly patients are more likely to have decreased renal function, care should be taken in dose selection in this age group and it may be useful to monitor renal function. Elderly subjects had greater ceftaroline exposure relative to non-elderly subjects when administered the same single dose of Teflaro. However, higher exposure in elderly subjects was mainly attributed to age-related changes in renal function. Dosage adjustment for elderly patients should be based on renal function [see Dosage and Administration and Clinical Pharmacology]. **Patients with Renal Impairment** - Dosage adjustment is required in patients with moderate (CrCl > 30 to ≤ 50 mL/min) or severe (CrCl ≤ 15 to ≤ 30 mL/min) renal impairment and in patients with end-stage renal disease (ESRD - defined as CrCl < 15 mL/min), including patients on hemodialysis (HD) [see Dosage and Administration and Clinical Pharmacology].

OVERDOSAGE: In the event of overdose, Teflaro should be discontinued and general supportive treatment given. Ceftaroline can be removed by hemodialysis. In subjects with ESRD administered 400 mg of Teflaro, the mean total recovery of ceftaroline in the dialysate following a 4-hour hemodialysis session started 4 hours after dosing was 76.5 mg (21.6% of the dose). However, no information is available on the use of hemodialysis to treat overdosage [see Clinical Pharmacology].

Distributed by:
Forest Pharmaceuticals, Inc.
Subsidiary of Forest Laboratories, Inc.
St. Louis, MO 63045, USA
Teflaro is a registered trademark of Forest Laboratories, Inc.

IF95USCFR04

Revised: April 2011

© 2010 Forest Laboratories, Inc. All rights reserved.

69-1020503-BS-A-APR11

Please also see full Prescribing Information at www.teflaro.com.



 **Emerald Journals**

Clinical Governance

An International Journal

Clinical Governance: An International Journal aims to address the doubts, queries, triumphs and practical applications of introducing quality assurance mechanisms into the delivery of care.

The journal takes an international stance and covers key developments worldwide which can inform best practice in health care. Efficiency, effectiveness and economics are the main factors in the assessment of best practice and all are addressed in the research- audit- and evidence-based papers published. All papers are peer reviewed to ensure their validity and value to current debates.

The journal publishes:

- Research articles which illustrate clear implications for practice
- Results-focused case studies which discuss problems and successes in clinical governance techniques
- Special issues on topical themes

For more information please visit the homepage:

www.emeraldinsight.com/cgij.htm

To submit a paper visit:

<http://mc.manuscriptcentral.com/cgij>



Research you can use

From the Society for Healthcare Epidemiology of America

Practical Healthcare Epidemiology

3rd edition

Edited by Ebbing Lautenbach,
Keith F. Woeltje, and Preeti N. Malani

Revised and expanded

Cloth \$185.00

E-book \$60.00

Cloth + E-book \$200.00

Order your copy online at www.press.uchicago.edu

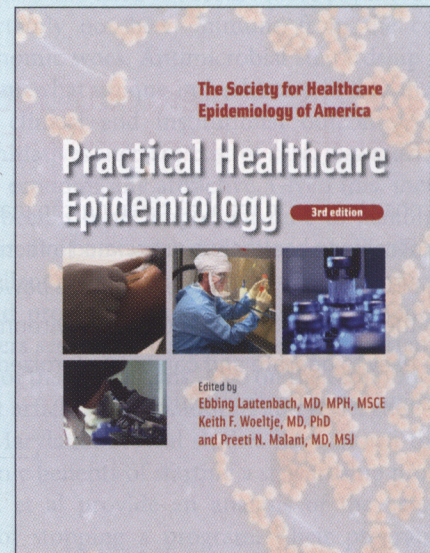
Address infection prevention and quality of patient care with this hands-on guide to epidemiologic principles and prevention strategies.

In recent years, issues of infection prevention and control, patient safety, and quality-of-care have become increasingly prominent in healthcare facilities. *Practical Healthcare Epidemiology* takes a practical, hands-on approach to these issues, addressing all aspects of infection surveillance and prevention in clear, straightforward terms. This fully revised third edition brings together the expertise of more than fifty leaders in healthcare epidemiology who provide clear, sound guidance on infection prevention and control for the full range of patients in all types of healthcare facilities, including those in settings with limited resources. A powerful resource for practitioners in any branch of medicine or public health who are involved in infection prevention and control, whether they are experienced in healthcare epidemiology or new to the field.

"A handy desk reference and an up-to-date primer for trainees and experts alike." — JAMA, The Journal of the American Medical Association

"An essential for anyone in the field." — Thomas R. Talbot, Chief Hospital Epidemiologist, Vanderbilt University Medical Center

"A much-needed response to the currently tough challenges posed to healthcare epidemiologists and infection preventionists ... highly recommended reading for trainees and professionals in infection control—and healthcare epidemiologists in particular." —Clinical Infectious Diseases



PUBLISHED BY
THE UNIVERSITY
OF CHICAGO PRESS

EVERY HIGH-TOUCH SURFACE. EVERY NOOK AND CRANNY.

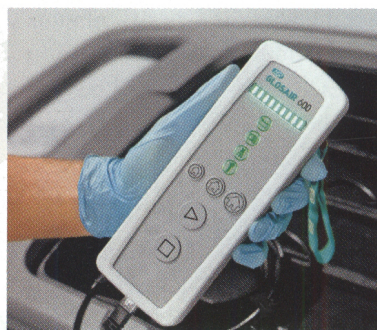
GLOSAIR™ System H₂O₂ Technology: Dependable disinfection. Every time.

Inconsistencies in manual cleaning can leave your facility vulnerable to healthcare-associated infections (HAIs). The GLOSAIR™ System safely delivers powerful disinfection for the added protection hospital environments need. It's easy to operate and can be customized to meet your facility's specific disinfection goals.*



TRY THE GLOSAIR™ 600 SYSTEM FOR 90 DAYS.

To find out more about this GLOSAIR™ System offer and available purchase discounts, call us at 1-888-783-7723 or visit us online at www.aspij.com/glosair90day.



ADVANCED STERILIZATION PRODUCTS

a *Johnson & Johnson* company

*Read and follow the User's Guide for the GLOSAIR™ 600 System prior to use for important safety information.
© Ethicon, Inc. 2012. All rights reserved.

AD-120042-01-US_A